

CHAPTER 3

AFFECTED ENVIRONMENT — FORT LEWIS

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

3.1 SOIL EROSION

Fort Lewis' topography is generally flat to gently rolling, with localized areas of moderately sloping lands. Surficial geologic units primarily consist of glacial deposits formed during the retreat of the Vashon glacier and include glacial outwash terraces, channels, glacial ponds, till, and outwash gravels. Due to the coarse nature of the glacial deposits, Fort Lewis soils are highly resistant to compaction and are typically permeable and well drained, despite high regional precipitation levels (Army 2001e). These properties, combined with generally gentle topography, result in limited erosion constrained to localized areas of steep slopes and escarpments along the Nisqually River and Puget Sound (Randolph et al. 2008).

The soil types on Fort Lewis are dominated by the Spanaway-Nisqually association (Pringle 1990). Spanaway soils are formed on gravelly glacial outwash and are typically gravelly sandy loam, whereas the Nisqually soils are formed on sandy glacial outwash and are loamy fine sands. Other well- to poorly drained soils exist throughout Fort Lewis. Soils on Fort Lewis have the potential to be moderately productive under good management practices, and the Nisqually loamy sand is cultivated in Pierce County to produce hay and minor berry crops (Zulauf 1979).

3.2 WATER RESOURCES

The affected environment section for water resources lays out the foundation for addressing issues identified during the public scoping process. These issues include the effects of Army Growth and Force Structure Realignment on surface water resources and the effects of construction and demolition activities and long-term operations on surface water and groundwater quality, including drinking water sources and hydrology.

The ROI for water resources includes portions of several jurisdictional units designated by Washington's natural resource agencies (**Figure 3-1**). Fort Lewis lies within three Water Resource Inventory Areas (WRIAs) that were designated by the Washington Department of Ecology, Department of Natural Resources (WDNR), and Department of Fish and Wildlife (WDFW) to facilitate watershed planning. In addition, WDNR further divides the WRIAs into smaller Watershed Administrative Units (WAUs). The three WRIAs are Nisqually River (WRIA 11), Chambers-Clover (WRIA 12), and Deschutes River Basin (WRIA 13). The five WAUs are Chambers-Clover, Muck Creek, Yelm Creek, McAllister, and Lower Deschutes (**Figure 3-1**).

3.2.1 Surface Water

Surface water resources in the ROI include rivers, streams, lakes, wetlands, and marine areas. The following sections describe the occurrence, quantity, and quality of water present in these resources.

1 **3.2.1.1 Surface Water Occurrence and Quantity**

2 The main surface water feature in the ROI is the Nisqually River, which crosses Fort Lewis in a
3 southeast to northwest direction and discharges into the Nisqually Reach of Puget Sound (**Figure**
4 **3-1**). Other major streams include Muck Creek, Murray Creek, and Sequelitchew Creek. In addition,
5 29 lakes exist on Fort Lewis, the largest of which are American, Lewis, Nisqually, and Sequelitchew
6 Lakes.

7 Due to the pervious nature of the surface soils and the presence of groundwater near the surface of
8 the land, several surface water bodies exist as surface expressions of the shallow groundwater table.
9 Examples are American Lake; Sequelitchew Lake; several wetlands; at times, Sequelitchew Creek
10 and Murray Creek in the cantonment area; and numerous other lakes, wetlands, and some tributaries
11 to Muck Creek. Some of these areas are both groundwater discharge and recharge areas, depending
12 on seasonal changes in groundwater elevation and on the direction of groundwater flow.

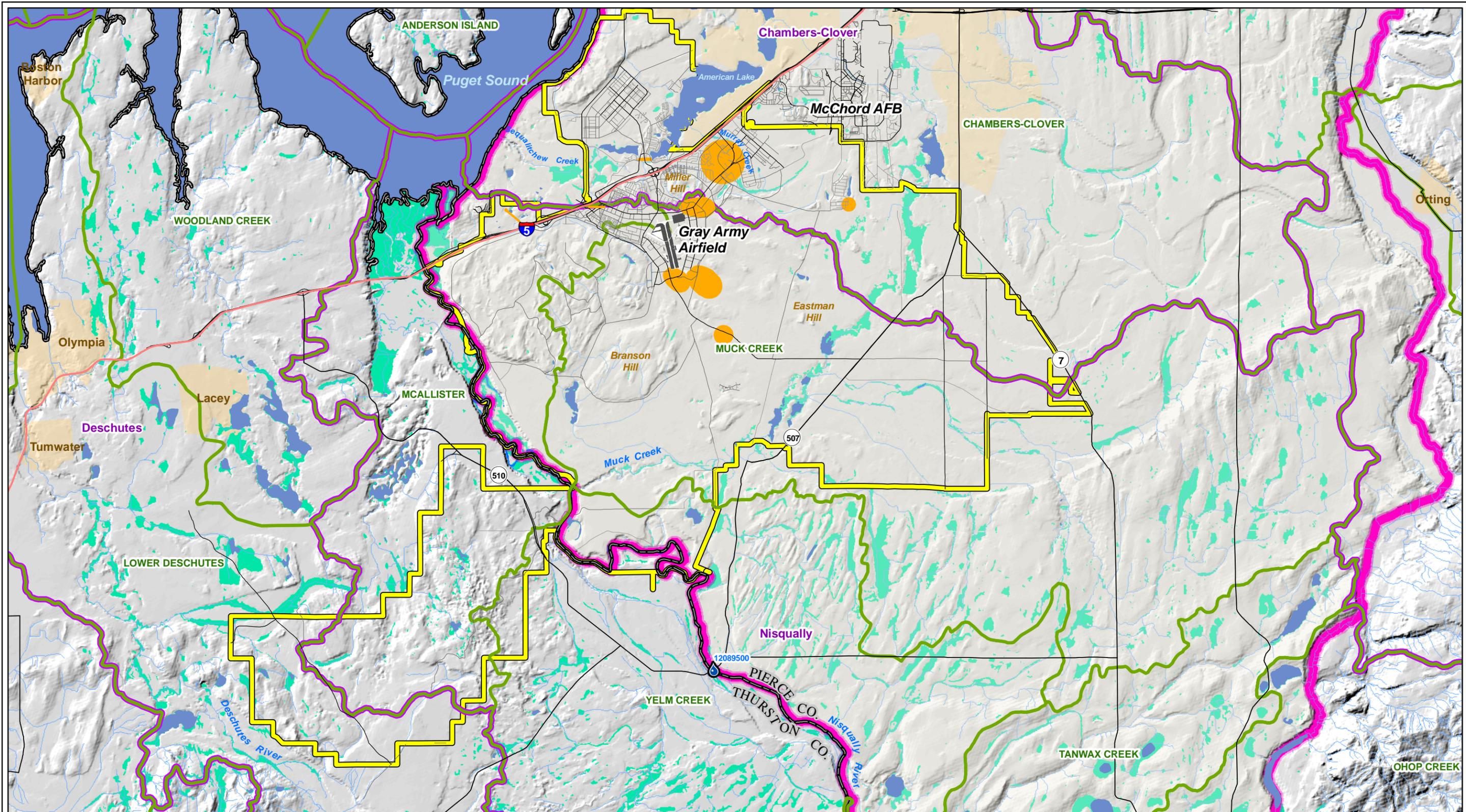
13 Although no streamflow data are specifically available for water resources on Fort Lewis, the U.S.
14 Geological Survey (USGS) monitors streamflows in the Nisqually River at the McKenna gauging
15 station (Station 12089500) upstream of Fort Lewis. Annual streamflows from 1947 through 2007
16 range from 590 cubic feet per second (cfs) (1,000,000 liters per minute [L/min]) to 2,240 cfs
17 (3,806,000 L/min), with an average of 1,280 cfs (2,170,000 L/min) for the 60-year period. Average
18 monthly streamflows during this period range from a low of 438 cfs (744,000 L/min) in August to a
19 high of 2,290 cfs (3,890,000 L/min) in December (USGS 2008).

20 Natural surface water, groundwater, and stormwater flow systems are mixed in some portions of Fort
21 Lewis because of interconnections among the three systems.

22 The stormwater drainage system primarily accommodates runoff from the major built-up areas, such
23 as North Fort and Main Post. Drainage of these areas generally is to the north, with discharges into
24 Puget Sound. Within the drainage basin are American Lake, American Lake Marsh, Bell Marsh,
25 Elliot Marsh, Hamer Marsh, Kennedy Marsh, Lynn Lake, McKay Marsh, Murray Creek, Sears Lake,
26 Sequelitchew Creek, and Sequelitchew Lake. Sequelitchew Creek is the major drainage channel for
27 American and Sequelitchew Lakes. In addition to Sequelitchew Creek, a drainage canal on North
28 Fort conveys its associated waters into Puget Sound (Chavez 2009).

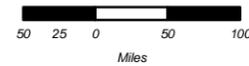
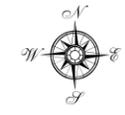
29 In several areas, stormwater drainage systems include natural surface waters as part of their
30 conveyance system. Examples are Murray Creek and Bell, Hamer, and McKay marshes near
31 Sequelitchew Creek. Murray Creek receives several stormwater discharges, including a motor pool
32 area discharge that routes first through Kennedy Marsh. Hamer, Bell, and McKay marshes, which
33 are situated adjacent to Sequelitchew Creek, receive stormwater flows from two large storm drains
34 and several small storm drains. Stormwater flows through the marshes as sheet flow or in channels,
35 depending on which drain is involved. Most stormwater flow passes under Sequelitchew Creek in
36 culverts and continues through a constructed storm drainage channel that discharges to Puget Sound
37 near the sewage treatment plant at the northwest corner of Fort Lewis. Stormwater flows from areas
38 that include commercial or industrial activity are treated prior to discharge to the marshes. Because
39 of the interconnections between natural surface water, groundwater, and stormwater, the three flow
40 systems are mixed in some areas of Fort Lewis.

41 The Federal Emergency Management Agency/Flood Insurance Rate Map (FEMA/FIRM) “Special
42 Flood Hazard Areas” maps suggest that the Nisqually River and Muck Creek are the only drainages
43 subject to major flooding (Washington Department of Ecology 2008). Local flooding occurs because
44 of backups in the storm drainage system along Pendleton Avenue between its intersections with



Legend

-  USGS Monitoring Station
-  Interstate
-  State Route
-  WAU Boundary
-  County Boundary
-  WRIA Boundary
-  Water Body
-  Fort Lewis Boundary
-  Pierce County Sole Source Aquifer Boundary
-  River / Stream
-  Well Head Protection Area
-  Wetland
-  Municipal Area



FORT LEWIS GTA EIS

*Figure 3-1
Water Resources at
Fort Lewis*

ANALYSIS AREA: Thurston & Pierce Counties, Washington	
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1 Kaufman Avenue and Division Street. Inadequate storm drain size in the lower part of the drainage
2 basin is believed to cause this flooding along Pendleton Avenue. Additional local flooding has been
3 reported for the stormwater system in North Fort, but blocked storm drain inlets are believed to cause
4 that flooding because the system is adequately sized to carry expected stormwater flows.

5 **3.2.1.2 Surface Water Quality**

6 The State of Washington classifies marine waters into four classes (AA, A, B, and C) based on
7 meeting their water quality standards. Class AA represents extraordinary, class A represents
8 excellent, class B good, and class C represents fair marine aquatic resources environment. All marine
9 waters receiving surface water from streams on Fort Lewis are classified as AA (Kolosseus 2006).

10 The State of Washington also classifies freshwater surface bodies based on their water quality into
11 five categories, with Category 1 representing the cleanest waters and Category 5 representing the
12 most polluted waters. Category 5 is the list of impaired water bodies known as the 303(d) list in the
13 Clean Water Act. Placement in Category 5 means that water quality standards have been violated for
14 one or more pollutants, and there is no Total Maximum Daily Load (TMDL) or other pollution
15 control plan in place (Washington Department of Ecology 2004).

16 Although none occurs within the Fort Lewis ROI, several water bodies in the Nisqually WRIA have
17 been placed on the 303(d) list for impairment. McAlister Creek, which is northwest of Fort Lewis, is
18 listed as impaired by fecal coliform and dissolved oxygen. Ayer Creek (located west of the Fort
19 Lewis boundary) and Nisqually Reach are each listed as impaired by fecal coliform. Some upstream
20 tributaries to Nisqually River are listed as impaired by temperature, phosphorus, or both
21 (Washington Department of Ecology 2004).

22 Surface water quality problems within the Chamber-Clovers watershed (WRIA 12) are mainly fecal
23 coliform bacteria and phosphorus (Washington Department of Ecology 1995). Within the boundaries
24 of Fort Lewis, American Lake is listed as impaired by phosphorus based on the 303(d) list. Other
25 303(d) listed segments are located outside of Fort Lewis (Washington Department of Ecology 2004).

26 In the WRIA 13, the Deschutes River (located just west of Fort Lewis), is listed as impaired by
27 temperature on the 303(d) list of impaired streams. However, no water bodies or stream segments
28 within the boundaries of Fort Lewis are listed as impaired (Washington Department of Ecology
29 2004).

30 Effluents from the Fort Lewis sewage treatment plant and nonpoint stormwater runoff discharge into
31 Puget Sound near the northwest corner of the installation. Treatment is provided for stormwater at
32 several locations. Wastewater from motor pools is treated and discharged to the sanitary sewer for
33 further treatment. Occasional overflows from the sewage treatment plant and stormwater collection
34 system discharge to surface waters.

35 Stormwater flows from commercial and industrial sections of the cantonment area are routed through
36 treatment facilities before discharge through wetlands or the constructed storm drainage channel to
37 Puget Sound. The treatment facilities are designed to remove suspended solids, infiltrate, and
38 separate oils. Although some residential and light commercial sections may discharge without a
39 specific treatment facility, in most cases the stormwater must travel through dense vegetation before
40 entering any body of water. A large discharge to American Lake from residential housing and streets
41 with no treatment does exist (Chavez 2009).

3.2.2 Groundwater

3.2.2.1 Groundwater Occurrence

The geologic strata beneath the Fort Lewis ROI form a complex system of hydrogeologic units that control groundwater flow in the area. This groundwater system has been characterized on both a broad regional scale and a detailed, site-specific scale (Army 1994).

The regional groundwater system consists of alternating aquifers (water-bearing strata composed of sand and gravel) and aquitards (strata composed of silts and clays not capable of producing significant quantities of groundwater). The shallowest aquifer encountered beneath the Fort Lewis ROI occurs in coarse gravels within the Vashon Drift. This aquifer usually exhibits unconfined or water-table conditions, meaning that groundwater levels occur at atmospheric pressure and are below the top of the aquifer. The depth to water in the shallow Vashon Drift Aquifer ranges from 10 feet (3 meters [m]) to 30 feet (9 m) throughout Fort Lewis, with lesser depths near lakes and streams and greater depths beneath the higher hills. The Vashon Drift Aquifer is continuous across the Fort Lewis ROI.

Deeper aquifers within the Salmon Springs Drift, Stuck Drift, and Orting Drift contain groundwater under confined conditions and are separated from shallower units by low-permeability aquitards. Under confined conditions, groundwater is contained in the aquifer under pressure by the overlying strata, resulting in groundwater levels that are above the top of the aquifer. Confined aquifers are generally less susceptible to surface sources of contamination than are unconfined aquifers.

On a regional scale, groundwater recharge originates as precipitation on the western flank of the Cascade Mountains. From here, it is transmitted in a generally westerly direction through the multiple layers of the hydrostratigraphic system and discharges to the Puyallup and Nisqually River valleys and to Puget Sound. Local recharge of the groundwater system beneath Fort Lewis is provided primarily by infiltration of direct precipitation, stormwater runoff, wastewater disposal, and reaches of lakes and streams that lie above the prevailing water table.

Groundwater in the shallow Vashon Drift Aquifer generally flows in a west-to-northwest direction across Fort Lewis, with localized changes in flow direction near discharge areas (major lakes, creeks, and the Nisqually River). Flow of groundwater in the deeper aquifers is also generally west to northwest. Groundwater elevations decrease with aquifer depth, indicating a downward vertical gradient. Groundwater velocities have been estimated at 0.02 feet (0.06 m) per day to 2 feet (0.6 m) per day for the shallow Vashon Drift aquifer and 0.1 foot (0.03 m) per day to 1 foot (0.3 m) per day for the Salmon Springs aquifer (Army 1994).

3.2.2.1.1 Groundwater Use

Fort Lewis operates four public water systems, all of which rely entirely on groundwater. The principal water supply system at the installation is the cantonment area system. The cantonment area system supplies water to more than 47,000 people in the cantonment area. The twelve source wells vary in depth from 17 feet (5.1 m) to 1,340 feet (408 m) and meet the water supply needs of the cantonment area. Rated capacities of these wells range from 400 to 1,650 gallons per minute (gpm) (1,510 to 6,250 L/min) (Chavez 2009). This system consists of one drinking water source, Sequalitchew Spring, and eight drinking water source wells at various locations around the Post. It has a supply capacity of approximately 19 million gallons per day (mgd) (72 million L/day) and a storage capacity of approximately 6.9 mgd (26 million L/day) (Chavez 2009).

1 The other three public water systems are relatively small and supply the Golf Course, the Ammo
2 Supply Point, and Range 17. Single-source wells supply the Golf Course and Range 17, whereas the
3 Ammo Supply Point has two source wells.

4 In 2008, demand for water in the cantonment area ranged from an average daily of 3.2 to 5.6 mgd
5 (12 to 21 million L/day) with a yearly daily average demand of approximately 3.8 mgd (14 million
6 L/day) (Chavez 2009). Year-round water demand in general, and summer water demand for
7 irrigation in particular, have declined due to implementation of an installation water conservation
8 regulation (Fort Lewis Regulation 11–5 *Water Conservation*) and water conservation program,
9 which includes public education. Historically, the water demand has ranged from approximately 5 to
10 16 mgd (19 to 61 million L/day) with an average demand of approximately 8 mgd (30 million L/day)
11 (Chavez 2009).

12 **3.2.2.2 Groundwater Quality**

13 Most of the groundwater quality problems in the regional area are attributed to natural conditions and
14 are generally related to iron and manganese. A 1998 USGS study concluded that contamination of
15 groundwater in Thurston County by commercial and industrial activities is minimal. In terms of
16 meeting drinking water standards, groundwater quality appears to be good. Nitrate is the most
17 widespread pollutant in shallow aquifers, and although it is not a problem throughout the entire
18 region, there are localized areas that exhibit elevated nitrate levels (Golder Associates 2003).

19 Groundwater in the Fort Lewis ROI is generally low in total dissolved solids and shows a
20 predominance of calcium and bicarbonate as major constituents, associated with lower
21 concentrations of magnesium, sulfate, and chloride (Brown and Caldwell 1985, as cited in Army
22 1994). Discharges from septic tanks and stormwater recharge systems (dry wells) have resulted in
23 detectable increases in constituents such as nitrates and chlorides in developed portions of Pierce
24 County. Monitoring records for the Fort Lewis water system indicate that, with few exceptions,
25 water quality complies with requirements for water supplies (Gray and Osborne 1991).

26 The groundwater quality beneath specific areas of Fort Lewis has been adversely affected by waste
27 disposal, leaks, and spills of chemicals. Three sites in the Fort Lewis ROI are on the EPA National
28 Priority List (NPL) of contaminated sites. These include the Logistics Center and two sites on
29 McChord AFB. A fourth site, Landfill No. 5 site, was delisted from the NPL in 1995 (EPA 2008c).
30 Current status and sources of contamination are discussed in **Section 3.12.8**.

31 Tungsten ammunition (5.56 mm) was used at Fort Lewis' small arms ranges in the early part of this
32 decade. The Army has now ceased using this ammunition. In 2007, the Army tested soil and water
33 for tungsten at two of Fort Lewis' ranges. Although the report for this sampling has not been
34 completed, preliminary results show that tungsten is limited to a depth near the surface. The testing
35 indicates that tungsten is not migrating to the groundwater.

36 **3.2.2.2.1 Groundwater Protection Programs**

37 EPA designates sole-source aquifers to protect drinking water supplies in areas where few or no
38 alternative sources to the groundwater resource exist and where, if contamination occurred, using an
39 alternative source would be extremely expensive. These areas have no alternative drinking water
40 sources that physically, legally, and economically could supply all those who depend upon the
41 aquifer for drinking water (EPA 2009). EPA defines a sole-source aquifer as an underground water
42 source that supplies at least 50 percent of the drinking water consumed in the area overlying the
43 aquifer. Most of the Fort Lewis ROI is underlain by the Central Pierce County Aquifer, which EPA

1 has designated as a sole-source aquifer. **Figure 3-1** shows the areal extent of the Central Pierce
2 County Aquifer.

3 Under the 1990 Growth Management Act, every county and city in Washington undergoing
4 comprehensive planning was required to adopt critical areas ordinances to protect the integrity of
5 natural resources. Many entities within the Nisqually Watershed include Wellhead Protection Areas
6 (WHPAs) as a component of their critical areas ordinances, with the intention of protecting
7 groundwater quality and supply (Golder Associates 2003). Several WHPAs occur within Fort Lewis
8 (**Figure 3-1**). A WHPA is defined as the area that lies within the 10-year time of travel zone
9 boundary of a Group A public water system well, as delineated by the water system purveyor
10 pursuant to Washington Administrative Code (WAC) 246–290–135 (Golder Associates 2003).

11 **3.3 BIOLOGICAL RESOURCES**

12 **3.3.1 Vegetation**

13 **3.3.1.1 Plant Communities**

14 The plant communities on Fort Lewis can be divided into four broad habitat types: coniferous
15 forests, grasslands (commonly known as prairies), oak/oak-mixed woodlands, and wetlands/riparian
16 zones (**Figure 3-2**).

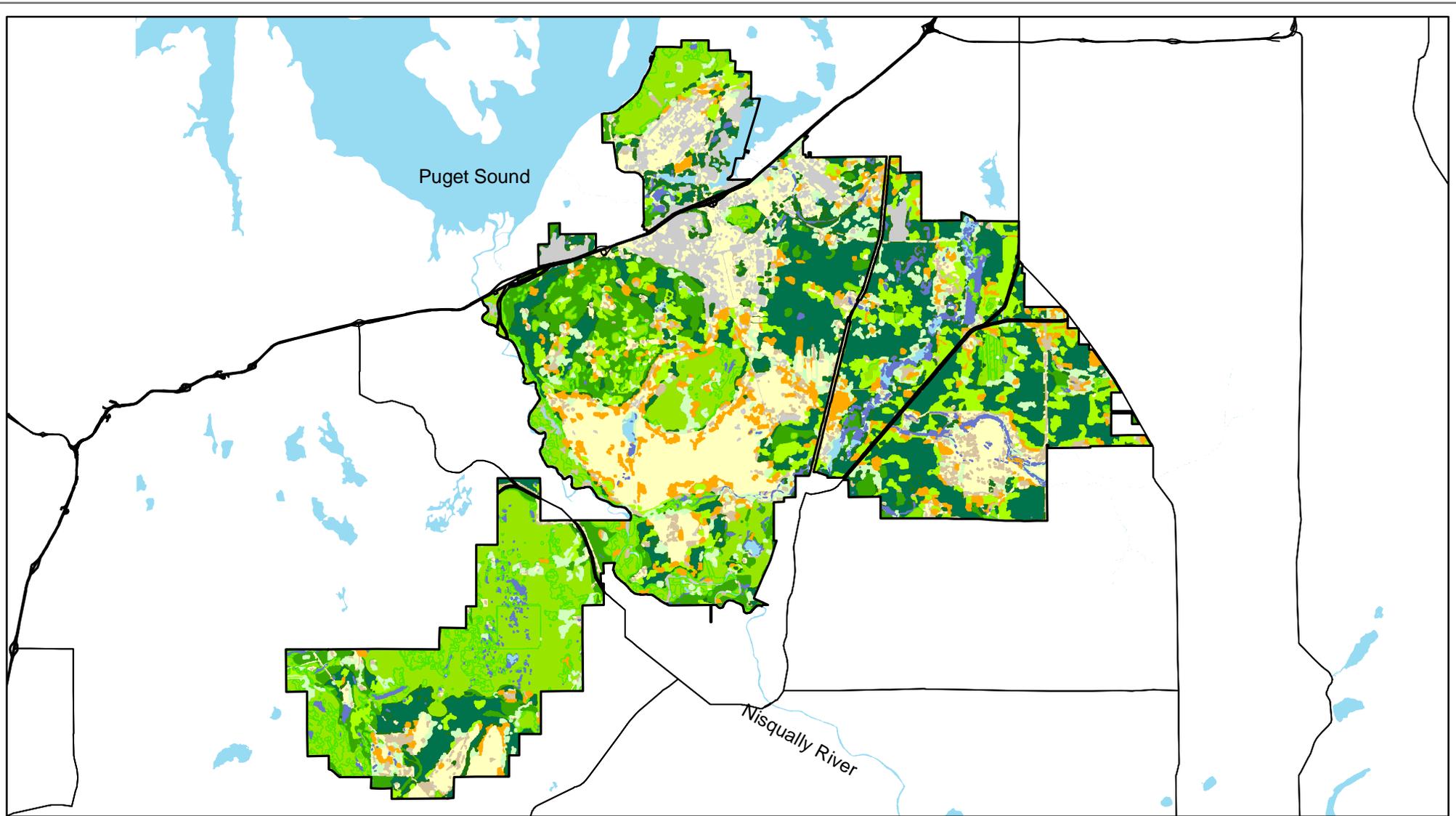
17 **3.3.1.1.1 Coniferous/Mixed Forests**

18 Nearly two-thirds of Fort Lewis (approximately 54,800 acres [22,200 ha]) is dominated by closed
19 forest, primarily conifer-dominated. Three coniferous forest types are present on Fort Lewis. The
20 most prevalent type is prairie colonization forest, dominated by Douglas-fir (approximately
21 30,300 acres [12,200 ha]). These forests consist of first-generation stands growing on prairie soils.
22 Ponderosa pine occurs in small, pure stands (approximately 780 acres [316 ha]) or scattered in the
23 overstory, and Oregon white oak is a fairly common overstory associate. These forests are the result
24 of Douglas-fir encroachment into grasslands in the absence of fires set by historical inhabitants. The
25 second type of coniferous forest is historical dry forest (7,300 acres [3,000 ha]), which is similar to
26 prairie colonization forest, but occurs in areas where similar forests were in existence prior to
27 European settlement. The third coniferous forest type is moist coniferous forest, which is dominated
28 by Douglas-fir and western hemlock, with western red cedar present in both the understory and
29 overstory (approximately 17,200 acres or 6,900 ha). Following logging or fire, some areas in a moist
30 coniferous forest are temporarily dominated by red alder and big leaf maple. Hardwood stands cover
31 approximately 6,400 acres (2,600 ha) of Fort Lewis.

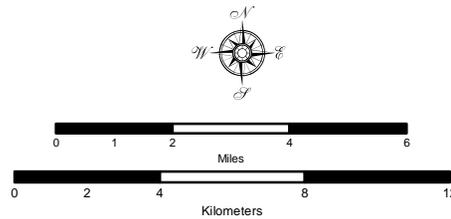
32 Plant communities with a significant component of ponderosa pine occur in both prairie colonization
33 forest and oak woodlands (see **Section 3.3.1.1.3**). Fort Lewis has the largest occurrence of native
34 ponderosa pine west of the Cascade Mountains, including a few acres of native pine savanna with
35 native grassland understory, which is a unique plant community found nowhere else.

36 **3.3.1.1.2 Prairies/Grasslands**

37 There are approximately 16,500 acres (6,677 ha) of grassland habitat on Fort Lewis. These
38 grasslands vary in quality, with quality typically defined in terms of the amount of native vegetation
39 relative to the amount of non-native vegetation on a given site. Intact, high-quality prairie is an open
40 grassland habitat dominated by the native bunchgrass Roemer's fescue (up to 70 percent cover), with
41 lesser amounts of long stolon sedge, California oatgrass, and prairie junegrass. The spaces between
42 clumps are occupied by numerous forbs, primarily perennials, which often grow up through a



- | | |
|---|---|
|  Prairie Colonization Forest |  Shrubland |
|  Historic Dry Forest |  Grassland |
|  Historic Moist Forest |  Water |
|  DF/DP Forest |  Wetland |
|  Woodland |  Developed/Bare Ground |
|  Savanna | |



FORT LEWIS GTA EIS	
<p><i>Figure 3-2</i> General Plant Communities on Fort Lewis</p>	
ANALYSIS AREA: Thurston & Pierce Counties, Washington	
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Prepared By: KA	Layout: ProjectArea.pdf

1 biological soil crust. Grasslands also include significant areas that are dominated by Scotch broom
 2 and can therefore be classified as shrubland, at least temporarily. The acreage and location of
 3 shrubland varies from year to year, based on the level of Scotch broom control and/or regrowth.

4 According to descriptions provided by the Washington Natural Heritage Program (WNHP),
 5 relatively undisturbed prairies can be defined by the Roemer’s fescue – white-top aster association
 6 community type. Disturbed grasslands typically support substantial populations of invasive species
 7 and are defined by several different disturbance community types, which vary on the basis of their
 8 species assemblages. On Fort Lewis, the vast majority of prairies have low to medium cover of
 9 native graminoids, and only 18 percent of surveyed prairies are estimated to have more than
 10 50 percent cover of native graminoids, based on data from 2007 (Randolph 2008). **Table 3–1**
 11 provides information on the native graminoid cover of the main prairie areas on Fort Lewis. Native
 12 graminoid cover does not reflect overall prairie quality, as it does not consider native forb diversity
 13 and cover. Areas such as Training Area (TA) 7S, Range 51, and Ranges 74/76 have some of the
 14 highest forb diversity and cover of any South Puget Sound prairie, although native graminoid cover
 15 is relatively low in these areas. Areas for which complete data are unavailable, such as parts of the
 16 Artillery Impact Area (AIA), are not included in **Table 3–1**.

Table 3–1 Native Graminoid Cover of Fort Lewis Prairies

Prairie	Acres in Good Condition ¹	Acres in Fair Condition ²	Acres in Poor Condition ³
Mortar Point 13 ⁴	N/A ⁵ (10.1%)	N/A (35.0%)	N/A (54.9%)
Range 51 ⁴	10 (10.1%)	20 (27.8%)	42 (62.1%)
Range 74/76 ⁴	17 (2.7%)	87 (14.3)	507 (83.0%)
TA 6 ⁶	51 (5.8%)	119 (13.5%)	709 (80.7%)
TA 7S ⁴	1 (0.8%)	3 (2.1%)	137 (97.1%)
TA 8 ⁶	0	0	371 (100%)
TA 14 (13 th Division Prairie) ⁶	37 (2.5%)	178 (12.1%)	1,257 (85.4%)
TA 15 ⁴	24 (4.8%)	72 (14.2%)	410 (81.0%)
Marion Prairie ⁶	8 (3.7%)	25 (11.7%)	181 (84.6%)
Johnson Prairie ⁶	43 (20.7%)	40 (19.2%)	125 (60.1 %)
Lower Weir Prairie ⁶	54 (11.1%)	59 (12.2%)	371 (76.7%)
Upper Weir Prairie ⁶	221 (43.4%)	73 (14.3%)	215 (42.2%)

Notes:

1 Good condition = 51 to 100% cover of native grass.

2 Fair condition = 31 to 50% cover of native grass.

3 Poor condition = 0 to 30% cover of native grass.

4 Source: Land Condition Trend Analysis (LCTA) land condition mapping data, 2008 (Lyon et al. 2008).

5. N/A = Not available.

6 Source: LCTA land condition mapping data, October 2003 (Gilbert 2003).

17
 18 WNHP ranks South Puget Sound prairies in their plant community ranking system with a Global and
 19 State rank of G1S1 (the most threatened ranking possible), which means that they are imperiled on
 20 both global and state levels. On Fort Lewis, four federal candidate species currently occur on
 21 prairies: Taylor’s checkerspot, mardon skipper, Mazama pocket gopher, streaked-horned lark, and
 22 three federal species of concern: Oregon vesper sparrow, valley silverspot, and white-top aster.
 23 Additionally, three species are listed as endangered, threatened, or sensitive by the State of
 24 Washington: Hall’s aster (threatened), Texas toadflax (sensitive), and Puget blue (state candidate).

25 **3.3.1.1.3 Oak/Oak-mixed Woodlands**

26 Oak and oak-mixed woodlands, which cover approximately 4,700 acres (1,900 ha) on Fort Lewis,
 27 range from pure Oregon white oak to a mix of oak, coniferous, and deciduous trees. Oak woodlands

1 are typically ecotonal habitat between the grasslands and the surrounding forests and occur in
 2 association with Oregon ash in riparian zones within the grasslands. Historically, these communities
 3 supported open canopies that allowed grasses to persist in the understory and ranged from open
 4 savannas with a low density of trees to woodlands with more closed canopies and abundant shrub
 5 cover in the understory. Today, most of the remaining prairie-forest ecotones are woodlands; a large
 6 percentage of savannas have been altered by fire suppression and the subsequent invasion of trees
 7 and Scotch broom. Because Oregon white oak woodlands provide habitat for many rare animals,
 8 including the western gray squirrel and several bird species, WDFW lists them as a Washington
 9 State Priority Habitat.

10 **3.3.1.1.4 Wetlands/Riparian Areas**

11 On Fort Lewis, wetlands cover approximately 4,100 acres (1,700 ha) and are widely distributed.
 12 Types of wetlands on Fort Lewis include:

- 13 • aquatic beds with aquatic vascular plants, such as duckweed, pondweed, and Eurasian water-
 14 milfoil;
- 15 • emergent wetlands, some of which are open, marshy habitats supporting numerous species of
 16 sedge, cat-tail, and other herbaceous species;
- 17 • scrub-shrub habitats that support low-growing woody species, such as spirea and willows;
 18 and
- 19 • forested wetlands, which are characterized by red alder and Oregon ash in the overstory and
 20 salmonberry, vine maple, and stinging nettle in the understory.

21 **3.3.1.2 Noxious Weeds**

22 There are 114 noxious weeds targeted for control in Pierce County (Pierce County Noxious Weed
 23 Control Board 2008) and 36 noxious weeds targeted for control in Thurston County (Thurston
 24 County Noxious Weed Control Agency 2008). Noxious weeds are found in all habitat types on Fort
 25 Lewis, but occur primarily along fence lines, buildings, and roads, and in training and open areas.
 26 Weed control management on Fort Lewis focuses on Scotch broom and listed noxious weeds,
 27 including tansy ragwort, knapweeds, leafy spurge, mouse-eared hawkweed, and sulphur cinquefoil.
 28 Wetlands on Fort Lewis contain scattered populations of reed canarygrass, purple loosestrife,
 29 yellow-flag iris, and Eurasian watermilfoil. Control efforts on the installation include mechanical
 30 control, hand and machine removal, tree girdling, establishment of desirable cover, and use of
 31 herbicides. The Forestry and Fish and Wildlife Habitat and ITAM programs are responsible for
 32 controlling Scotch broom and unwanted trees in the TAs.

33 **3.3.1.3 Special Status Species**

34 According to information from the U.S. Fish and Wildlife Service (USFWS) and WNHP, 15 plant
 35 species of special status may occur on or near Fort Lewis (**Table 3–2**). Included are species that
 36 historically occurred on or near Fort Lewis, but are not known to occur there currently. These species
 37 are federally designated as threatened or endangered under the Endangered Species Act (ESA), or as
 38 species of concern, or are state-designated as endangered, threatened, or sensitive.

39 Detailed information for federally listed and special concern plant species that may occur at or near
 40 Fort Lewis is provided in the following sections.

3.3.1.3.1 Golden Paintbrush

The golden paintbrush is a perennial herb that occurs in open grasslands at elevations below 328 feet (100 m) around the periphery of the Puget Trough. Most populations occur on glacially derived soils. Associated species include Roemer's fescue, red fescue, camas, common velvetgrass, yarrow, bracken fern, vetch, and brome (Gamon 1995). Many populations of this species have been extirpated (made locally extinct) by conversion of habitat to agricultural, residential, and commercial development. In Oregon, the golden paintbrush historically occurred in the grasslands and prairie of the Willamette Valley, but has since been extirpated from all of these sites.

Table 3–2 Special Status Plant Species That May Occur On or Near Fort Lewis

Common Name	Scientific Name	Federal Status ¹	State Status ¹
Bog clubmoss	<i>Lycopodiella inundata</i>	--	S
Bristly sedge	<i>Carex comosa</i>	--	S
Chain-fern	<i>Woodwardia fimbriata</i>	--	S
Common blue-cup	<i>Githopsis specularioides</i>	--	S
Golden paintbrush	<i>Castilleja levisecta</i>	T	E
Hall's aster	<i>Symphiotrichum hallii</i>	--	T
Marsh sandwort	<i>Arenaria paludicola</i>	E	XN
Pine-foot	<i>Pityopus californica</i>	--	T
Small-flowered trillium	<i>Trillium parviflorum</i>	--	S
Tall agoseris	<i>Agoseris elata</i>	--	S
Texas toadflax	<i>Nuttallanthus texanus</i>	--	S
Torrey's peavine	<i>Lathyrus torreyi</i>	SC	T
Water howellia	<i>Howellia aquatilis</i>	T	T
White meconella	<i>Meconella oregana</i>	SC	T
White-top aster	<i>Sericocarpus rigidus</i>	SC	S

Note:

1. E = endangered; T = threatened; S = sensitive; SC = species of concern; and XN = possibly extirpated or extinct. Sources: USFWS 2008d, e; WNHP 2008c.

The golden paintbrush was federally listed as threatened on June 11, 1997. Critical habitat has not been designated. In Washington, golden paintbrush is listed as a state endangered species. The species is threatened by habitat modification through succession of grassland to shrub and forest habitat. In addition, the potential for expansion and persistence of refugia (suitable habitat) is low due to reduction of habitat. Because the current distribution of the species has been greatly fragmented and reduced from the historical distribution, the species is vulnerable to other threats like interspecific competition with native and non-native woody species and reduced vigor and reproductive potential caused by trampling or collecting during public recreational use of sites. The species is particularly vulnerable in sites zoned for use as residential development or commercial use.

The USFWS lists the golden paintbrush as a species that may occur on Fort Lewis. Fort Lewis contains suitable habitat for this species, but several surveys have failed to find it (Army 2001c, e). However, six native grasslands near Fort Lewis, all of which are Army Compatible Use Buffer (ACUB) areas, have experimental, introduced populations of this species (Dunwiddie 2009).

3.3.1.3.2 Marsh Sandwort

Marsh sandwort is a perennial herb that occurs in wetlands and freshwater marshes in Washington, Oregon, and California from sea level to more than 1,400 feet (425 m) (USFWS 1993). As of May 14, 2001, however, the only remaining populations were located in California (USFWS 2006).

1 Populations occur in saturated acidic bog soils, which are predominantly sandy with a high organic
2 content.

3 The marsh sandwort was federally listed as endangered on August 3, 1993. Critical habitat has not
4 been designated. In Washington, marsh sandwort is considered possibly extirpated or extinct. Many
5 populations of this species have been extirpated by the elimination of wetlands in which the species
6 grows, degradation of wetlands through urban development, conversion of the habitat for agriculture
7 and ranching activities, and off-road vehicle recreational use.

8 The marsh sandwort was listed by the USFWS as a species that may occur on Fort Lewis. Fort Lewis
9 contains suitable habitat for this species, but several surveys have failed to find it (Army 2001c, e).
10 The WNHP does not list this species as present in Thurston or Pierce counties (WNHP 2008c).

11 **3.3.1.3.3 *Torreys' Peavine***

12 Torrey's peavine is a perennial legume native to wooded regions of the West Coast of the United
13 States. It ranges as far north as Pierce County, Washington and as far south as Monterey, California.
14 It sprouts bluish flowers that range from 0.31 to 0.51 inches (8 to 13 mm) in length. The Torrey's
15 peavine is a federal species of concern and a state threatened species. There are only two current
16 records of the existence of Torrey's peavine in Pierce County, Washington. The only known extant
17 occurrences in Washington are in somewhat open areas within Douglas-fir-dominated sites within
18 the Western Hemlock Zone (Franklin and Dyrness 1973). The sites have varying canopy cover, but
19 all are greater than 60 percent. The topography of the sites is relatively gentle. Associated species
20 include Douglas-fir, sword fern, bracken fern, Oregon grape, salal, bedstraw, and blackberry.

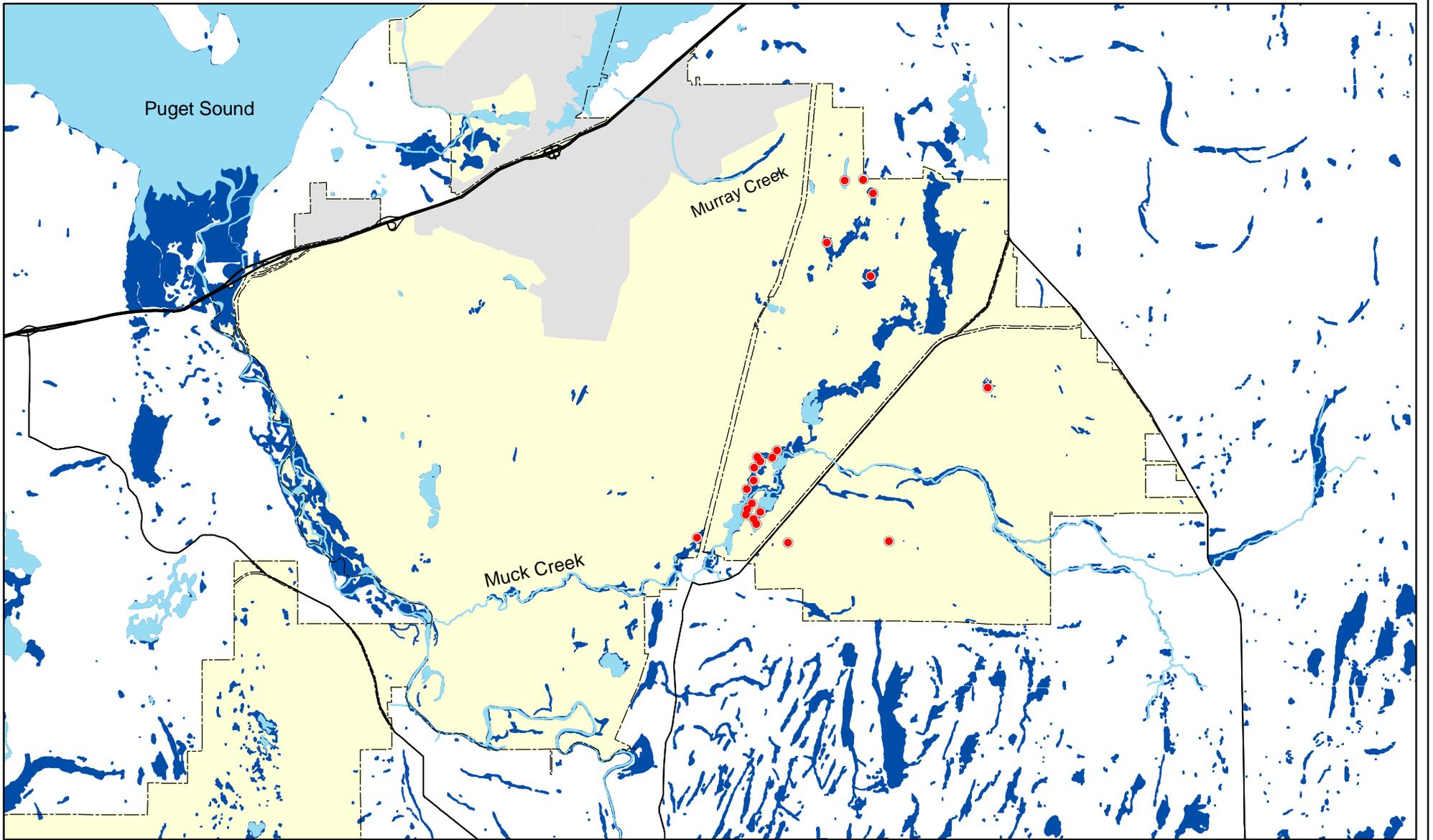
21 It is likely that natural disturbances, such as fire and wind-throw, helped create habitats historically.
22 The species appears to favor forest openings, especially trail edges. It forms dense patches where
23 competition from other species is low. It does not appear to do well, however, where there is
24 significant cover of other species. The Torrey's peavine is listed by the USFWS as a species that
25 may occur on Fort Lewis. Fort Lewis contains suitable habitat for this species, but it has not been
26 found on the installation.

27 **3.3.1.3.4 *Water Howellia***

28 Water howellia is a self-pollinated, annual aquatic plant that was federally listed as a threatened
29 species on July 14, 1994 (USFWS 1994). No critical habitat has been designated for the species. In
30 Washington, water howellia is listed as a state threatened species. Its historical range consists of five
31 states in the Northwest United States: California, Idaho, Montana, Oregon, and Washington. In
32 Washington, water howellia has been reported in Clark, Spokane, Pierce, and Thurston counties. The
33 population has declined due to competition with introduced plants, loss of wetland habitat, and
34 changes in habitat caused by timber harvesting, livestock grazing, and residential development.

35 Water howellia is an annual aquatic forb that occurs in ephemeral freshwater marshes (Gilbert 2001).
36 The species depends on an annual cycle of inundation and exposure of substrate to persist, with seeds
37 germinating on exposed substrate in the fall, the majority of growth occurring the following April,
38 and seed dispersal occurring from June into late summer. The stems grow under water in an erect
39 manner, and rely on the water for structural support.

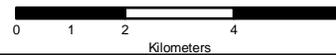
40 Water howellia was first discovered on Fort Lewis in 1994. During surveys in 2003 and 2004, 22
41 wetlands on the Main Post were identified as occupied by water howellia (**Figure 3-3**; Lynch 2005).
42 These wetlands occur within the Ammunition Storage Area and in TAs 6, 8, 11, 12, and 13. These
43 populations have been monitored since 1998 and appear to be stable (Gilbert 2002). All areas that



● Water Howellia locations

■ Wetlands

■ Lakes and Streams



FORT LEWIS GTA EIS

*Figure 3-3
Water Howellia Locations
on Fort Lewis*

ANALYSIS AREA: Thurston & Pierce Counties, Washington	
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1 could potentially contain water howellia were identified during these surveys, although all wetlands
 2 are considered to have potential habitat. The wetlands on Fort Lewis that have populations of water
 3 howellia range in size from less than 1 acre to 40 acres (0.4 to 16 ha), contain substrate of either
 4 Tanwax peat or Semiahmoo muck, and undergo significant annual fluctuations in water level
 5 (Gamon 1998). Other occurrences of water howellia in the region include two locations at McChord
 6 AFB, one location in Thurston County, and one location in Clark County.

7 Water howellia grows in firm, consolidated clay and organic sediments, in freshwater wetlands that
 8 are filled by spring rains and snowmelt runoff and that exhibit some drying during the growing
 9 season. The species' microhabitat consists of shallow water and the edges of deep ponds that are
 10 partially surrounded by broadleaf deciduous trees. One of the key habitat features necessary for
 11 water howellia survival is drying of wetlands during the autumn to allow seed germination, followed
 12 by submergence in the spring to permit growth and flowering. Water howellia is often found in
 13 relatively open wetlands with little surrounding deciduous forest (The Nature Conservancy 1997).
 14 The primary threats to water howellia include encroachment of invasive plant species into wetlands,
 15 unauthorized use of wetlands by humans, altered hydrology, and plant succession (Gamon 1997). It
 16 is thought that the presence of water howellia on Fort Lewis represents a metapopulation, which
 17 must grow in several areas to maintain a viable population through time because of the potential for
 18 frequent local extinction (USFWS 1996).

19 **3.3.1.3.5 White-top Aster**

20 White-top aster is a perennial prairie forb that is endemic to low-elevation prairies west of the
 21 Cascade Range. Its north/south geographic range extends from Vancouver Island, British Columbia
 22 to the Willamette Valley of Oregon (Gamon and Salstrom 1992). The distribution of white-top aster
 23 throughout its range is patchy and discontinuous, with the largest recorded population of the species
 24 found on Fort Lewis. White-top aster is found primarily on prairies with greater than 50 percent
 25 cover of native species (Thomas and Carey 1996). The species appears to favor at least partially open
 26 conditions, and its demographics are influenced by its long-lived, clonal nature.

27 On Fort Lewis, white-top aster is found on all prairies, but is much more common on prairies with a
 28 large native species component, such as Lower Weir and Johnson prairies, TA 15, and portions of
 29 the AIA. Because white-top aster is unable to colonize new sites readily, the species is threatened by
 30 factors that can potentially destroy existing populations (Bigger and Paine 1998). After 5 years of
 31 data collection, modeling predictions estimated that white-top aster populations appear to be
 32 shrinking by nearly 50 percent annually; however, field observations do not support this finding and
 33 predict that a much more stable population exists (Wolford 2001). If an existing population is
 34 eradicated, there is little chance that a new population will replace it. At the federal level, white-top
 35 aster is listed as a species of concern. In Washington, white-top aster is a sensitive species and was
 36 recently delisted from threatened status.

37 **3.3.2 Fish Resources**

38 **3.3.2.1 Fish Species and Populations**

39 At least 25 fish species live in lakes, ponds, marshes, rivers, and streams on Fort Lewis (**Table 3-3**
 40 and **Table 3-4**). Populations include resident, anadromous, and warm water fish species that live in
 41 aquatic habitats on Fort Lewis (Army 2007d). Common resident and anadromous fish species that
 42 may occur on Fort Lewis include steelhead/rainbow trout, Chinook salmon, chum salmon, coho
 43 salmon, pink salmon, sockeye salmon/kokanee, cutthroat trout, bull trout, and mountain whitefish.
 44 For anadromous fish species, incubation of eggs and rearing of juveniles occurs in freshwater before

1 the fish migrate to seawater for adult development, later returning to freshwater to spawn. Common
 2 warm water fish species found on Fort Lewis include rock bass, largemouth bass, brown bullhead,
 3 bluegill sunfish, pumpkinseed sunfish, black crappie, and yellow perch.

Table 3–3 Fish Species Found in Fort Lewis Lakes, Ponds, and Marshes

Name	Size (acres)	Maximum Depth (feet)	Fish
American Lake	1,123	90	Rainbow trout, kokanee, cutthroat trout, largemouth bass, yellow perch, rock bass, brown bullhead, black crappie
American Lake Pond	1	6	Rainbow trout, kokanee, cutthroat trout, largemouth bass, yellow perch, rock bass, brown bullhead, black crappie
Cat Lake	4	25	Largemouth bass, brown bullhead, black crappie
Chambers Lake	100	10	Cutthroat trout, largemouth bass, yellow perch, pumpkinseed sunfish, brown bullhead, black crappie
Clay Pits	3	8	Cutthroat trout, pumpkinseed sunfish
Clear Creek Pond	3	12	Cutthroat trout, rainbow trout
Dailman Lake	30	4	Cutthroat trout, largemouth bass, yellow perch, pumpkinseed sunfish, brown bullhead, black crappie
Deschutes Marsh	8	4	Largemouth bass
Fiander Lake	30	8	Largemouth bass, black crappie, brown bullhead, carp
Halverson Marsh	24	17	Cutthroat trout, chum salmon, coho salmon
Hamilton Lake	16	10	Cutthroat trout, largemouth bass, yellow perch, pumpkinseed sunfish, brown bullhead, black crappie
Hardhack Marsh	115	5	Black crappie
Hodge Lake	4	8	Unknown
Johnson Marsh	125	10	Cutthroat trout, largemouth bass, black crappie, pumpkinseed sunfish, brown bullhead
Jolly Lake	27	4	No fish, very shallow in summer
Lewis Lake	54	8	Largemouth bass, black crappie, pumpkinseed sunfish
Lynn Lake	4	6	Brown bullhead
Nisqually Lake	120	20+	Largemouth bass
No Name Lake	3	11	Cutthroat trout
Oxbow Lake	4	8	Cutthroat trout, pumpkinseed sunfish, largemouth bass
Sears Lake	4	8	Largemouth bass, pumpkinseed sunfish, black crappie, rock bass, brown bullhead
Sequalitchew Lake	80	10	Yellow perch, largemouth bass, bluegill sunfish, pumpkinseed sunfish, black crappie, rock bass, brown bullhead, coho salmon
Shannon Marsh	5	6	Unknown
Shaver Lake	6	Shallow	Cutthroat trout (in Muck Channel)
Spanaway Marsh	373	6	Cutthroat trout, largemouth bass, black crappie
Vietnam Village Marsh	69	10	Largemouth bass, pumpkinseed sunfish, black crappie
Watkins Lake	5	8	Unknown
Wright’s Lake	11	6	Largemouth bass, pumpkinseed sunfish, brown bullhead

Source: Army 1984

4
 5 Chambers Lake, Johnson Marsh, and Halverson Marsh in the Muck Creek system provide rearing
 6 habitat for both sea-run and resident coastal cutthroat trout (Army 1984). The kokanee population in
 7 American Lake is self-sustaining, as there is no outlet for fish migration to and from Puget Sound.

1 Kokanee populations have been supplemented by a fish pen rearing and release program operated by
 2 Camp Murray and WDFW in 2005, 2006, and 2007. Additionally, WDFW stocked and reared
 3 juvenile coho salmon in Sequalitchew Lake from 1976 to 1996, which migrated outward to Puget
 4 Sound via Sequalitchew Creek. This program was terminated when water quality deteriorated in the
 5 lake due to the nutrient-rich foods fed to the juvenile fish. Runs of adult coho salmon were observed
 6 in Sequalitchew Creek during autumn, although there is no evidence to suggest that these fall runs
 7 still occur.

8 The Nisqually River and Muck Creek, along with eight smaller streams, are the primary water
 9 systems within the installation for anadromous fisheries (**Table 3-4**). The Nisqually River drainage
 10 basin is a significant producer of chum salmon within the South Puget Sound region, and Muck
 11 Creek is the primary production area for this species within the Nisqually watershed. Muck Creek
 12 also supports populations of sea-run cutthroat trout, coho salmon, and steelhead trout. Johnson
 13 Creek, a tributary to Muck Creek, supports small runs of coho and chum salmon and steelhead trout.
 14 South and Lacamas creeks receive little fish use because of low flows. Production of pink and
 15 Chinook salmon is minimal on Fort Lewis, as these species spawn mainly in the mainstem of the
 16 Nisqually River. It has been determined that Chinook salmon utilize the lowermost reaches of the
 17 Nisqually River (Nisqually Chinook Recovery Team 2001).

Table 3-4 Fort Lewis Stream Characteristics and Fish Species

Name	Length on Fort Lewis (miles)	Discharge (cubic feet per second)	Fish Species	Remarks
Cabin Creek	1	6-8	Chinook salmon, chum salmon, coho salmon, cutthroat trout, steelhead trout	Year-round flow
Clear Creek	1	12-25	Chinook salmon, chum salmon, coho salmon, cutthroat trout, steelhead trout	Year-round flow
Exeter Springs	600 feet	15 (average in winter)	Chum salmon, coho salmon	Dries up most years in late summer
Halverson Channel	0.5	10 (average in winter)	Chum salmon, coho salmon, cutthroat trout, steelhead trout	Year-round flow
Johnson Creek	0.75	Up to 40 in winter	Cutthroat trout, chum salmon, coho salmon, steelhead trout	Dries up partially in summer
Lacamas Creek	0.5	Estimated 5-10	Coho salmon, cutthroat trout, steelhead trout	Year-round flow
Muck Creek	14.5	300 average in winter	Chum salmon, coho salmon, cutthroat trout, steelhead trout	Some sections dry up in summer and fall
Murray Creek	3	12-25	Cutthroat trout	Year-round spring-fed stream
Nisqually River	15.5	575-2,300	Chum salmon, coho salmon, Chinook salmon, pink salmon, steelhead trout, cutthroat trout, bull trout, largescale sucker, mountain whitefish	Year-round flow
Sequalitchew Creek	1	Up to 17	Coho salmon (smolts)	Very brushy and swampy
South Creek	1.3	Up to 75	No observations of fish since 1970s	Dries up in late spring

Sources: Army 1984, Clouse 2002

1 Fish species present in South Puget Sound and near the installation include Pacific herring, surf
2 smelt, hake, cod, pollock, rockfish, surfperch, flounder, sole, spiny dogfish, Chinook salmon, chum
3 salmon, coho salmon, pink (or humpback) salmon, sockeye salmon, and sea-run cutthroat trout. Surf
4 smelt do not spawn in near-shore areas of Solo Point (Army 1998b). Pacific herring were harvested
5 for bait, roe, and food until this fishery was closed in 1983 because herring are a major food fish for
6 declining salmon populations. Herring spawn on kelp and eelgrass found in near-shore regions, but
7 this habitat is not found in abundance near Solo Point or nearby islands. However, a large
8 concentration is found west of Anderson Island (Palsson 1998). Groundfish and salmonids are
9 harvested off Solo Point (Puget Sound Water Quality Authority [PSWQA] and WDNR 1992).

10 Puget Sound is home to many shellfish and crustaceans: Dungeness crab, red or rock crab, spot
11 prawn, geoduck, Japanese oyster, Olympia oyster, European flat oyster, horse clam, butter clam,
12 manila clam, native littleneck clam, soft-shell clam, spiny scallop, pink scallop, rock scallop, pinto
13 abalone, sea urchin, and sea cucumber. Shellfish and crustaceans are abundant within Puget Sound in
14 near-shore, shallow areas to depths greater than 300 feet (91 m), although they are not found in
15 major abundance near Solo Point (PSWQA and WDNR 1992).

16 **3.3.2.2 Fish Habitat**

17 Fish habitats on Fort Lewis include lakes, ponds, streams, marshes, and more than 2 miles (3 km) of
18 shoreline along Puget Sound. Most of the 29 bodies of water on Fort Lewis are relatively small (less
19 than 30 acres [12 ha] of surface water) and shallow (less than 10 feet [3 m] in depth).

20 The various rivers and streams within Fort Lewis connect some of these bodies of water with Puget
21 Sound, thereby providing habitat and migration corridors for anadromous fish. Streams and rivers on
22 the installation generally can be characterized as low- to moderate-gradient waters having alternating
23 pool and riffle habitats, with substrates dominated by cobble and gravel. Seasonal springs such as
24 Nixon, Halverson, and Exeter springs are extremely important to anadromous fish for spawning
25 grounds. Gravel has been added to each of the springs to enhance spawning habitat. These
26 waterways are highly important to fish, as they provide spawning and rearing habitat for anadromous
27 species, particularly chum, steelhead, and coastal cutthroat trout.

28 Infestations of reed canarygrass in some of the streams at Fort Lewis have reduced water flow,
29 limiting the ability of salmon and trout to successfully navigate and spawn within them. Projects
30 involving reed canarygrass removal, and other enhancement projects aimed at improving spawning
31 habitat, have been in effect since the mid-1970s. Since the implementation of these projects,
32 significant numbers of salmon and trout have returned to spawn within the restored streams. At
33 Exeter Springs, a primary spawning site for late-returning native chum salmon in Muck Creek, a
34 600-foot-long (183 m) by 12-foot-wide (4 m) spawning channel was built in 1974 as part of an
35 enhancement project. Lined with spawning gravel and regularly maintained and enhanced (reed
36 canarygrass and sand removed and native vegetation planted), salmon escapement within the channel
37 reached an all-time high in 1998 to 1999. A total of 2,442 fish returned during this time, which was
38 approximately 20 percent of the combined total escapement from Muck Creek and Exeter Springs
39 (Army 2001c). In 2001, a 940-foot-long (286 m) by 15-foot-wide (5 m) spawning channel was
40 created from an existing drainage ditch that is hydrologically connected to Muck Creek as a
41 cooperative project with the Nisqually Tribe. Chum salmon have used this channel since it was
42 completed.

43 Because of historical land use practices prior to government acquisition, many wetlands on Fort
44 Lewis were ditched and drained for agricultural purposes, which severely degraded many aquatic
45 habitats on the installation. Extensive restoration of lakes and marshes on Fort Lewis occurred during

1 the 1970s and 1980s. Restoration projects have included installing dikes for water level
 2 manipulation, clearing vegetation and silt from stream channels, installing culverts, and constructing
 3 headgates and spillways. These projects should restore historical spawning areas and increase salmon
 4 production on Fort Lewis.

5 The north end of Fort Lewis is adjacent to approximately 2.5 miles (4 km) of shoreline. This area
 6 provides habitat for out-migrating juvenile anadromous salmonids and in-migrating adult salmonids
 7 using Nisqually River to the south and Chambers Creek to the north. Chinook salmon may run along
 8 the coast on their way to spawning habitat in Nisqually River and Chambers Creek, but it is unlikely
 9 that they spawn in Sequelitchew Creek (Baranski 1998, Carlson 1998, Fraser 1998, Mills 1998,
 10 Norman 1998, Walter 1998). Chinook salmon may congregate at the mouth of Sequelitchew Creek
 11 before moving on to the Nisqually River and Chambers Creek. Steep gradients and marsh habitat in
 12 the upper reaches of Sequelitchew Creek make for poor spawning habitat. However, adult coho and
 13 chum salmon are known to spawn intermittently in the lower 650 feet (200 m) of the creek near
 14 Puget Sound, and sea-run cutthroat trout are thought to utilize the creek when flows are adequate.

15 **3.3.2.3 Special Status Species**

16 Several fish species that are federally listed as threatened under the ESA: the Puget Sound
 17 Evolutionary Significant Unit (ESU) of Chinook salmon and steelhead, and the Puget Sound Distinct
 18 Population Segment (DPS) of bull trout may occur near Fort Lewis (**Table 3–5**). The Hood Canal
 19 ESU for summer-run chum salmon is also federally listed as threatened in the Puget Sound;
 20 however, there are no listed runs of this species within the vicinity of either the Nisqually River
 21 drainage or Fort Lewis. The sea-run cutthroat trout, Puget Sound/Strait of Georgia ESU coho
 22 salmon, and the Pacific and river lampreys are all species of concern at the federal level.

Table 3–5 Special Status Fish Species That May Occur on or Near Fort Lewis

Species	Scientific Name	Federal Status ¹	State Status ¹
Bull trout	<i>Salvelinus confluentus</i>	T	C
Chinook salmon	<i>Oncorhynchus tshawytscha</i>	T	C
Coho salmon	<i>Oncorhynchus kisutch</i>	SC	--
Pacific lamprey	<i>Lampetra tridentate</i>	SC	--
River lamprey	<i>Lampetra ayresi</i>	SC	C
Sea-run cutthroat trout	<i>Oncorhynchus clarki clarki</i>	SC	--
Steelhead	<i>Oncorhynchus mykiss</i>	T	--

Note:

1 T = threatened; C = candidate; SC = species of concern. Species of concern receive no legal protection under the ESA.
 Sources: USFWS 2008d, e; National Marine Fisheries Service 2008a; and WDFW 2008.

23
 24 More detailed information on federally listed fish species that may occur on or near Fort Lewis is
 25 provided in the following sections.

26 **3.3.2.3.1 Bull Trout**

27 Bull trout are native to the Pacific Northwest and Western Canada, and were federally listed as a
 28 threatened species on June 10, 1998 (USFWS 1998). Historically, bull trout were found throughout
 29 the Pacific Northwest, including Montana, Idaho, northern California, Washington, and Nevada
 30 (Knowles and Gumtow 1996). They exhibit both resident and migratory life-history strategies

1 throughout much of their current range (Rieman and McIntyre 1993). Resident bull trout complete
2 their life cycles in the tributary streams in which they spawn and rear. Migratory bull trout spawn in
3 tributary streams, and juvenile fish rear for 1 to 4 years before migrating to either a lake (adfluvial),
4 river (fluvial), or, in certain coastal areas, saltwater (anadromous), to mature (Fraley and Shepard
5 1989, Goetz 1989).

6 The Coastal-Puget Sound DPS of bull trout is significant to the species as a whole because it
7 contains the only anadromous forms of bull trout in the coterminous United States. The DPS
8 includes the Puget Sound Management Unit, which includes all watersheds within the Puget Sound
9 Basin and the marine near-shore areas of Puget Sound (USFWS 2004a). Bull trout have been
10 observed in the Nisqually River, which passes through Fort Lewis (Fresh et al. 1979, Bottorff and
11 Swanson 1993, Chan 2004). Bull trout historically were present in the Nisqually River, and there
12 have been recent sightings in the Nisqually River, where they have likely been foraging bull trout
13 (Chan 2000, 2003, Ellings 2004). One juvenile was collected during stream sampling in the lower
14 reaches of the Nisqually River in the mid-1980s (WDFW 1998), and in the late 1990s one adult was
15 observed at Clear Creek hatchery in mid-September (USFWS 2004a). In July 2004, one bull trout
16 was collected in the lower reaches of the Nisqually River (Army 2006a). Bull trout are most likely to
17 be found in the Nisqually River during the winter and spring months, and are unlikely to be found
18 there later in the summer and fall when they journey upstream into glacial streams to spawn. The
19 Bull Trout Recovery Unit Team has decided that the Nisqually River Basin is not a core population
20 watershed for Puget Sound bull trout. However, the team has designated it as “core habitat,” given
21 the possibility that bull trout from other South Puget Sound watersheds may use the Nisqually River
22 estuary for habitat.

23 In 1996, a study was conducted to determine the presence of bull trout and potential habitat on Fort
24 Lewis. Cabin, Sequalitchew, and Murray Creeks were surveyed for bull trout presence. Muck and
25 Clear creeks were not surveyed because they did not contain suitable habitat for bull trout. The
26 survey did not locate any populations of bull trout on Fort Lewis (Army 2006a).

27 On September 25, 2005, the USFWS designated critical habitat for the Coastal-Puget Sound DPS of
28 bull trout, including 1,212 miles (1,951 km) of stream and marine shoreline in the Puget Sound
29 region (USFWS 2005b). Fort Lewis water bodies are exempt from this critical habitat designation.

30 **3.3.2.3.2 Chinook salmon**

31 This species is found from the Bering Strait south to southern California. The Puget Sound ESU for
32 Chinook salmon is federally listed as threatened. The Nisqually River maintains a summer and fall
33 stock of the Puget Sound ESU of Chinook salmon. Adults enter the river from July through
34 September, with peak spawning occurring in mid-October (Nisqually Chinook Recovery Team
35 2001). Seaward migration of Nisqually River Chinook salmon is assumed to be predominantly in the
36 spring and summer of the first year of freshwater residence. Historically, there was a spring
37 component in the Nisqually River, but these runs were last observed in the early 1950s, and the ESU
38 is now considered extinct from this river. Some experimental rearing of Chinook and coho salmon
39 has been conducted in Sequalitchew Creek on Fort Lewis in the past. Since the survival of Chinook
40 salmon was poor (Mills 1998), this program was terminated in the early 1990s (Zuchowski 2006).
41 Although some Chinook salmon may use the lower reaches of Sequalitchew Creek, it is unlikely that
42 they spawn in the creek, as there is little spawning habitat immediately downstream of Sequalitchew
43 Lake (Carlson 1998, Norman 1998).

1 On September 2, 2005, the National Marine Fisheries Service (NMFS) designated critical habitat
2 areas in Washington for Puget Sound Chinook salmon (USFWS 2005a). However, none of the
3 streams on Fort Lewis is classified by NMFS as critical habitat for Chinook salmon.

4 **3.3.2.3.3 Steelhead**

5 The original range of steelhead was from northern Mexico to southeastern Alaska, and inland to the
6 tributaries of the upper Columbia River, to Hell’s Canyon Dam on the Snake River, and the
7 Clearwater and Salmon rivers in Idaho. Puget Sound ESU steelhead is present in most drainages of
8 Puget Sound, coastal streams, and the lower Columbia River. The Nisqually River has both winter-
9 and summer-run steelhead (Hiss et al. 1982). The winter run consists of both native fish and hatchery
10 fish of outside origin, but is managed for natural production. This run contributes to both the
11 Nisqually Indian commercial and non-Indian sport fisheries on the Nisqually River. The summer run
12 consists of hatchery fish of outside origin and contributes to a small non-Indian sport fishery on the
13 river. Hatchery plants of both winter and summer steelhead have occurred historically in the basin,
14 but have been eliminated to protect the native wild stock (Army 2006a). Spawning occurs from April
15 through June, with fry emerging from late May through August.

16 Critical habitat designations for steelhead in the Pacific Northwest were finalized on August 15,
17 2005; these designations only apply to Columbia River steelhead ESUs. All military areas are
18 excluded from the critical habitat designation (pursuant to the National Defense Authorization Act
19 for Fiscal Year 2004). In the Pacific Northwest, these exclusions total 29 stream miles (47 km) and
20 48 shoreline miles (77 km) in Puget Sound.

21 **3.3.2.3.4 Other Species**

22 Sea-run cutthroat trout may be present in some on-site streams, such as Sequelitchew Creek, when
23 flows are adequate (Baranski 1998). Puget Sound/Strait of Georgia ESU coho salmon have been seen
24 congregating at the mouth of Sequelitchew Creek before moving on to the Nisqually River and
25 Chambers Creek (Walter 1998). There is little spawning habitat within Sequelitchew Creek, except
26 for the lower reaches near Puget Sound, and fish offspring have little chance of surviving in the
27 marshes associated with the upper reaches of the creek (Baranski 1998, Mills 1998, Norman 1998).
28 The Pacific and river lampreys have not been observed on Fort Lewis, although they have been
29 documented as occurring within the area surrounding the installation (Clouse 2002). Both lamprey
30 species spawn in the gravel riffles of clear coastal streams and then migrate to the ocean to mature.

31 **3.3.3 Wildlife Resources**

32 **3.3.3.1 Wildlife Species and Their Habitats**

33 Fort Lewis has a mosaic of plant community distributions and productive wildlife habitats utilized by
34 approximately 20 species of reptiles and amphibians, 200 species of birds, 50 species of butterflies,
35 and 50 species of mammals (Army 1994). Throughout the installation, there are large expanses of
36 undeveloped, low-elevation wetland and upland habitats influenced by the Puget Sound maritime
37 climate, glacial plains, and the Nisqually River watershed. These habitats are also present in the
38 areas surrounding the installation, although they generally exist as small, fragmented pieces given
39 the extensive development in the region.

40 **3.3.3.1.1 Forests**

41 Forests are the largest ecosystem type on Fort Lewis and in the region, predominantly consisting of
42 coniferous forests dominated by Douglas-fir. As the largest contiguous block of natural landscape in

1 the South Puget Sound area, Fort Lewis is a critical component in regional attempts to preserve and
2 enhance biological diversity. Forestlands adjacent to Fort Lewis are mostly fragmented and less
3 valuable to forest-dependent species than forests on the installation.

4 Wildlife species typically associated with forested environments inhabit a wide array of habitat
5 conditions. Important factors influencing the distribution and abundance of wildlife species within
6 forests include the seral stage of forest stands, understory densities, canopy connectivity, and the
7 quantity and distribution of coarse woody debris and snags. Common forest-dwelling amphibians
8 and reptiles include northwestern salamander, long-toed salamander, western toad, garter snake, and
9 rubber boa. Larger trees and snags are utilized as foraging, nesting, and perching sites for bald
10 eagles, great blue herons, osprey, band-tail pigeons, and a variety of woodpeckers and owls
11 (Kavanagh 1991). The coniferous forests are also home to black-capped chickadees, red-breasted
12 nuthatches, brown creepers, whereas ruffed grouse, kinglets, and warblers are attracted to deciduous
13 and mixed coniferous-deciduous forests. Raptors known to nest in coniferous forests include red-
14 tailed hawk, Cooper’s hawk, and the sharp-shinned hawk. Upland game birds, bluebirds, thrushes,
15 flycatchers, and warblers use the forest edge. Although many of these bird species are resident year-
16 round on Fort Lewis, kinglets, flycatchers, warblers, and other birds found on Fort Lewis are
17 migratory birds that spend only a portion of their year on Fort Lewis. Migratory birds may winter or
18 breed on Fort Lewis, or may just use the installation for short periods while migrating between their
19 breeding grounds to the north and wintering grounds to the south. Migratory birds are protected
20 under the Migratory Bird Conservation Act of 1929, as amended, that provides protections to reduce
21 the risk of harm to migratory birds or their habitats from Army or other federal actions. Forests
22 provide cover and forage for a variety of mammal species, including Columbia black-tailed deer,
23 raccoon, coyote, black bear, various bat species, Townsend chipmunk, and northern flying squirrel.
24 Several wildlife species of concern, including the bald eagle, the pileated woodpecker, and several
25 neotropical birds, rely upon the installation’s large blocks of forest for all or part of their life history
26 needs.

27 **3.3.3.1.2 Prairies/Grasslands**

28 The grassland landscape in South Puget Sound once extended from just south of Tacoma to beyond
29 Oakville along the Chehalis River (Army 1998b). In 1995, less than 3 percent of that area remained
30 as grassland dominated by native vegetation (Crawford and Hall 1997). However, a significant
31 portion of the Fort Lewis-McChord AFB complex still contains native grasslands. The grasslands
32 represent some of the last remaining grasslands in western Washington.

33 Native grasslands provide habitat for several rare plant and animal species, such as white-top aster,
34 pocket gopher, and several species of butterflies. Hawks, common nighthawks, lazuli buntings,
35 swallows, and sparrows forage and/or nest in the prairies. Fort Lewis contains bird species
36 specifically adapted to prairie environments, including the western bluebird, streaked horned lark,
37 western meadowlark, Oregon vesper sparrow, and savannah sparrow. Most of these species are
38 migratory birds that spend only a portion of the year on Fort Lewis. Prairies provide food and limited
39 cover for small- and medium-sized mammals, such as pocket gopher, deer mouse, vagrant shrew,
40 Pacific jumping mouse, moles, and Eastern cottontail.

41 **3.3.3.1.3 Oak Woodlands**

42 Since Euro-American settlement, more than one-half of all oak habitats in the South Puget Sound
43 region have been eliminated. Historically, oak savanna and open woodlands were common and
44 consisted of large, continuous stands containing large, mature, widely spaced oaks with single trunks

1 and broad, spreading crowns. The understory was one herbaceous layer of native bunchgrasses and
2 forbs. Frequent and regular fires helped to maintain these communities.

3 Reduction in the use of fire, land conversion and development, livestock grazing, military training,
4 and other factors have resulted in the loss of oak woodlands. Oak stands are now much smaller and
5 mostly isolated from other oak stands. Fire suppression has led to the invasion of woody pest
6 species, primarily Scotch broom and Douglas-fir, which compete with oaks for scarce nutrients, and
7 in the case of Douglas-fir, overtop and kill younger oaks.

8 Oak woodlands occur predominantly on grassland margins and provide important transitional
9 wildlife habitat between grassland and forest ecosystems. On Fort Lewis, oak woodlands primarily
10 occur within grassland/conifer forest ecotones, and to a lesser extent in grassland/riparian ecotones
11 and as individual stands, which may or may not be adjacent to conifer forest. Oregon white oak
12 woodlands are used by an abundance of mammals, birds, reptiles, and amphibians. Many
13 invertebrates, including various moths, butterflies, gall wasps, and spiders, live exclusively in
14 association with this oak species. Oak/conifer associations provide contiguous aerial pathways for
15 animals such as the state threatened western gray squirrel, and they provide important roosting,
16 nesting, and feeding habitat for wild turkeys and other birds and mammals. Dead oaks, and dead
17 portions of live oaks, harbor insect populations and provide nesting cavities. Acorns, oak leaves,
18 fungi, and insects provide food. Some birds, such as the Nashville warbler, exhibit unusually high
19 breeding densities in oak. Oaks on Fort Lewis may play a critical role in the conservation of
20 neotropical migrant birds that migrate through, or nest in, Oregon white oak woodlands (Larsen and
21 Morgan 1998). Oak woodlands provide important forage and nesting habitat for Columbia black-
22 tailed deer, Douglas squirrel, western gray squirrel, and northern flying squirrel.

23 **3.3.3.1.4 Wetlands**

24 Approximately 4,100 acres (1,700 ha) of wetlands occur on Fort Lewis. Wetlands are widely
25 distributed throughout the installation, and range in type from open water to forested swamps. They
26 support numerous species of plants and animals. Ten amphibian and four reptile species were
27 reported on Fort Lewis during a 1996 to 1997 herpetofauna inventory, including the northwestern
28 salamander, long-toed salamander, Pacific giant salamander, rough-skinned newt, western red-
29 backed salamander, ensatina, western toad, Pacific treefrog, red-legged frog, bullfrog, northern
30 alligator lizard, western terrestrial garter snake, northwestern garter snake, and common garter snake
31 (Hallock and Leonard 1997).

32 The western pond turtle may also occur on or near Fort Lewis, but has not been found on the
33 installation (Forrester and Storre 1992). Western fence lizard, racer, sharp-tailed snake, and gopher
34 snake, all species historically reported to occur in the vicinity of Fort Lewis, also were not detected.

35 The shrubs, trees, and water found in wetlands and riparian corridors provide foraging, nesting, and
36 rearing sites for rufous-sided towhees, swallow, American robins, ruffed grouse, red-winged
37 blackbirds, cedar waxwings, and belted kingfishers. Wetlands and riparian corridors also provide
38 habitat for waterfowl and a variety of other water-dependent birds found year-round at Fort Lewis.
39 Robins, blackbirds, waxwings, and several species of waterfowl are migratory birds that may breed
40 or winter on Fort Lewis, or only use the installation for a short period each year while migrating
41 between breeding and wintering grounds.

42 Wetlands and riparian corridors are a source of food and cover for both upland- and wetland-
43 associated mammals. Species typically found in wetland and riparian environments in the Fort Lewis
44 region include river otter, mink, muskrat, and beaver. Columbia black-tailed deer, black bear,

1 raccoons, striped skunks, and spotted skunks are also frequent users of wetland and riparian
2 corridors.

3 Approximately 620 acres (250 ha) of freshwater wetland and 260 acres (105 ha) of riparian/forested
4 wetland habitat are found on the Nisqually National Wildlife Refuge (Nisqually Refuge), located
5 northwest of Fort Lewis. These habitats support wildlife that are similar in species composition to
6 those found on Fort Lewis. More than 20,000 waterfowl use the refuge during winter. Numerous
7 other wetlands are found in the South Puget Sound region near Fort Lewis, as well.

8 **3.3.3.1.5 Estuarine and Marine Habitats**

9 Fort Lewis borders Puget Sound. Fish and other marine organisms found along the coast and near
10 Fort Lewis are discussed in **Section 3.3.2**.

11 Bird species attracted to the protected marine habitats of Puget Sound include seabirds (such as
12 alcids, gulls, shearwaters, and phalaropes) and shorebirds (such as sandpipers, herons, and plovers).
13 Pigeon guillemot and glaucous-winged gull, the primary seabirds commonly found nesting south of
14 Whidbey Island, are the only breeding seabirds with nests found in highly industrial areas in Puget
15 Sound (e.g., Commencement Bay near Tacoma). Pigeon guillemots are particularly common near
16 Solo Point, and the steep slopes adjacent to Solo Point provide suitable nesting habitat. They breed
17 along the Pacific Coast from northwest Alaska to southern California, nesting in crevices and
18 cavities on rocky shores and coastal cliffs.

19 Several marine mammal species may be found in the waters of South Puget Sound, including harbor
20 seal, Steller sea lion, California sea lion, river otter, Dall's porpoise, harbor porpoise, killer whale,
21 minke whale, humpback whale, and gray whale. Marine mammals in Puget Sound are heavily
22 dependent on good water quality, sufficient food, and undisturbed habitat for their health and
23 survival. Five of these species are resident to Puget Sound: harbor seal, Dall's porpoise, harbor
24 porpoise, killer whale, and minke whale. The other species are migratory (PSWQA and WDNR
25 1992).

26 Seals and sea lions rest or haul-out on shorelines throughout Puget Sound. Haul-out areas are found
27 in South Puget Sound, Hood Canal, Port Gardner, Admiralty Inlet, the San Juan Islands, and the
28 Strait of Juan de Fuca. California sea lions are found in Puget Sound in winter at haul-out sites near
29 Fox Island, Port Gardner, and on Sucia Island in the northern San Juan Islands. California sea lions
30 are occasionally seen near Solo Point, and one was found beached at Solo Point following a shooting
31 injury (Clouse 1998).

32 River otters are mainly found on quiet shorelines with inflowing freshwater streams. They are found
33 in South Puget Sound. Dall's porpoise and harbor porpoise travel in groups or pods within Puget
34 Sound, but Dall's porpoises are more commonly seen. These porpoises sometimes ride in ships' bow
35 waves. Harbor porpoise is rarely seen south of Central Puget Sound, and Dall's porpoise is only
36 occasionally seen south of Admiralty Inlet. Killer whales are occasionally seen in Central and South
37 Puget Sound, but the three resident pods travel throughout Puget Sound feeding on fish, squid, and
38 other mammals. Humpback and gray whales are rare visitors to Puget Sound (Army 1998b).

39 The Nisqually River Delta, a biologically rich and diverse area at the southern end of Puget Sound
40 and within miles of Fort Lewis, supports a variety of habitats. Here, the freshwater of the Nisqually
41 River combines with the saltwater of Puget Sound to form an estuary rich in nutrients and detritus.
42 These nutrients support a web of sea life, the benefits of which extend throughout Puget Sound and
43 beyond. Together with McAllister and Red Salmon Creeks, the Nisqually River forms one of the

1 largest remaining relatively undisturbed estuaries in Washington. Although most major estuaries in
 2 Washington have been filled, dredged, or developed, the estuary of the Nisqually River has been set
 3 aside especially for wildlife as the Nisqually Refuge. The Refuge is home to thousands of waterfowl
 4 and other wildlife from fall through spring, and large numbers of migratory and resident birds and
 5 other wildlife during all times of the year. Waterfowl, shorebirds, raptors, and marsh and water birds
 6 all are attracted to the mosaic of habitats found on the Nisqually Delta.

7 **3.3.3.2 Special Status Species and Critical Habitat**

8 Numerous species in the Fort Lewis region have been given a special status at the federal and/or state
 9 level, based on their risk of decline and extirpation (**Table 3–6**). The presence of several of these
 10 species on Fort Lewis has not been documented in the recent past, but potential habitat for these
 11 species does exist on the installation. In addition, some species occupy small territories or occur in
 12 isolated sites in Pierce or Thurston counties that are located outside the Fort Lewis boundary.
 13 Federally listed species and species that are candidates for listing at the federal level and that could
 14 be found on or near Fort Lewis, as well as the bald eagle, are discussed in more detail below. The
 15 Canada lynx, gray wolf, and grizzly bear are very unlikely to be found on or near Fort Lewis and are
 16 not discussed in this section.

17 **3.3.3.2.1 Prairie Butterflies**

18 The prairies on Fort Lewis support populations of several special status butterfly species, including
 19 the mardon skipper and Taylor’s checkerspot, both of which are candidates for federal listing.
 20 Another prairie butterfly, the valley silverspot, is a federal species of concern. Fort Lewis contains
 21 the largest colony of Taylor’s checkerspot in Washington, but colonies of this species have been
 22 extirpated in recent years at several locations on Fort Lewis where they once occurred (Wolford et al.
 23 2008). Numbers of Taylor’s checkerspots observed at the location of the large colony on Fort Lewis
 24 in 2007 were only one-half the numbers seen during 2006, and numbers of butterflies seen in 2008
 25 were about one-half the numbers seen in 2007. The mardon skipper is found in only four counties in
 26 Washington. These butterfly species are non-migratory and typically associated with high-quality
 27 prairie habitat. Threats to all three species include loss and fragmentation of high-quality prairie
 28 habitat, human disturbance, and off-road vehicles.

29 **3.3.3.2.1 Leatherback Sea Turtle**

30 The leatherback sea turtle is the largest turtle and the largest living reptile in the world (NMFS
 31 2008b). Leatherback sea turtles are commonly known as pelagic animals, but also forage in coastal
 32 waters. In fact, leatherback sea turtles are the most migratory and wide-ranging of sea turtle species.
 33 Leatherback sea turtle nesting grounds are located around the world, with the largest remaining
 34 nesting assemblages found on the coasts of northern South America and western Africa. Leatherback
 35 sea turtles are rarely seen in southern Puget Sound (Army 1998b).

36 **3.3.3.2.1 Oregon Spotted Frog**

37 Oregon spotted frogs are highly aquatic and live in or near permanent bodies of water, including
 38 lakes, ponds, slow streams, and marshes. They are most often found in non-woody wetland plant
 39 communities that support vegetation such as sedges, rushes, and grasses. Oregon spotted frogs were
 40 collected near Fort Lewis during the early 20th century and at least one historical site once existed on
 41 Fort Lewis; however, no Oregon spotted frogs were detected during extensive surveys conducted in
 42 the early 1990s. The last documentation of Oregon spotted frogs in Pierce County was in 1959 at
 43 Spanaway Pond, located northeast of Fort Lewis (Hallock and Leonard 1997). A population in the
 44 Black River watershed in Thurston County, which is 12 miles (19 km) southwest of Fort Lewis, is

1 the only known extant population in the lowlands of western Washington and Oregon (Leonard
 2 1990, McAllister 1995). In September 2008, about 500 Oregon spotted frogs were released into
 3 Dailman Lake on Fort Lewis. Because Fort Lewis provides enough appropriate habitat, the WDFW
 4 believes a pilot Oregon spotted frog reintroduction is likely to be successful on Fort Lewis (Reinert
 5 2008). Oregon spotted frogs will be released annually on Fort Lewis through at least 2012.

Table 3–6 Special Status Wildlife Species that may be Found on or in the Vicinity of Fort Lewis

Common Name	Scientific Name	Federal Status ¹	State Status ¹
Invertebrates			
Fender's soliperlan stonefly	<i>Soliperla fenderi</i>	SC	--
Mardon skipper	<i>Polites mardon</i>	C	E
Taylor's checkerspot	<i>Euphydryas editha taylori</i>	C	E
Valley silverspot	<i>Speyeria zerene bremeri</i>	SC	C
Reptiles and Amphibians			
Cascades frog	<i>Rana cascadae</i>	SC	--
Larch mountain salamander	<i>Plethodon larselli</i>	SC	S
Leatherback sea turtle	<i>Dermochelys coriacea</i>	E	E
Northwestern pond turtle	<i>Clemmys marmorata marmorata</i>	SC	E
Oregon spotted frog	<i>Rana pretiosa</i>	C	E
Rocky Mountain tailed frog	<i>Ascaphus truei</i>	SC	C
Van Dyke's salamander	<i>Plethodon vandykei</i>	SC	C
Western toad	<i>Bufo boreas</i>	SC	C
Birds			
Bald eagle	<i>Haliaeetus leucocephalus</i>	SC	S
Common loon	<i>Gavia immer</i>	--	S
Marbled murrelet	<i>Brachyramphus marmoratus</i>	T	T
Northern goshawk	<i>Accipiter gentilis</i>	SC	C
Northern spotted owl	<i>Strix occidentalis caurina</i>	T	E
Olive-sided flycatcher	<i>Contopus borealis</i>	SC	--
Oregon vesper sparrow	<i>Pooecetes gramineus affinis</i>	SC	C
Peregrine falcon	<i>Falco peregrinus</i>	SC	S
Pileated woodpecker	<i>Dryocopus pileatus</i>	--	C
Purple martin	<i>Progne subis</i>	--	C
Slender-billed, white-breasted nuthatch	<i>Sitta carolinensis aculeata</i>	SC	C
Streaked horned lark	<i>Eremophila alpestris strigata</i>	C	E
Yellow-billed cuckoo ²	<i>Coccyzus americanus</i>	C	C
Mammals			
California wolverine ²	<i>Gulo gulo luteus</i>	SC	C
Canada lynx ²	<i>Lynx canadensis</i>	T	T
Gray wolf ²	<i>Canis lupus</i>	E	E
Grizzly bear ²	<i>Ursus arctos</i>	T	E
Humpback whale	<i>Megaptera novaeangliae</i>	E	E
Long-eared myotis	<i>Myotis evotis</i>	SC	--
Long-legged myotis	<i>Myotis volans</i>	SC	--
Mazama pocket gopher	<i>Thomomys mazama</i>	C	T
Northern sea otter	<i>Enhydra lutris kenyoni</i>	SC	--
Pacific Townsend's big-eared bat	<i>Corynorhinus townsendii townsendii</i>	SC	C
Southern resident killer whale	<i>Orcinus orca</i>	E	E
Steller sea lion	<i>Eumetopias jubatus</i>	T	T
Western gray squirrel	<i>Sciurus griseus griseus</i>	SC	T

Notes:

1. E = endangered; T = threatened; C = candidate; S = sensitive; and SC = species of concern.

2. Species occurs on USFWS lists, but is not known to occur in the region currently.

Sources: NMFS 2008b; USFWS 2008d, e; and WDFW 2008.

3.3.3.2 *Bald Eagle*

On July 28, 2007, the USFWS delisted bald eagles that inhabit the lower 48 states because the species was meeting or exceeding established recovery goals throughout its range. However, the bald eagle is still protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act.

Bald eagles are year-round residents on Fort Lewis. Upwards of 270 bald eagles may winter on the installation (Stalmaster and ENSR 2006). In addition, ten bald eagle nesting territories have been identified: Nisqually River, Nisqually Bluff, Collard Woods, American Lake north, American Lake south, American Lake west, Spanaway Marsh, Johnson Marsh, Halverson Marsh, and Fort Lewis Golf Course (**Figure 3-4**). Seven territories were active in 2008, and six fledged young (Zuchowski 2008). Although not unusual, productivity fluctuates within these nesting territories. During the last decade, numbers of both nesting and wintering bald eagles on Fort Lewis have increased, a trend that has been observed throughout the South Puget Sound region (Stinson et al. 2001). Food supplies are the most important factor in maintaining the wintering population at Fort Lewis (Stalmaster 1992a, Stalmaster and ENSR 2005). Additional concerns are the maintenance of habitat near and within extensively used roost sites and foraging areas, particularly along Muck Creek and Carter Woods along the Nisqually River, and disturbance factors that could preclude bald eagles from using suitable habitat.

3.3.3.3 *Marbled Murrelet*

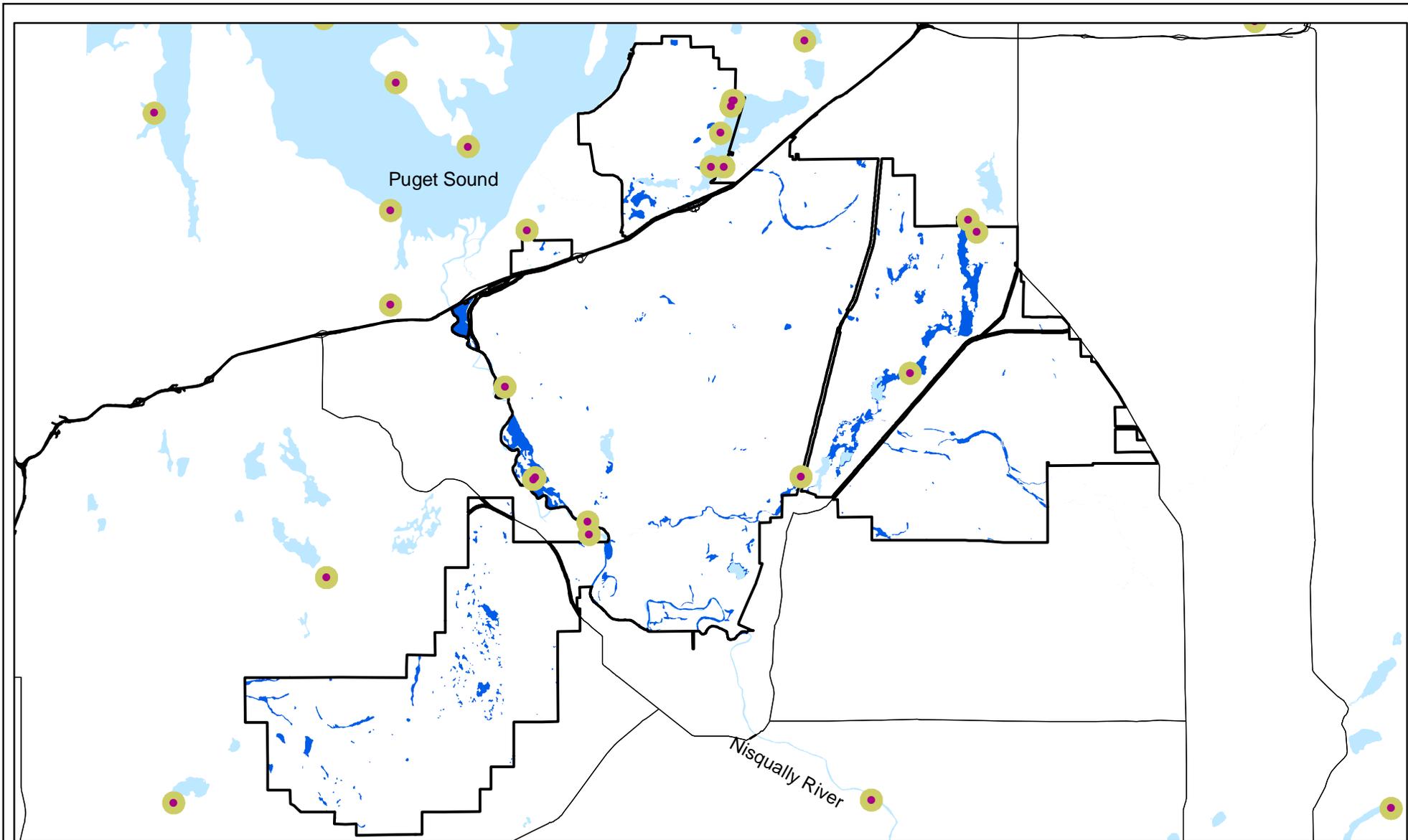
The marbled murrelet is a marine bird species that nests on large-diameter upper branches of coniferous trees in older forests along the marine coast and inland up to approximately 40 miles (64 km) (Hamer and Cummins 1991). Murrelets are usually found in marine areas with mature forests nearby to provide nesting habitat (Washington Department of Wildlife 1993). The greatest concentration of marbled murrelets in Washington is found in northern Puget Sound.

Marbled murrelets are not known to occur on Fort Lewis. Surveys have been conducted twice at Fort Lewis (Bottorff et al. 1991, Bottorff et al. 1992), and though birds were observed near Fort Lewis on the Nisqually River and in the Puget Sound area near Solo Point, none were found on the installation. Marbled murrelet critical habitat has been designated in Pierce County (USFWS 2004b); however, this habitat is located primarily in late-succession reserve forests on federal land in the Cascade Range, in the eastern section of the county. There is no critical habitat designation within Fort Lewis.

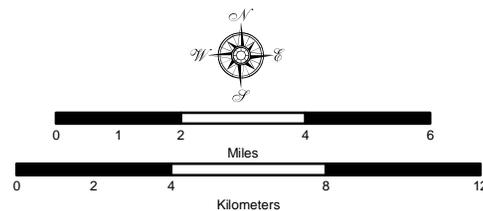
3.3.3.4 *Northern Spotted Owl*

The northern spotted owl is associated with most of the major types of coniferous forest in the Pacific Northwest. Suitable habitat for the species on Fort Lewis was identified and mapped by the USFWS, and in 1992, 62,000 acres (25,100 ha) of Fort Lewis were designated as critical habitat for the northern spotted owl (USFWS 1991). Based on a recent ruling by the USFWS, however, the areas previously designated as critical habitat for the northern spotted owl on the installation were removed as part of the overall critical habitat revision for this species (USFWS 2008a). Fort Lewis is considered a strategic location between known spotted owl populations on the Olympic Peninsula to the west and the Cascade Range to the east.

Surveys for northern spotted owls using calling stations on Fort Lewis were conducted during nine years between 1991 and 2008 (USFWS 1991; Raedeke and Associates, Inc. 1995; Malkin 1999; ENSR 2003, 2006, 2008). No spotted owls were detected during these surveys. Fort Lewis has prepared a management plan that will encourage management of forestlands to develop the characteristics of northern spotted owl habitat (Bottorff and Rhode 1994).



-  Bald Eagle Nests and Buffers
-  Wetlands
-  Lakes and Streams



FORT LEWIS GTA EIS	
<i>Figure 3-4 Bald Eagle Nests on Fort Lewis</i>	
ANALYSIS AREA: Thurston & Pierce Counties, Washington	File: Arcadis\DEIS Figures.mxd
Date: 7/16/2009	Layout: ProjectArea.pdf
Prepared By: BC/KA	

1 **3.3.3.2.1 Streaked Horned Lark**

2 The streaked horned lark, one of the four breeding subspecies of horned lark in Washington, breeds
 3 in the lowlands of western Washington, in remnant grasslands on prairies and beaches (Smith et al.
 4 1997). Streaked horned larks have declined with the loss of prairie habitats to development and
 5 succession to forest. With the cessation of burning of the prairies by Native Americans, Douglas-fir
 6 has spread over much of the prairie and introduced grasses, weeds, and Scotch broom have degraded
 7 much of the remainder. Streaked horned larks may have also been restricted to portions of the prairie
 8 where the vegetation was short and sparse due to excessive dryness or repeated burns (Stinson 2005).

9 At present, known breeding locations of streaked horned larks within the vicinity of the installation
 10 include Fort Lewis/McChord AFB and the Olympia Airport in Thurston County (Pearson 2003,
 11 Pearson and Hopey 2005). On Fort Lewis, streaked horned larks use three open areas with limited
 12 vegetative cover as breeding sites. From 2002 to 2004, 90 active nests were recorded near GAAF, 31
 13 active nests were recorded on 13th Division Prairie, and one active nest was recorded in the AIA
 14 (Pearson and Hopey 2005). Of these, 39 percent near GAAF were successful, 19 percent in 13th
 15 Division Prairie were successful, and the nest in the AIA failed. However, extensive nest surveys
 16 were not conducted in the AIA due to unexploded ordnance danger. More than 70 percent of nest
 17 failures were due to depredation, primarily by crows and small mammals, such as raccoons.

18 **3.3.3.2.2 Yellow-billed Cuckoo**

19 The yellow-billed cuckoo is considered extirpated in Washington, but vagrant birds are very rarely
 20 seen in the state during the summer (Seattle Audubon Society 2002). Historically, yellow-billed
 21 cuckoos nested along wooded rivers in eastern Washington, as well as in various locations in western
 22 Washington. The species has not been seen on Fort Lewis, nor have there been any recent sightings
 23 of the species near the installation.

24 **3.3.3.2.3 Mazama Pocket Gopher**

25 The Mazama pocket gopher is a regional endemic found only in western Washington, western
 26 Oregon, and northern California (Stinson 2005). Mazama pocket gophers are known to persist at 27
 27 sites scattered across the southern Puget Sound grasslands and alpine meadows of the Olympics.
 28 Although gophers may total in the low thousands, many are small populations on marginal sites that
 29 are unlikely to persist. Most gopher populations are restricted to grasslands on remnant and former
 30 prairie sites. Mazama pocket gophers are not constrained to live on native vegetation and will eat
 31 many introduced grasses and weedy forbs. Soil type seems to affect their distribution, because they
 32 are absent from most prairies with particularly rocky soils. On Fort Lewis, there is evidence of
 33 pocket gopher populations in the AIA, as well as various other prairie habitats (ENSR 1994, 2004;
 34 Steinberg 1995; EDAW 2006; Schmidt 2006).

35 **3.3.3.2.4 Steller Sea Lion**

36 The Steller sea lion, also known as the northern sea lion, is the largest member of the Otariid (eared
 37 seal) family. Steller sea lions “forage” near shore and in pelagic waters (NMFS 2008b). They are
 38 capable of traveling long distances in a season and can dive to depths of approximately 1,300 feet
 39 (400 m). They also use terrestrial habitat as haul-out sites for periods of rest, molting, and as
 40 rookeries for mating and pupping during the breeding season. At sea, they are seen alone or in small
 41 groups, but may gather at the surface near rookeries and haul outs. Fewer than 50 Steller sea lions
 42 are seen in Puget Sound each year (Army 1998a). Numbers are highest in April and May, and then
 43 decline rapidly (Steiger and Calambokidis 1986). Steller sea lion haul-out sites are known near Fox

1 Island in the South Puget Sound, Port Gardner, the San Juan Islands, and the Strait of Juan de Fuca
2 (Army 1998b). No critical habitat has been designated in Washington.

3 **3.3.3.2.5 Southern Resident Killer Whale**

4 Killer whales are the most widely distributed cetacean (e.g., whales, dolphins, and porpoises) species
5 in the world (NMFS 2008b). Killer whales are highly social animals that occur primarily in pods, or
6 groups, of up to 50 animals. The Southern Resident Killer Whale (SRKW) population contains three
7 pods (or stable family-related groups), and is considered a stock under the Marine Mammal
8 Protection Act. The range of killer whales during the spring, summer, and fall includes the inland
9 waterways of Puget Sound, Strait of Juan de Fuca, and Southern Georgia Strait. Their occurrence in
10 the coastal waters off Washington has been documented. The SRKW population is currently
11 estimated at about 88 whales, a decline from its estimated historical level of about 200 during the
12 mid- to late-1800s. Critical habitat has been designated in most of Puget Sound, including along Fort
13 Lewis and the northern Washington coast.

14 **3.3.3.2.6 Humpback Whale**

15 The humpback whale is distributed worldwide in all ocean basins, though in the north Pacific it does
16 not occur in Arctic waters (NMFS 2008b). In winter, most humpback whales occur in the subtropical
17 and tropical waters of the Northern and Southern Hemispheres. The north Pacific population was
18 considerably reduced because of intensive commercial exploitation during the 20th century and
19 recovery has been very slow. Studies indicate that humpback whales from the western and central
20 north Pacific mix on summer feeding grounds in the central Gulf of Alaska and perhaps the Bering
21 Sea. No critical habitat has been designated for humpback whales. Humpback whales are rarely seen
22 in southern Puget Sound (Army 1998b).

23 **3.3.3.3 Game Fish and Wildlife Species**

24 Hunting and fishing are allowed on much of Fort Lewis in locations that do not interfere with
25 military training activities. Game species on Fort Lewis include black bear and Columbia black-
26 tailed deer, 11 additional species of mammals, 8 species of upland birds, 24 species of waterfowl,
27 and 24 species of fish.

28 Recent surveys suggested that there are approximately 10 to 12 black bear on Fort Lewis. Columbia
29 black-tailed deer are common throughout most of the installation, especially in wooded areas and
30 near prairie edges.

31 Bobwhite quail and ring-necked pheasant are the most common upland game species on the
32 installation. Approximately 2,000 to 5,000 pheasants are released annually on controlled hunting
33 areas during October and November.

34 Waterfowl use much of the 4,100 acres (1,700 ha) of wetlands found on Fort Lewis and are seen
35 along the coastline near Solo Point. Waterfowl have benefited from several management programs
36 on the installation, including the protection of wetlands; installation of wood duck boxes, which are
37 used by wood ducks and a variety of other cavity nesting birds; control of aquatic weeds; and
38 management of ponds and lakes for open water. More than 20,000 waterfowl use the Nisqually
39 Refuge during winter.

1 **3.4 WETLANDS**

2 Wetlands and other aquatic habitats are widely distributed over Fort Lewis, covering roughly
3 4,100 acres (1,700 ha) or about 5 percent of the installation. This relative lack of wetland habitat is
4 largely the result of the underlying coarse outwash gravels deposited by the Vashon glaciation and
5 the resultant soils formed within it (Army 1994). Somewhat excessive internal drainage of soils, such
6 as Spanaway gravelly sandy loams, precludes the development of the anoxic site conditions
7 representative of wetland environments.

8 Types of wetlands present include aquatic beds, emergent, scrub-shrub, and forested. Aquatic beds
9 are characterized by the presence of aquatic vascular plants, such as duckweed, pondweed, and
10 Eurasian watermilfoil. Emergent wetlands include open, marshy habitats that support numerous
11 species of sedge, cattail, and other herbaceous species. Scrub-shrub habitats support low-growing
12 woody species, such as spirea and willows. Forested wetlands are characterized by red alder and
13 Oregon ash in the overstory, and salmonberry, vine maple, and stinging nettle in the understory.

14 Most major wetlands on Fort Lewis have a hydrological connection to creek and river drainages,
15 such as Muck Creek and the Nisqually River, and are therefore limited to creek and river drainages.
16 In particular, the Nisqually River, Muck Creek, and their tributaries support a wide array of wetland
17 types. Johnson and Spanaway marshes are important examples of western Washington marsh habitat.

18 Prior to government acquisition in the early 1900s, many of the wetlands in the Fort Lewis area were
19 ditched and drained for agricultural purposes. Water has been restored to these drained wetlands
20 through various restoration projects on the installation. Restoration projects include manipulating
21 water levels through dike construction, installing overflow channels, and installing fish ladders.
22 Wetlands on Fort Lewis are managed to maintain wetland training opportunities, enhance
23 anadromous fish habitat, provide recreational opportunities, and control non-invasive species (Army
24 2007d). Several wetlands also have been incorporated into Fort Lewis' stormwater collection and
25 conveyance system and, consequently, they receive discharges of stormwater.

26 **3.5 WILDFIRE MANAGEMENT**

27 Wildfire poses a threat to the sensitive ecosystems, cultural sites, and training lands of the Army.
28 Army training activities require the use of munitions and weapons systems that often increase the
29 chance of wildfire ignition that may damage important resources. The ROI covered in this analysis
30 includes those Army-administered lands that would be affected by implementing the stationing and
31 realignment decisions of the ROD for the 2007 GTA FPEIS, as well as the future stationing of
32 additional CSS Soldiers and a medium CAB. Information on wildfire management provided in this
33 section serves as baseline data for the analyses and comparison of the alternatives discussed in
34 **Chapter 4.**

35 **3.5.1 Wildfire Management Direction**

36 Fire protection and management direction at Fort Lewis are guided by the following policies, laws,
37 regulations, and procedures:

- 38 • Army Regulation 420–74, which requires military personnel involved in training or testing
39 activities to be aware of fire hazards, and allows for military testing and training programs to
40 be adjusted or suspended to avoid high fire hazard areas or periods.
- 41 • Department of the Army PAM 420–7, which requires that fire weather data be collected and
42 establishes a fire danger classification system based on observed forecasted weather data.

1 During periods of very high fire hazard conditions, as determined by this classification
2 system, the installation fire marshal is authorized to suspend testing or training activities that
3 use incendiary devices or that may result in fires.

- 4 • Department of Defense Wildland Fire Management Policy (September, 28 1998), which sets
5 guidelines and recommendations for the management of wildland fires and the use of
6 prescribed fire on Department of Defense (DoD) installations and properties.
- 7 • Memorandum: Army Wildland Fire Policy Guidance (September 4, 2002), which establishes
8 Army policies and standards for integrated wildland fire management, establishes
9 certification and training standards for wildland fire management personnel, and directs the
10 development and content of Integrated Wildland Fire Management Plans (IWFMPs).
- 11 • Fort Lewis Regulation 350–30 (Fort Lewis Range Regulations), which describes the seasonal
12 fire restrictions, use of pyrotechnics, and reporting procedures for wildland fires.
- 13 • Memorandum: DoD Civilian Support for Wildland Fire Fighting (September 12, 2000),
14 which sets forth the procedures for dispatching civilian resources for mutual aid not covered
15 by state agreements.

16 Fort Lewis has developed an IWFMP for the installation (Army 2000b). The IWFMP is the primary
17 guidance document with respect to fire prevention, fire suppression, post-fire actions, and fire
18 management direction for the installation. An update of the 2000 IWFMP for Fort Lewis is currently
19 being conducted (Leeper 2009).

20 Fire protection for structural and airport fires at Fort Lewis is the responsibility of the Fort Lewis
21 Fire Department (Leeper 2009). The Fort Lewis Fire Department maintains mutual aid agreements
22 with all fire departments in the surrounding municipalities, including DuPont, Steilacoom,
23 Lakewood, Tacoma, Roy, Yelm, McKenna, Gig Harbor, Spanaway, and Tillicum (Army 2001e).

24 Wildland fire incidents at Fort Lewis are handled by the Forestry Section of the Environmental
25 Division, Public Works (International Association of Fire Fighters [IAFF] 2003, Army 2004b). The
26 Wildland Fire Program Manager from the Forestry Section provides daily direction about fire danger
27 levels on the installation. Range Control is responsible for obtaining information on fire prevention
28 from troops within the TAs, as well as issuing daily training restrictions to reduce fire occurrence
29 (Army 2005c, 2007d).

30 **3.5.2 Fire History and Risk of Fire**

31 The risk of fire at Fort Lewis depends on several factors, including weather conditions; fuel
32 availability (vegetation); the frequency, type, and intensity of military training activities; and
33 location in relation to fire suppression resources (i.e., water and fire fighting personnel). The
34 combination of climate (relatively mild) and vegetation at Fort Lewis contribute to a low to moderate
35 fire danger at the installation for the majority of the year. For most of the year, precipitation
36 maintains a high-moisture content in the installation’s vegetation and reduces its ability to burn.
37 However, the warmer, drier summer months (between June and October) can create a high fire
38 danger (Army 2001e).

39 From 1988 to 2000, the Fort Lewis Forestry Section conducted 1,492 fire runs, with a high of 156
40 runs in one year and a low of 76 in another year. The sizes of these wildfires ranged from campfire
41 size to 160 acres; however, most were small in size (Army 2000b). Between 2001 and 2008, the
42 Forestry Section conducted 615 fire runs, with a high of 149 runs in one year, and a low of 19 in
43 another year. The total number of acres burned by wildfires during these years was 7,861 acres

1 (3,181 ha). However, acreages were not reported for fires less than one acre in size or for every fire
2 that occurred in the AIA because these fires are allowed to burn for safety reasons (e.g., UXO
3 concerns) and to reduce fire intensity in the AIA in future years. The sizes of the reported fires
4 occurring between 2001 and 2008 ranged from less than one acre (0.4 ha) to 650 acres (260 ha),
5 though most were 10 acres (4 ha) or less in size. Although 2008 experienced the greatest number of
6 reported acres burned (3,487 acres [1,411 ha]) during the past 8 years, it should be noted that 2008
7 was the only year for which wildfires in the AIA were consistently reported. Wildfires in the AIA
8 accounted for approximately 2,145 acres (868 ha) of the 3,487 acres (1,411 ha) burned during 2008,
9 including the 650-acre (260-ha) wildfire noted above (Leeper 2009).

10 Approximately 80 percent of the fires on Fort Lewis are a result of military training exercises and
11 result from the use of pyrotechnics and tracers and ignitions from campfires and vehicles. Such fires
12 vary in size and location, but are predominately small and limited to impact areas where gunnery
13 training is conducted (Army 2007d). On Fort Lewis, the effects of ammunition are concentrated at
14 four impact areas. These include the North Small Arms Impact Area (NSAIA) and Central Small
15 Arms Impact Area (CSAIA) (which are for small arms only) and the AIA and South Small Arms
16 Impact Area (SSAIA) (which are for small arms and live-fire maneuver/combined arms live-fire
17 exercises) (Army 2006b). The remaining 20 percent of fires on Fort Lewis are caused by activities
18 other than training and typically occur in the cantonment area. In forests on the installation,
19 numerous small fires occur annually and are extinguished quickly, with an annual burned area of less
20 than 500 acres (200 ha) (Army 2007c).

21 While wildfire suppression is a management approach used over most of the installation, many
22 accidental ignitions in prairie habitats on Fort Lewis are allowed to burn. In the AIA, ignitions
23 caused by exploding shells occur regularly. These fires are not extinguished and burn approximately
24 2,470 to 3,000 acres (1,000 to 1,200 ha) of predominantly prairie habitat annually (Army 2007d).

25 The Forestry Section establishes a fire danger level at the installation depending on the climate and
26 fuel moisture conditions (Army 2005c). With the exception of within the AIA, including Ranges 52
27 through 79 and Mortar Points 1 through 14, seasonal fire hazards on Fort Lewis (between June 1 and
28 October 31) restrict the use of tracers and other potentially incendiary ammunition (Army 2000b,
29 2006b). Fire hazard levels are posted daily, with the following associated restrictions to ignition
30 sources:

- 31 • Level I – Tracers, pyrotechnics, troop fires, and smoking are authorized.
- 32 • Level II – Pyrotechnics, troop fires, and smoking allowed on roads, gravels, or other cleared
33 surfaces (no tracers).
- 34 • Level III – Pyrotechnics, troop fires, and tracers prohibited. Smoking is allowed on roads,
35 gravels, or specially prepared areas free of flammable materials (Army 2006d).

36 **3.5.3 Fire Management Areas and Activities**

37 Although most wildfires occurring on Fort Lewis are suppressed, no fire suppression activities occur
38 within the AIA, the SSAIA, the buffer zone in between these areas, or other areas of known
39 explosive contamination. These fires are monitored to ensure no catastrophic events develop. On
40 occasion, burning out from firebreaks ahead of the fires in these areas is conducted.

41 Following each fire season, data from fires occurring during the year (for example, location, size,
42 fuel loads, response times, and damage) are evaluated to develop a Fire Risk/Hazard Assessment.
43 This assessment is used to develop recommendations for fire prevention and control and, where

1 appropriate, these recommendations are incorporated into Fort Lewis' fire prevention education
2 program (Army 2000b).

3 On TAs, the Range Division is responsible for preventing fires caused by training activities, with
4 direction provided by the Forestry Section. To reduce the risk of wildfires occurring and spreading in
5 TAs, early detection, firebreaks, and prescribed burning for fuels reduction are used. Early detection
6 is usually made by military troops or people with area access permits, and fires are reported to the
7 Fort Lewis Fire Department dispatcher, Fort Lewis Fire Alarm Central (FAC), Range Control, or
8 nearby municipal fire departments (Army 2000b, 2007c). In 2008, the dispatching function moved
9 from the Forestry Section to the Fort Lewis Fire Department dispatch center (Leeper 2009).

10 Appropriate fire suppression actions are taken at Fort Lewis depending on the location of the fire,
11 season, fire danger level, weather conditions, planned prescribed burns, and fuel availability. In TAs
12 on Fort Lewis, most small fires are suppressed by troops. Larger wildfires are suppressed by Forestry
13 Section staff, unless they fall within the parameters of planned prescribed burns. Planned prescribed
14 fires are allowed to burn under Army observation, usually to the limits of the closest firebreak (Army
15 2007c). In addition, fire fighters sometimes ignite backfires to control the spread of wildfires in Fort
16 Lewis impact areas, rather than enter areas with potential UXO hazards (Army 2005c).

17 Firebreaks on Fort Lewis consist of roads (paved or gravel) and streams. Firebreaks serve to limit the
18 spread of fires on the installation and prevent fires from extending beyond Post boundaries. The Fort
19 Lewis Forestry Section maintains more than 200 miles (320 km) of fire trails, which include
20 boundary fire trails, forest plantation fire trails, and firing range trails. Firing range trails serve to
21 prevent fires started during training in the small arms and artillery impact areas from spreading into
22 areas of higher value, such as the cantonment area (Army 2000b). Forestry equipment operators
23 grade many range roads and firebreaks annually in support of fire control efforts (Army 2007c).

24 Prescribed burning is conducted on Fort Lewis to maintain a landscape of variable, discontinuous
25 fuels and to reduce total fuel loads. Since inception of the prescribed burning program in 1983,
26 1,500 acres (600 ha) on average have been treated with prescribed fire annually (Army 2000b).
27 Forestry Section staff conduct these prescribed burns and schedule them once a year, with most
28 burns conducted in the summer. Fish and Wildlife and Range Division staff provide
29 recommendations for areas that would benefit from prescribed burning. In many cases, prescribed
30 fire burning is combined with other management tools, such as mowing (Army 2007c).

31 Fort Lewis has 125 separate prescribed fire units, covering more than 14,300 acres (5,790 ha). The
32 units include areas of ponderosa pine, native prairie, and oak woodlands, as well as firing points and
33 live fire ranges. Because Fort Lewis is in the early stages of the pine restoration process, most
34 prescribed burning in ponderosa pine stands have occurred as initial burns conducted during summer
35 months. According to the IWFMP, once these stands are established, they should be treated every 6
36 to 8 years. Prairie ecosystems are burned every 3 to 4 years, with burning typically occurring in the
37 spring. Once fuels have been sufficiently reduced, burning in prairie areas may be conducted in the
38 fall. Oak woodlands are burned every 4 to 5 years and are typically burned in the fall or summer.

39 Actual units burned and exact dates of prescribed burns are scheduled using Annual Work Plans and
40 Forest Activity Reports. The Fort Lewis IWFMP outlines the procedures that must be followed
41 during implementation of prescribed burning, including maintenance of 164-foot (50-m) buffer areas
42 around Post boundaries and 66-foot (20-m) buffer areas around high-intensity power lines and roads
43 with public right-of-way or easement. All appropriate state and local agencies and fire districts
44 (Army 2000b) are contacted prior to any prescribed burn operation at Fort Lewis.

3.5.4 Firefighting Resources

Fire protection for structural and airport fires at Fort Lewis is the responsibility of the Fort Lewis Fire Department. The Fort Lewis Fire Department employs 60 operational firefighters, nine fire prevention staff, and eight management and support staff (Leeper 2009). The Fort Lewis Fire Department has four fire stations (three on the Main Post and one on North Fort) and is responsible for providing fire and emergency services to a service area of approximately 86,000 acres (35,000 ha) and a population of more than 35,000. In addition, the Fort Lewis Fire Department maintains mutual aid agreements with all of the fire departments in the surrounding municipalities. During emergencies, these municipal fire departments respond to Fort Lewis as they would any other 911 call (IAFF 2003).

Wildland fire incidents at Fort Lewis are handled by the Forestry Section of the Public Works Environmental Division (IAFF 2003, Army 2004b). The Forestry Section has seven full-time permanent employees who conduct fire control activities (Leeper 2009). These employees are supplemented with two full-time permanent employees of the Fish and Wildlife Section when needed (Army 2000b). During the high fire danger period at Fort Lewis (June through October), an additional 14 temporary forestry technicians and two full-time heavy equipment operators are employed (Leeper 2009). For fires occurring during non-duty hours, the Forestry Section provides the Fort Lewis FAC with an emergency “on call” list of forestry personnel. All personnel conducting fire suppression activities, including prescribed burning operations, are required to be Red Card certified for the duties they are assigned. Training for forestry technicians is required to meet the standards outlined in the National Wildfire Coordinating Group’s 310–1, Wildland and Prescribed Fire Qualification Guide (Army 2000b).

Under most circumstances, permanent and temporary employees in the Forestry Section are capable of controlling wildfires occurring at Fort Lewis. However, during the high fire danger period, Soldiers from I Corps and Fort Lewis may be required to provide support. In addition, help from the WDNR and local fire districts is available through mutual aid agreements. The Fort Lewis and McChord AFB Fire Departments may also respond to requests for assistance in fire suppression (Army 2000b).

Two standpipes on Fort Lewis’ main water system are used as water fill points for wildland fire equipment. One is located at Building T1206, and the other is located adjacent to the ball fields near the Post cemetery. All wildland fire engines are equipped to enable any fire hydrant located on- or off-Post to be used as a fill point. In addition, nearby lakes and streams, including Cat Lake, Fiander Lake, Nisqually River, Muck Creek, Lewis Lake, Chambers Lake, and Johnson Marsh, may be used as water sources for wildfire suppression (Army 2000b).

Equipment for both ground and aerial fire suppression is used for wildfires at Fort Lewis. Among other equipment, five Type 6 wildland engines (200-gallon [760-L] capacity), four Type 4 engines with 1,000-gallon (3,800-L) capacity, one Type 3 water tender, one dozer with transport, and one 1-ton 4x4 stake truck (command vehicle) provide ground suppression assistance (Army 2000b). In addition, Fort Lewis has two full-time Aircraft Rescue Fire Fighting (ARFF) companies that respond to airfield fires (Leeper 2009).

3.6 CULTURAL RESOURCES

The ROI for cultural resources encompasses the area within the boundaries of Fort Lewis. The affected environment for cultural resources for the GTA undertaking includes three broad resource

1 types: archaeological sites (prehistoric and historic-period sites), historic districts, individual historic
2 buildings and structures, Native American traditional cultural resources.

3 Baseline data for cultural resources are derived from the existing Fort Lewis ICRMP (Army 2005d),
4 which is in the process of being revised and updated, and previous cultural resources work
5 completed on the installation. Information is presented in **Sections 3.6.3** through **3.6.4** for each
6 resource type.

7 **3.6.1 Applicable Federal Authorities**

8 Assessment of potential impacts to cultural resources is considered with reference to several federal
9 authorities pursuant to Army Regulation 200–1, Chapter 6, Cultural Resources. Cultural resources
10 are defined as:

- 11 • Historic properties, including traditional cultural properties (TCPs), as defined by Section 106
12 of the National Historic Preservation Act (NHPA). Historic property means any prehistoric or
13 historic district, site, building, structure, or object greater than 50 years old that is included in,
14 or eligible for inclusion in, the National Register of Historic Places (NRHP).
- 15 • Native American cultural items (funerary objects, objects of cultural patrimony) as defined in
16 the Native American Graves Protection and Repatriation Act (NAGPRA), which applies to
17 federal lands.
- 18 • Archeological resources defined in the Archeological Resources Protection Act (ARPA),
19 which are protected from unauthorized excavation, removal, or damage on federal and Indian
20 lands.
- 21 • Indian sacred sites, as defined in EO 13007, to which access is provided under the American
22 Indian Religious Freedom Act (AIRFA)
- 23 • Artifact or archive collections as defined in 36 CFR 79, Curation of Federally Owned and
24 Administered Collections.

25 **3.6.2 Archaeological Resources**

26 Approximately 74 percent of Fort Lewis has been surveyed for archaeological resources. Surveys
27 have been conducted on both a project-specific basis to examine an area of proposed ground
28 disturbance and on an annual inventory basis for compliance with Section 110 of the NHPA.
29 Approximately 90 percent of the cantonment area that is suitable for development has been surveyed
30 for archaeological resources. Twenty-nine archaeological sites were identified in the cantonment
31 area, of which 26 are historic-period archaeological sites, two are prehistoric sites, and one is a
32 multi-component site.

33 Prehistoric sites on Fort Lewis are characterized as sparse scatters of stone tools and tool-making
34 debris or shell middens, most likely representing temporary camps associated with subsistence
35 procurement activities (Righter 1981, Maass et al. 2005, Dampf et al. 2008). Most of the prehistoric
36 sites on Fort Lewis are found in alluvial settings near waterways (Nisqually River, Muck Creek) or
37 prairie habitats where seasonal camas bulbs and other resources, such as terrestrial mammals, would
38 have been procured.

39 Historic-period archaeological sites are relatively more common on Fort Lewis than prehistoric sites,
40 and are associated with several historical themes identified in Lewarch’s study of historic-period
41 archaeological resources on Fort Lewis (Lewarch et al. 1999):

- 42 • early Nisqually Indian Reservation (1857 to 1917);
- 43 • Hudson’s Bay Company and Puget Sound Agricultural Company;

- 1 • American settlement and agricultural development;
- 2 • growth of late 19th to early 20th century rural agricultural communities;
- 3 • railroad transportation, logging, and milling; and
- 4 • development of Fort Lewis from its establishment in 1917 to World War II.

5 Five historic cemeteries are known to exist on Fort Lewis and are managed and protected as
6 archaeological resources. These date primarily to the Nisqually Indian Reservation and early pioneer
7 periods (circa [ca.] 1854 to 1917). Most of the cemeteries are unmarked. The Fort Lewis Military
8 Cemetery remains in active use.

9 Survey efforts to date have recorded 382 archaeological sites spanning 8,000 years of history and
10 prehistory: 334 are historic period sites, 26 sites date to the prehistoric period, and 20 sites contain
11 both prehistoric and historic components. Of the total inventory of 382 sites, 216 have been recorded
12 with the Department of Archaeology and Historic Preservation (DAHP) and 24 have been evaluated
13 for NRHP eligibility, of which four have been determined eligible.

14 **3.6.3 Historic Districts, Buildings, and Structures**

15 The Proposed Action calls for major redevelopment and construction in the cantonment area, which
16 may directly affect NRHP-eligible historic properties through demolition or alteration, or indirectly
17 through visual intrusions incompatible with the historic setting of a property or district.

18 **3.6.3.1 Historic Districts**

19 Three NRHP-eligible historic districts occur on Fort Lewis: the Fort Lewis Garrison Historic
20 District, the Old Madigan General Hospital Historic District, and the American Lake Department of
21 Veteran’s Affairs Hospital Historic District. A historic district is defined as a significant
22 concentration of buildings, structures, or both dating to the same time period and associated with the
23 same historical theme. A historic district has a specific geographical boundary within which
24 contributing and non-contributing resources are present.

25 The Fort Lewis Garrison Historic District is listed in the Washington Heritage Register and in 2004
26 was determined eligible for, but not formally nominated to, the NRHP. The historic landscape in and
27 around the Fort Lewis Garrison Historic District is recognized as contributing to its significance. The
28 historic landscape has features that include, but are not limited to, views, open space, vegetation, site
29 furnishings, circulation systems, and water features. The District contains 299 contributing buildings,
30 structures, and objects distributed over 420 acres (170 ha) as follows:

- 31 • 71 buildings in the Garrison area;
- 32 • 123 residences in the Broadmoor Housing area;
- 33 • 99 residences in the Greenwood Housing area;
- 34 • the 91st Division Monument; and
- 35 • Camp Lewis road alignments railroad alignments.

36 The Old Madigan General Hospital Historic District was determined eligible for, but not formally
37 nominated to, the NRHP in 2001. The District originally contained 99 buildings, 42 of which were
38 recorded to the specifications of the Historic American Building Survey (HABS) and demolished in
39 1994. The remaining District’s resources include 27 contributing buildings, 29 non-contributing
40 buildings and structures, and one road structure distributed over 32 acres (13 ha).

1 The American Lake Department of Veteran’s Affairs Hospital Historic District was nominated to the
2 NRHP in May 2009, and is listed on Washington Heritage Register. The District contains 85
3 contributing buildings distributed over 106 acres (43 ha). All of the buildings are owned by the
4 Department of Veteran’s Affairs on lands leased from Fort Lewis. The Army has no NHPA
5 management responsibility for these buildings.

6 **3.6.3.2 Individual Historic Properties**

7 Several individual historic properties and commemorative objects exist on Fort Lewis. Individual
8 NRHP-eligible historic properties on Fort Lewis include:

- 9 • Salvation Army Red Shield Inn (Fort Lewis Museum) (NRHP-listed)
- 10 • Liberty Gate (Main Gate)
- 11 • Mount Rainier Ordnance Depot Gate (Logistics Center Gate) and Headquarters Building
- 12 • Carey Memorial Theater (Building 2163)

13 Fort Lewis also has two commemorative objects that are notable historical resources, but are not
14 NRHP-eligible properties: the Captain Wilkes July 4, 1841 Celebration Site, listed in the Washington
15 Heritage Register in 1970, and the Hudson’s Bay Company Trail Monument (Building No. 4185).
16 The monument is near the DuPont Gate and bears a Fort Lewis building number.

17 **3.6.4 Native American Traditional Cultural Resources**

18 Present-day Fort Lewis is located within the traditional territories of the Nisqually and Puyallup
19 tribes as they existed in the early 19th century. Places and resources that are important to the ongoing
20 traditional or ceremonial practices of the Nisqually and Puyallup tribes (and other area tribes) are
21 present on Fort Lewis. Such places include particular plant and animal habitats, natural features of
22 the landscape, and sites where important rituals, such as vision quests, were carried out in the past
23 and which continue to be used for such purposes. Resources of traditional cultural or ceremonial
24 value may not have specific geographic boundaries that can be drawn on a map, and may be known
25 only to tribal members who wish to keep their location and nature confidential (cf. Parker and King
26 1998). The following summary is based on ethnographic sources reviewed for and cited in previous
27 work completed for Fort Lewis cultural resources studies.

28 At the time of sustained European contact, the Nisqually inhabited as many as 40 villages along the
29 Nisqually River, from its headwaters in the foothills of Mount Rainier to its delta on Puget Sound
30 (Ruby and Brown 1992, Carpenter 2002). Ethnographic place-names recorded by ethnographer T.T.
31 Waterman in the vicinity of Fort Lewis include a Nisqually village at the mouth of the Nisqually
32 River, *“sqwE’l³e*, from which came the modern name for the river and the people, which means
33 “late.” This may refer to the fact that salmon were said to run later in the Nisqually than in other
34 regional rivers and streams.

35 As with other groups in western Washington, the Nisqually relied on salmon as a staple resource.
36 The Nisqually established fishing stations along the Nisqually River to capture migrating salmon in
37 addition to other fish species (Smith 1940, Ballard 1957, Lane 1973). They lived in permanent
38 winter villages, which consisted of one or more cedar plank longhouses occupied by several related
39 families (Carpenter 2002, Haeberlin and Gunther 1930, Smith 1940). Major village sites have been
40 identified at the Nisqually River delta; the mouths of Muck Creek, Clear Creek, and Meshal Creek;
41 and the towns of Roy, Rainier, and Tenino (Smith 1940).

1 The northern portion of Fort Lewis was also within the aboriginal territory of the Puyallup Indians
2 (Haerberlin and Gunther 1930, Smith 1940). At the time of contact, the Puyallup lived in winter
3 villages on the Puyallup River, Commencement Bay, Hylebos Creek, Wapato Creek, Carbon River,
4 Stuck River, South Prairie Creek, and Vashon Island (Smith 1940). Villages were often composed of
5 one large house occupied by four to eight families. During the summer months, each family group
6 would leave the village and travel to seasonal resource procurement locations, such as the camas
7 prairies.

8 Fort Lewis cultural resource managers are aware that there are places and resources on the
9 installation that have traditional cultural or ceremonial importance to the Nisqually, Puyallup, and
10 Squaxin Island tribes. Several important traditional places have been identified on Fort Lewis by
11 elders of the Nisqually Indian Tribe, who have expressed their wish to keep their location
12 confidential. An ongoing program of consultation with the tribes is in place to ensure accessibility
13 and confidentiality within the parameters of the Fort Lewis mission.

14 As part of its responsibility under Section 106 of the NHPA, Fort Lewis initiated consultation for the
15 GTA undertaking with the Nisqually, Puyallup and Squaxin Island tribes in January 2009. Letters
16 were sent to each tribe on January 30, 2009, introducing the GTA undertaking and inviting the tribes
17 to a consultation meeting at Fort Lewis on February 3. At the meeting, Fort Lewis cultural resources
18 management staff presented the GTA alternatives, the Section 106 consultation process, and the
19 status of the installation's cultural resources inventory and management program. Tribal members
20 were shown maps of the installation and were given the opportunity to explore and discuss how the
21 proposed intensification of training activities associated with the GTA undertaking might affect
22 tribal cultural resources. While various tribal members confirmed that there are places and resources
23 on Fort Lewis that are important, no specific impacts were identified. All agreed to continue
24 consulting throughout the EIS process so that any adverse impacts the tribes may identify after
25 reviewing the DEIS document can be avoided, minimized, or mitigated. Fort Lewis also explained
26 that the Section 106 process would result in the development of a Programmatic Agreement (PA)
27 pursuant to 36 CFR § 800.14(b)(3) concerning the management of cultural resources on Fort Lewis,
28 for which the tribes would have the opportunity to provide input (the PA is discussed in **Section**
29 **4.6.8** and provided in **Appendix D**). A summary of the meeting minutes was sent to the tribes for
30 review on February 20, 2009.

31 **3.7 AIR QUALITY**

32 **3.7.1 Air Quality Regulations Applicable to Fort Lewis**

33 The Clean Air Act, as amended in 1990, requires EPA to set National Ambient Air Quality
34 Standards (NAAQS) for pollutants considered harmful to public health and the environment. Primary
35 standards set limits to protect public health, and secondary standards set limits to protect public
36 welfare (including protection against decreased visibility and damage to animals, crops, vegetation,
37 and buildings). NAAQSs have been set for six principal pollutants, known as criteria pollutants:
38 carbon monoxide (CO), lead, nitrogen dioxide (NO₂), particulate matter less than 10 microns or 2.5
39 microns in diameter (PM₁₀ and PM_{2.5}, respectively), ozone (a product of volatile organic compounds
40 [VOCs] and nitrogen oxides [NO_x] reacting in the atmosphere), and sulfur dioxides (SO₂) (**Table 3–**
41 **7**). NAAQSs are based on concentrations averaged over various periods. Standards for pollutants
42 with acute health effects are based on relatively short-term periods (1 hour, 3 hours, 8 hours, or
43 24 hours), whereas additional standards are based on relatively long periods (quarterly and annually)
44 to gauge chronic effects. Individual states are responsible for regulating pollution sources.

Under the General Conformity Rule of the Clean Air Act, Section 176(c), EPA established certain statutory requirements for federal agencies to demonstrate conformity of the proposed activities with the State Implementation Plan for attainment of the NAAQS. Certain actions are exempted from conformity determinations, while others are presumed to conform if the total project emissions are below *de minimis* levels and less than 10 percent of the regional emissions inventory.

EPA has divided the country into geographical regions known as Air Quality Control Regions (AQCRs) to evaluate compliance with the NAAQS. Fort Lewis is located in the Puget Sound Intrastate AQCR and the Olympic-Northwest Washington Intrastate AQCR. EPA designates AQCRs as either attainment or nonattainment areas for each of the individual criteria pollutants. Attainment areas have concentrations of criteria pollutants below NAAQSs, and nonattainment areas have concentrations above NAAQSs. Maintenance areas are attainment areas that had a history of nonattainment, but are now consistently meeting the NAAQS.

Table 3–7 National Ambient Air Quality Standards

Air Pollutant	Standard Type	Concentration ¹	AQCR Classification for Fort Lewis ²
Particulate matter (PM ₁₀)	Primary and Secondary	150 µg/m ³ 24-hour average	Unclassifiable
Particulate matter (PM _{2.5})	Primary and Secondary	15 µg/m ³ annual arithmetic mean	Not currently applicable
	Primary and Secondary	35 µg/m ³ 24-hour average	Not currently applicable
Sulfur dioxide	Primary	0.030 ppm (80 µg/m ³) annual arithmetic mean	Attainment
	Primary	0.14 ppm (365 µg/m ³) 24-hour average	Attainment
	Secondary	0.50 ppm (1,300 µg/m ³) 3-hour average	Attainment
Carbon monoxide	Primary	9 ppm (10,000 µg/m ³) 8-hour average	Unclassifiable/Attainment
	Primary	35 ppm (40,000 µg/m ³) 1-hour average	Unclassifiable/Attainment
Ozone	Primary and Secondary	0.12 ppm (235 µg/m ³) 1-hour average	Attainment
	Primary and Secondary	0.075 ppm 8-hour average (2008 standard)	Not currently applicable ³
	Primary and Secondary	0.08 ppm 8-hour average (1997 standard)	Attainment
Nitrogen dioxide	Primary and Secondary	0.053 ppm (100 µg/m ³) annual arithmetic mean	Unclassifiable/Attainment
Lead	Primary and Secondary	1.5 µg/m ³ Quarterly average	Unclassifiable/Attainment

Notes:

1 µg/m³ = micrograms per cubic meter; ppm = parts per million

2 AQCR = Air Quality Control Region

3 Data are currently being collected to determine this classification. Preliminary data indicate that the Puget Sound region has violated the new standard (Puget Sound Clean Air Agency 2008).

Source: EPA 2008b

Toxic air pollutants (also known as toxic air contaminants) are known or suspected to cause cancer or other serious health effects, or to cause adverse environmental effects (EPA 2008b). Emissions of toxic air pollutants must be below Acceptable Source Impact Levels (ASILs), which are concentrations established by regulatory authorities to evaluate air quality impacts. Toxic air pollutants are referred to as hazardous air pollutants under the Clean Air Act. National emission standards for hazardous air pollutants (NESHAPs) are technology-based limits on the release of hazardous air pollutants from industrial sources. NESHAPs are not based on health risk considerations.

In accordance with Prevention of Significant Deterioration (PSD) regulations, attainment areas are classified as Class I, Class II, or Class III areas. Class I areas have the most stringent limitations on new emission sources, followed by Class II and Class III areas. EPA has designated certain national parks and wilderness areas as Class I areas. These areas are considered pristine and are therefore afforded special protection from impacts associated with air pollution. The closest PSD Class I area

1 to Fort Lewis is Mount Rainier National Park, which is located approximately 50 miles (80 km) to
2 the east (**Figure 3-5**).

3 **3.7.2 Air Quality on Fort Lewis**

4 Air quality in the Fort Lewis area is good. According to the most recent air quality report from Puget
5 Sound Clean Air Agency (2008), the major source of air pollution in the Puget Sound region is on-
6 road vehicles, which are the greatest contributors to criteria pollutants and greenhouse gas emissions
7 in the Puget Sound airshed. Additionally, area sources, such as outdoor and indoor burning, are
8 major contributors to particulate matter (PM) emissions. All of Washington is in attainment with the
9 NAAQS for criteria pollutants, or is designated as unclassified/attainment. Areas with the
10 unclassified/attainment designation cannot be completely classified because of a lack of information,
11 but are treated as attainment areas for regulatory purposes.

12 Portions of Fort Lewis are located in maintenance areas for ozone and CO (**Figure 3-6**).
13 Maintenance areas were previously nonattainment areas but have since been redesignated to
14 attainment areas. To maintain continued attainment with the NAAQS, federal actions occurring in
15 maintenance areas are subject to general conformity thresholds of 100 tons (100,000 kg) per year for
16 each pollutant formerly designated as nonattainment. Because of the new lower standards for ozone,
17 portions of Fort Lewis could potentially be a nonattainment area for this pollutant in the near future.
18 According to Puget Sound Clean Air Agency (PSCAA), the nonattainment designation, should it
19 occur, would likely be in a couple of years. At that time, Fort Lewis will have to work with PSCAA
20 to address the new designation (Carr 2009). Additionally, a new PM_{2.5} nonattainment area in
21 southern Tacoma has been proposed (PSCAA 2008). The boundary of this proposed area is adjacent
22 to the eastern boundary of Fort Lewis, but does not include the installation.

23 Fort Lewis contributes emissions from both mobile and stationary sources. The primary pollutants
24 from motor vehicles include NO_x, CO, and VOCs. Secondary pollutants include PM₁₀ and PM_{2.5}
25 emissions as fugitive dust, caused by motor vehicles travelling on unpaved and/or gravel roads,
26 project construction, demolition, and training exercises. Stationary sources at Fort Lewis include
27 aerospace maintenance and rework operations, fuel burning, fuel storage and dispensing, degreasing,
28 woodworking, and painting operations. The primary pollutants from fuel burning are NO_x, CO, SO₂,
29 VOCs, and PM₁₀. The primary pollutants from fuel storage and painting are VOCs. A 2007 inventory
30 of emissions from the major stationary air pollution sources on the installation is provided in **Table**
31 **3-8**.

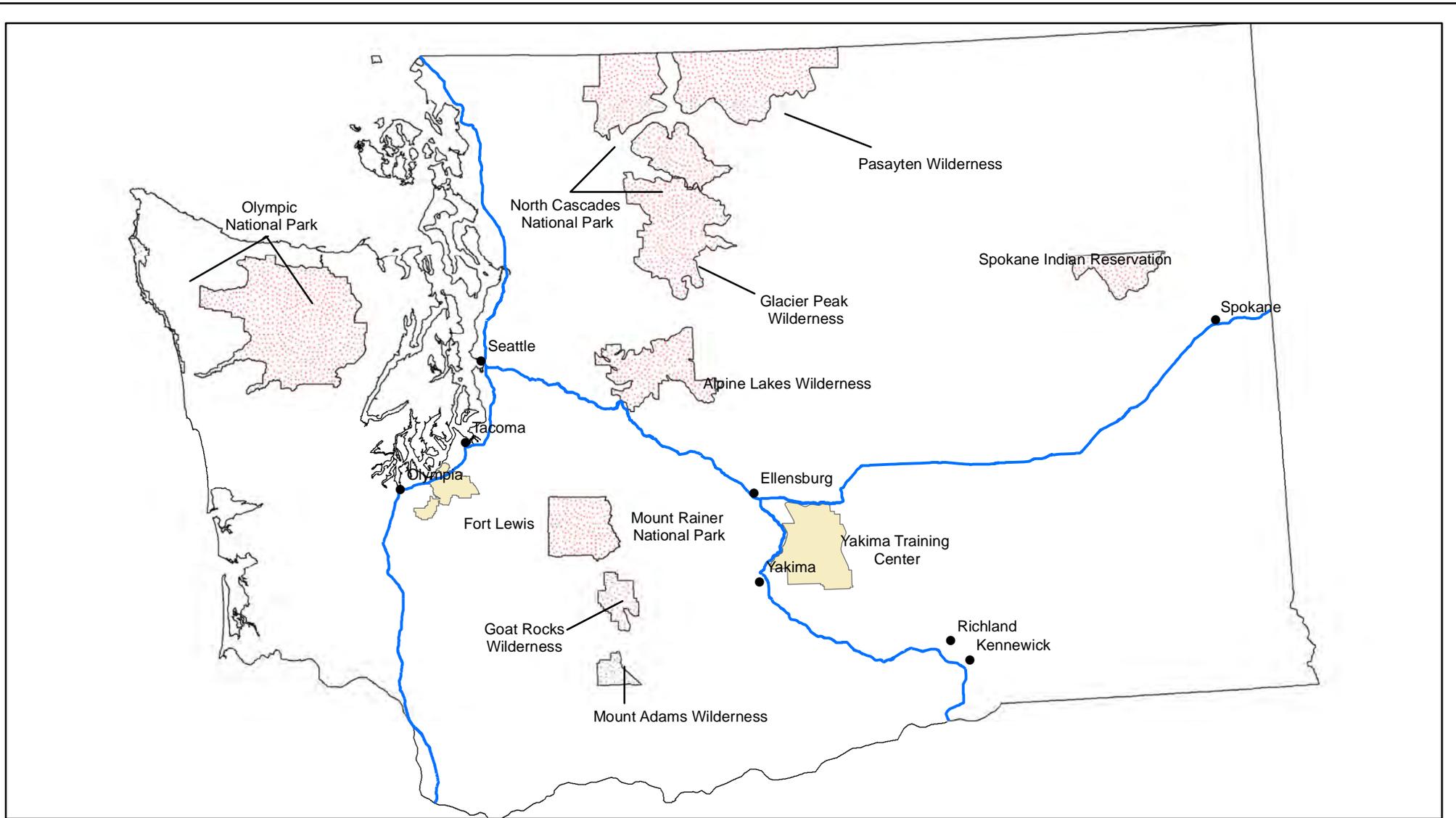
Table 3-8 2007 Air Emission Inventory from Fort Lewis Stationary Sources

Pollutant	Tons/Year
Carbon monoxide (CO)	65.9
Nitrogen oxides (NO _x)	56.6
Sulfur oxides (SO _x)	7.2
Volatile organic compounds (VOCs)	29.6
Particulate matter (PM ₁₀ and PM _{2.5})	10.2
Total hazardous air pollutants	4.5
Total toxic air contaminants	10.7

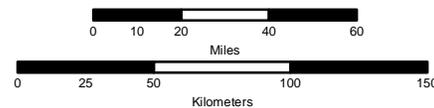
Source: Rosacrans 2008

32

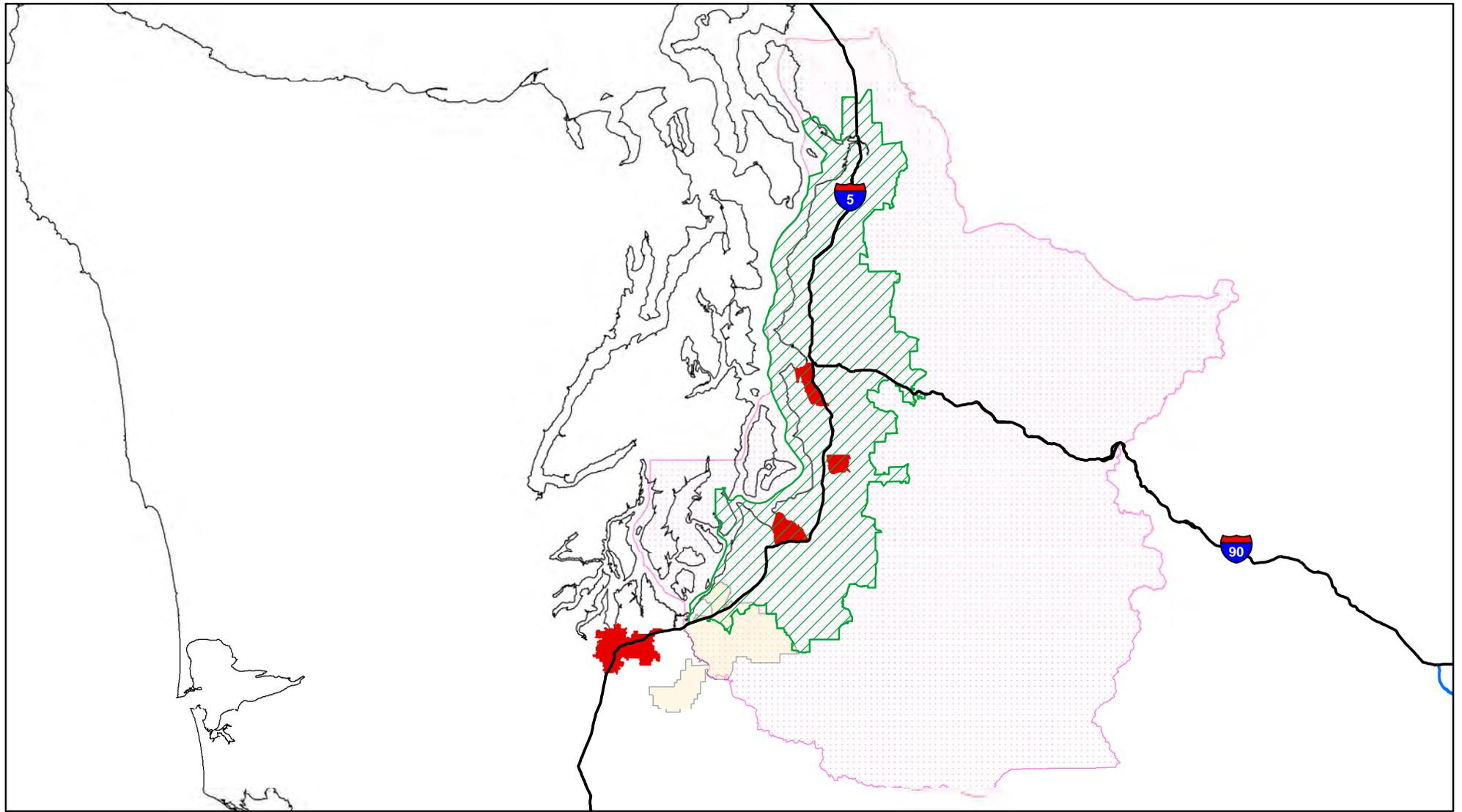
33



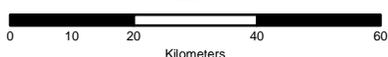
 Class 1 Areas



FORT LEWIS GTA EIS	
<p>Figure 3-5 Class 1 Areas in Washington State</p>	
ANALYSIS AREA: Thurston & Pierce Counties, Washington	
Date: 7/16/2009	File: Arcadis\DEIS Figures.mxd
Prepared By: BC	Layout: ProjectArea.pdf



-  CO Maintenance Area
-  PM10 Nonattainment Areas
-  Ozone Maintenance Area
-  Fort Lewis



FORT LEWIS GTA EIS	
<i>Figure 3-6 Air Quality Maintenance and Nonattainment Areas in the Vicinity of Fort Lewis</i>	
ANALYSIS AREA: Thurston & Pierce Counties, Washington	
Date: 7/16/2009	File: ArcadisDEIS Figures.mxd
Prepared By: BC	Layout: ProjectArea.pdf

3.8 NOISE

Noise is generally described as unwanted sound. The physical characteristics of sound include intensity, frequency, and duration. Sound is transmitted by mechanical vibrations through different mediums, like air. When sound energy increases, the noise is perceived louder. Sound levels are typically measured using a logarithmic decibel (dB) scale.

Measurements and descriptions of sounds are usually based on various combinations of the following factors:

- vibration frequency characteristics of the sound, measured as sound wave cycles per second (Hertz [Hz]) which determines the “pitch” of a sound;
- total sound energy being radiated by a source, usually reported as a “sound power level;”
- actual air pressure changes experienced at a particular location, usually measured as a “sound pressure level” (the frequency characteristics and sound pressure level combine to determine the “loudness” of a sound at a particular location);
- duration of a sound; and
- changes in frequency characteristics or pressure levels through time.

Human hearing varies in sensitivity for different sound frequencies. Human hearing is limited to frequencies between about 20 and 20,000 Hz, with the upper limit generally decreasing with age. Correction factors for adjusting actual sound pressure levels to correspond with human hearing have been determined experimentally. A-weighted correction factors are employed for measuring noise in ordinary environments and de-emphasize the very low and very high frequencies of sound in a manner similar to the response of the human ear. Therefore, the A-weighted decibel (dBA) is a good correlation to a human’s subjective reaction to noise. To the average human ear, the apparent increase in “loudness” doubles for every 10-dBA increase in noise (Bell 1982).

Although the A-weighting scale is the most widely used decibel weighting procedure, other weighting scales are also used. The C-weighted scale and unweighted decibel values are commonly used for blast noise, sonic booms, or other low-frequency sounds capable of inducing vibrations in buildings or other structures. The C-weighted sound level is a measure read from a standard sound level meter that de-emphasizes the low and high frequencies. Additionally, evaluations of blast noise or sonic boom events sometimes use a peak overpressure measurement.

Equivalent noise levels (L_{eq}) are used to develop single-value descriptions of average noise exposure over various periods. Such average noise exposure ratings often include additional weighting factors for potential annoyance due to time of day or other considerations. The L_{eq} data used for these average noise exposure descriptors generally are based on A-weighted sound level measurements.

L_{eq} are not an averaging of decibel values, but are based on the cumulative acoustical energy associated with the component decibel values. High dB events contribute more to the L_{eq} value than low dB events.

Peak noise levels are described as L_{max} . It is the highest sound level measured over an entire noise event. Discrete noise events sometimes are characterized using the sound exposure level (SEL). The SEL measure represents the cumulative sound exposure, intensity, and duration, over an entire noise event, integrated with respect to a 1-second timeframe. SEL measurements are equivalent to the L_{eq} value of a 1-second noise event producing the same cumulative acoustic energy as the actual noise

1 event being analyzed. In effect, an SEL measure distributes or compresses the noise event to fit a
2 fixed 1-second time interval. SEL values can be computed using any decibel-weighting scheme.

3 Average noise exposure over a 24-hour period is often presented as a day-night average sound level
4 (L_{dn}). L_{dn} values are calculated from hourly L_{eq} values, with the L_{eq} values for the nighttime period
5 (10 p.m. to 7 a.m.) increased by 10 dB to reflect the greater disturbance potential from nighttime
6 noises. The C-weighted day-night sound level (CDNL) is used to describe the cumulative or total
7 noise exposure during the prescribed time. The CDNL has been found to be a good measure of
8 annoyance noise in a community.

9 Ambient background noise is not evaluated in environmental noise calculations because background
10 noise varies by location, with wilderness areas being as low as 10 dBA, and because when
11 calculating noise levels, louder sounds dominate the equation. Therefore, it is reasonable to assume
12 that evaluation of background in calculations would have little impact on CDNL.

13 The Army has developed computer models that assess peak noise levels associated with random
14 blast noise events, while also factoring in the statistical variations caused by weather (U.S. Army
15 Center for Health Promotion and Preventive Medicine [USACHPPM] 2009). The noise contour
16 plotted is PK15 (met) (unweighted peak, 15 percent metric). PK15 (met) is the peak sound level that
17 is likely to be exceeded 15 percent of the time. Because weather conditions can cause noise levels to
18 vary significantly, even from hour to hour, the programs calculate a range of peak levels. By plotting
19 the PK15 (met) contour, events are expected to fall within the contours 85 percent of the time. This
20 gives the installation a way to consider the areas affected by training noise, but without placing
21 stipulations on land that may receive high sound levels under infrequent weather conditions that
22 favor the propagation of sound. PK15 (met) does not consider the duration or number of events, so
23 the size of the contours will remain the same regardless of the number of events.

24 3.8.1 Department of Defense Noise Guidelines

25 DoD began developing noise evaluation programs in the early 1970s. Initial program development
26 involved the Air Installation Compatible Use Zone (AICUZ) program for military airfields. Early
27 application of the AICUZ program emphasized Air Force and Navy airfields. The Army
28 implemented the program as the Installation Compatible Use Zone (ICUZ) program by addressing
29 both airfield noise issues and other major noise sources, such as weapons testing programs and firing
30 ranges. Joint Air Force, Army, and Navy planning guidelines were issued in 1978. The 1978
31 guidelines use annual average L_{dn} values to categorize noise exposure conditions on military
32 installations.

33 The Army has supplemented the original 1978 guidelines to develop a more comprehensive
34 Environmental Noise Management Program (ENMP). The ENMP program incorporates ICUZ
35 evaluations as one component of the program. Other components of the ENMP include programs for
36 handling noise complaints and undertaking supplemental noise evaluations when warranted by the
37 nature of discrete noise events. Criteria for evaluation of noise levels have been expanded beyond the
38 normal A-weighted L_{dn} descriptor to include the use of C-weighted L_{dn} values to characterize major
39 blast noise sources and the use of peak unweighted decibel values to characterize small arms firing
40 and large weapons training.

41 USACHPPM assists Army installations in developing ENMPs. USACHPPM also undertakes special
42 noise studies to evaluate noise problems associated with various types of noise sources. When
43 investigating noise conditions related to weapons firing or ordnance detonations, USACHPPM
44 typically measures peak unweighted decibel levels and/or C-weighted SEL levels.

3.8.2 The Army Land Use Guidelines

The Army land use guidelines identify four noise zones (USACHPPM 2009) summarized below and in **Table 3–9**. The Land Use Planning Zone (LUPZ) day-night sound level (DNL) noise contours (60 dB A-weighted day-night sound level [ADNL] for aviation activity or 57 dB CDNL) represent an annual average that separates Noise Zone II from Noise Zone I. The contours are generated by taking all operations that occur over the year and dividing by the number of training days. The noise environment varies daily and seasonally because operations are not consistent through all 365 days of the year. In addition, the Federal Interagency Committee on Urban Noise document states “Localities, when evaluating the application of these guidelines to specific situations, may have different concerns or goals to consider.” For residential land uses, depending on attitudes and other factors, a 60 dB ADNL or a 57 dB CDNL may be considered by the public as an impact on the community environment. To provide a planning tool that could be used to account for days of higher than average operations and possible annoyance, the LUPZ contour is included on the noise contour maps generated from the modeling. The LUPZ contour is included on the noise contour maps contained in this document.

Table 3–9 Land Use Planning Guidelines for Noise

Noise Zones	Aviation (ADNL)	Large Caliber Weapons (CDNL)	Small Arms Weapons PK15 (met)
LUPZ	60-65	57 – 62	NA
I	<65	< 62	<87
II	65-75	62 – 70	87-104
III	>75	> 70	> 104

Source: USACHPPM 2009

Noise Zone I includes all areas around a noise source in which the DNL is less than 65 dB ADNL for aviation activity, less than 62 dB CDNL for large caliber weapons, or less than 87 PK15 (met) for small arms weapons. This area is usually acceptable for all types of land use activities.

Noise Zone II consists of an area where the DNL is between 65 and 75 dB ADNL for aviation activity, between 62 and 70 dB CDNL for large caliber weapons, or between 87 and 104 PK15 (met) for small caliber weapons. Land within Noise Zone II is usually acceptable for industrial, manufacturing, transportation, and resource production. However, if the community determines that land in Noise Zone II (attributable to small arms) areas must be used for residential purposes, then noise level reduction (NLR) features of 25 to 30 dB should be incorporated into the design and construction of new buildings to mitigate noise levels. For large caliber weapons, NLR features cannot adequately mitigate the low-frequency component of large caliber weapons noise.

Noise Zone III consists of the area around the noise source where the DNL is greater than 75 DB ADNL for aviation activities, greater than 70 dB CDNL for large caliber weapons, or greater than 104 PK15 (met) for small caliber weapons. Noise-sensitive land uses (such as housing, schools, and medical facilities) are not recommended within Noise Zone III.

3.8.3 Existing Conditions

The chief sources of noise from Fort Lewis include aircraft (rotary- and fixed-winged) flyovers from GAAF and McChord AFB, munitions detonations, and live-fire (artillery and mortar) (Army 2007d). Range limitations are imposed on nighttime firing to reduce noise impacts to nearby residential

1 communities. Small towns near the installation sometimes experience short-term noise level
2 increases from training activities (Army 2007e).

3 Existing sources of noise at Fort Lewis include military aviation activities, small arms artillery, large
4 caliber weapons training, and vehicular traffic. Noise from vehicular traffic is primarily located in
5 the cantonment area. The highest noise levels are associated with weapons noise and flyovers from
6 jets and helicopters. The Army has developed noise contours for Fort Lewis (USACHPPM 2009).

7 **3.8.3.1 Baseline Conditions Demolition and Large Caliber Operational Noise**

8 **Figure 3-7** shows the baseline condition demolition and large caliber weapons noise contours for
9 Fort Lewis. The LUPZ 57 dB CDNL extends approximately 2.8 miles (4,500 m) beyond the western
10 boundary, toward the town of Lacey; approximately 0.9 mile (1,500 m) into the DuPont area;
11 approximately 2.5 miles (4,000 m) beyond the southern boundary, encompassing the town of Yelm;
12 and approximately 3.4 miles (5,500 m) beyond the southeastern boundary. Noise Zone II (62 dB
13 CDNL) extends beyond the western boundary approximately 0.6 mile (1,000 m), encompassing the
14 Nisqually Indian Community; less than 0.3 mile (500 m) beyond the southern boundary, into Yelm;
15 and beyond the southeastern boundary 1.2 miles (2,000 m), encompassing the town of Roy. The
16 Noise Zone III (70 dB CDNL) contour extends beyond the western boundary less 0.3 mile (500 m)
17 into the Nisqually Indian Community and approximately 660 feet (200 m) beyond the southeastern
18 boundary near the town of Roy.

19 **3.8.3.2 GAAF Noise Contours**

20 The noise contours for the baseline airfield operations are shown on **Figure 3-8**. The LUPZ (60 dB
21 ADNL) and Zone II (65 dB ADNL) noise contours do not extend into the family housing areas or
22 beyond the installation boundary. The low number of operations does not produce a Zone III (75 dB
23 ADNL) noise contour.

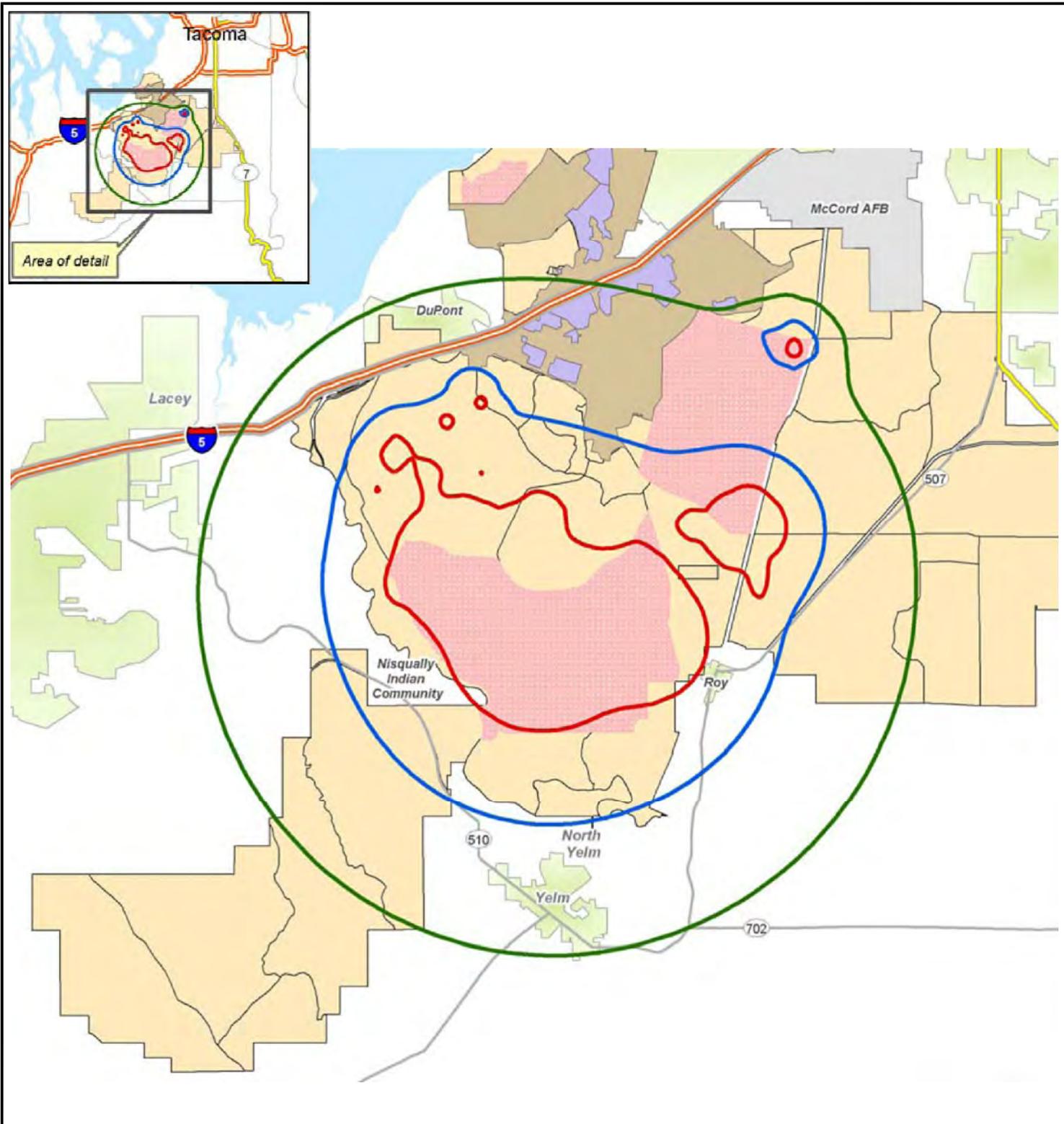
24 **3.8.3.3 Small Caliber Weapons Noise**

25 The contours for small arms operations at Fort Lewis were created using PK15 (met). Because the
26 contours are based on peak levels rather than a cumulative or average level, the size of the contours
27 will not change if the number of rounds fired increases. Therefore, the baseline is equal to the
28 projected.

29 The noise contours for small arms operations near the Fort Lewis cantonment area are shown on
30 **Figure 3-9**. The Zone II PK15 (met) 87 dB noise contour extends into the Evergreen, Hillside, and
31 Madigan housing areas. The Zone III PK15 (met) 104 dB noise contours do not extend into the
32 housing areas.

33 Although the local conditions at Fort Lewis require noise-sensitive land uses in Noise Zone II, on
34 Post, this type of land use is strongly discouraged in AR 200–1 (Army 2007b). Noise-sensitive land
35 uses are acceptable within the LUPZ and Noise Zone I, but are normally not recommended in Noise
36 Zone II or in Noise Zone III. However, if the community determines that land in Noise Zone II
37 (attributable to small arms) areas must be used for residential purposes, then the NLR features of 25
38 to 30 dB should be incorporated into the design and construction of new buildings to mitigate
39 interior noise levels. Normal construction is expected to provide an NLR of 20 dB.

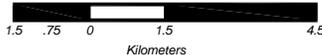
40



Source: USACHPPM 2009

Legend

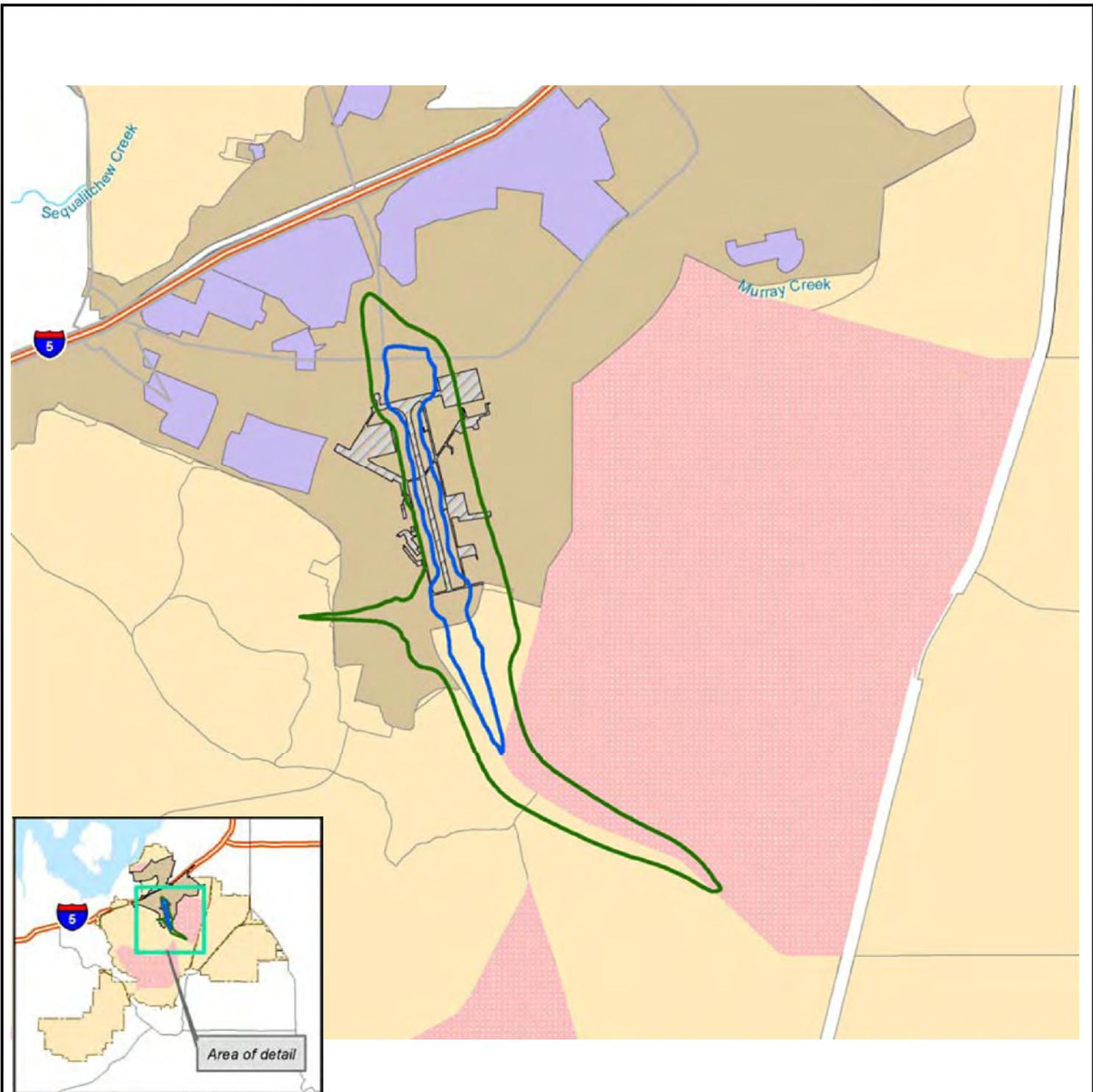
-  Cantonment Area
-  Housing Area
-  Impact Area
-  Fort Lewis
-  LUPZ (57 dB CDNL)
-  Zone II (62 dB CDNL)
-  Zone III (70 dB CDNL)



FORT LEWIS GTA EIS

*Figure 3-7
Fort Lewis Contemporary Operating
Environmental Demolition and
Large Caliber Operational Noise Contours*

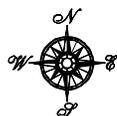
ANALYSIS AREA: Thurston & Pierce Counties, Washington	
Date: 7/14/2009	File: Ft. Lewis Figures.dwg
Prepared By: ETC	Layout: 001



Source: USACHPPM 2009

Legend

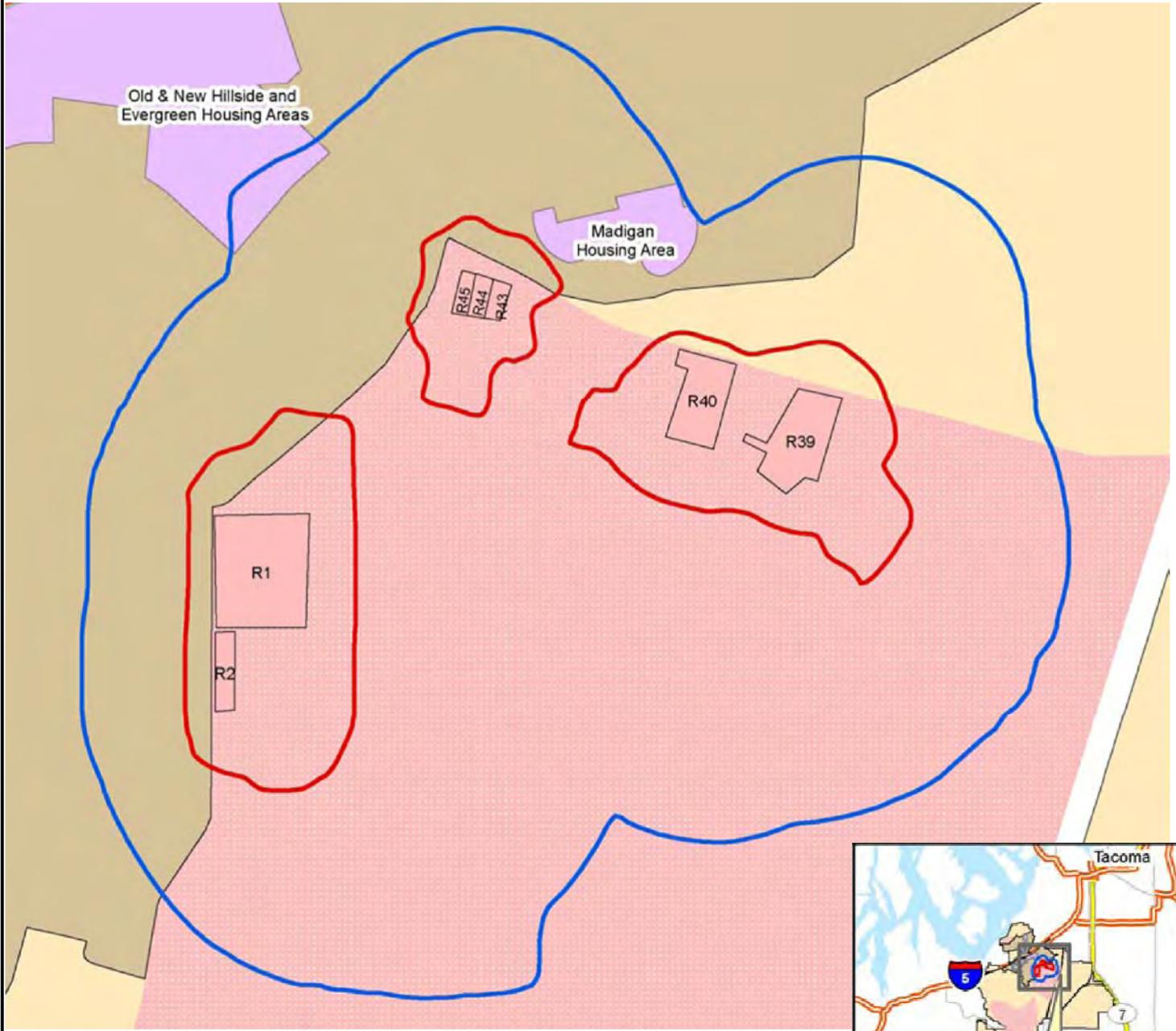
- Cantonment Area
- Housing Area
- Gray Army Airfield
- Fort Lewis
- Impact Area
- LUPZ (60 dB ADNL)
- Zone II (65 dB ADNL)



FORT LEWIS GTA EIS

*Figure 3-8
Gray Army Airfield Contemporary Operation
Environment - Operational Noise Contours*

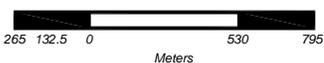
ANALYSIS AREA: Thurston & Pierce Counties, Washington	
Date: 7/14/2009	File: Ft. Lewis Figures.dwg
Prepared By: ETC	Layout: 003



Source: USACHPPM 2009

Legend

-  Zone II [87 dB PK15 (met)]
-  Zone III [104 dB PK15 (met)]
-  Impact Area
-  Range Footprint Utilized in the Small Caliber Noise Contours
-  Family Housing
-  Cantonment Area
-  Fort Lewis



FORT LEWIS GTA EIS	
<i>Figure 3-9 Fort Lewis Small Caliber Operational Noise Contours</i>	
ANALYSIS AREA: Thurston & Pierce Counties, Washington	
Date: 7/14/2009	File: Ft. Lewis Figures.dwg
Prepared By: ETC	Layout: 004

1 **3.8.4 Complaint Risk Guidelines for Demolition Activity and Large Caliber**
2 **Weapons**

3 Under the Complaint Risk Guidelines, the peak contours show the expected level that one would get
4 on a sound level meter when firing a weapon. This metric represents the best available scientific
5 quantification for assessing the complaint risk of large caliber weapons ranges. The complaint risk
6 areas for PK15 (met) noise contours are defined as follows:

- 7 • The high risk of complaint area consists of the area around the noise source in which PK15
8 (met) is greater than 130 dB for large caliber weapons.
- 9 • The moderate risk of complaint area is the area where the PK15 (met) noise contour is
10 between 115 dB and 130 dB for large caliber weapons.
- 11 • The low risk of complaint area is the area where the PK15 (met) noise contour is less than
12 115 dB for large caliber weapons.

13 The large caliber weapons baseline complaint risk noise contours for Fort Lewis are shown on
14 **Figure 3-10**. The complaint risk contours are based on peak levels rather than a cumulative or
15 average level; therefore, the size of the contours will not change if the number of rounds fired
16 increases.

17 The moderate complaint risk contour PK15 (met) 115 dB extends beyond much of the boundary and
18 into DuPont, Lacey, and Yelm. The high complaint risk contour PK15 (met) 130 dB extends beyond
19 the boundary into the Nisqually Indian Community and near the town of Roy.

20 **3.9 LAND USE CONFLICT/COMPATIBILITY**

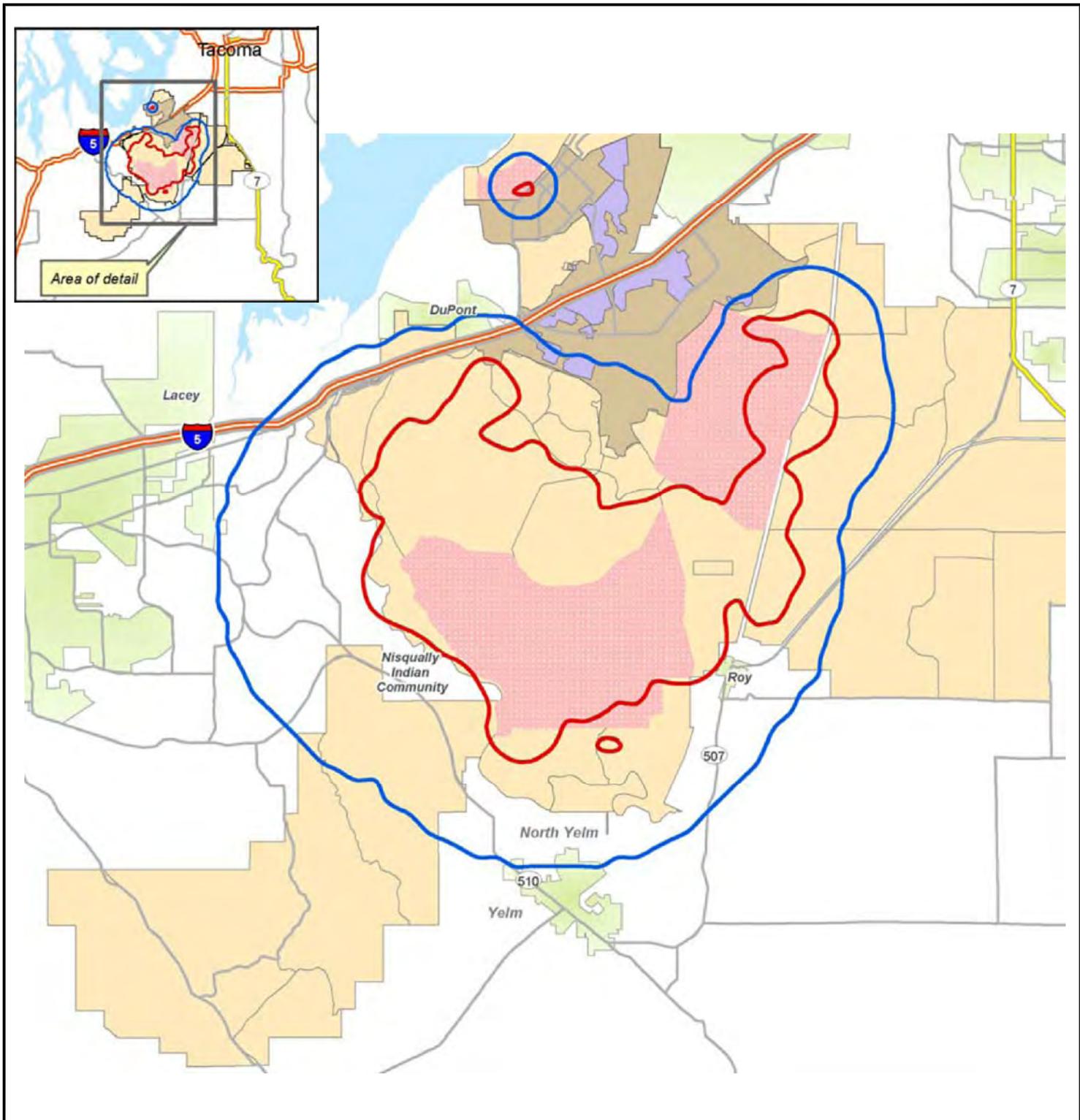
21 The ROI for the land use conflict and compatibility analysis includes lands within Fort Lewis
22 potentially affected by the proposed activities, as well as lands adjacent to or surrounding the
23 installation. The current land uses (including non-military uses, such as recreation), current conflict
24 and encroachment issues, as well as pertinent federal, state, and local land use regulations, policies,
25 and plans for the ROI are described in the following subsections. The proposed project activities will
26 primarily be located on land owned by the federal government. The proposed project activities are
27 subject to the federal authorities, but are not required to conform to state, county, municipal, or other
28 plans and policies or related land use documents.

29 One issue related to land use conflict/compatibility at Fort Lewis — temporary and permanent land
30 use effects from implementing GTA actions — was identified through public scoping, and provided
31 the context for the development of the affected environment.

32 **3.9.1 Land Use Planning**

33 Fort Lewis has a Real Property Master Plan (RPMP) dating from 1995. The plan describes 11
34 different uses on Fort Lewis and 11 slightly different uses for YTC. The plan includes objectives and
35 planning factors. It also makes general comments on present and future land use in different areas. It
36 does not, however, include ADPs nor have any of the details that the proposed ADPs have.
37 Consequently, Fort Lewis is in the process of updating its RPMP.

38 For the updated RPMP, Fort Lewis adopted a planning model that focuses on compact, walkable
39 development in identifiable neighborhood districts (Urban Collaborative 2009). Subsequently,
40 planners divided Fort Lewis and YTC into geographically distinct districts. ADPs were then created
41 to address the unique mission and facility requirements for each geographic area on Fort Lewis and



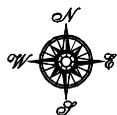
Source: USACHPPM 2009

Legend

-  Cantonment Area
-  Housing Area
-  Impact Area
-  Fort Lewis
-  115 dB PK15 (met)
-  130 dB PK15 (met)

Complaint Risk Guidelines

Risk of Complaints	dB PK15 (met)
Low	< 115
Moderate	115 - 130
High	> 130



FORT LEWIS GTA EIS	
<p><i>Figure 3-10</i> Fort Lewis Contemporary Operating Environment Complaint Risk Contours for Demolition and Large Caliber Operations</p>	
ANALYSIS AREA: Thurston & Pierce Counties, Washington	
Date: 7/14/2009	File: Ft. Lewis Figures.dwg
Prepared By: ETC	Layout: 002

1 YTC. Through the ADPs, the RPMP helps guide, program, and confirm priorities and long-range
2 capital improvement projects.

3 As discussed in **Section 2.2.5** and shown on **Figure 2–9**, 13ADPs were developed for the
4 cantonment area in Fort Lewis. The North Fort ADPs are North Fort, American Lake, and Greene
5 Park. The Main Post ADPs are Historic Downtown, East Division, Logistics Center, Madigan,
6 Jackson, Old Madigan, Hillside (Rainier Village), Miller Hill, Gray Army Airfield, and 3rd Brigade.

7 The ADPs represent the fulfillment of the design vision as a snapshot in time; however, the Army’s
8 needs will grow and change, so the ADPs will need to grow and change as well. Thus, each ADP
9 identifies the current conditions in the ADP area, including the manmade and natural environments.
10 Information about current vehicular circulation, parking, airfield, historic districts, environmental
11 restoration sites, munitions storage, topography, hydrology, and biological resources is included.
12 Each of these elements is considered when identifying opportunities and constraints to better define
13 the task of siting new facilities. **Section 2.2.5** summarizes the information for the 13 Fort Lewis
14 ADPs and the YTC ADP.

15 Major land uses within the Fort Lewis boundary include the cantonment area (approximately
16 10,600 acres [4,290 ha]) and training and impact areas (approximately 62,600 acres [25,300 ha] for
17 TAs and 12,900 acres [5,220 ha] for impact areas) (Army 2007d). **Figure 3-11** illustrates the
18 distribution of these major land uses within the boundaries of Fort Lewis. Fort Lewis also
19 accommodates multiple nonmilitary uses, including commercial timber harvests; recreational uses,
20 such as hunting, fishing, horseback riding, and other outdoor activities; and Native American
21 traditional cultural practices followed by the Nisqually Tribe. Timber harvests take place within the
22 various forested TAs. Recreational activities may take place anywhere throughout the non-restricted
23 areas of the Post, depending on scheduled training exercises.

24 Certain portions of Fort Lewis are designated as Controlled Use Areas, in which certain land use
25 activities are restricted either seasonally or year-round. Most Controlled Use Areas are located in
26 environmentally sensitive areas in which land use restrictions are necessary to protect natural and
27 cultural resources.

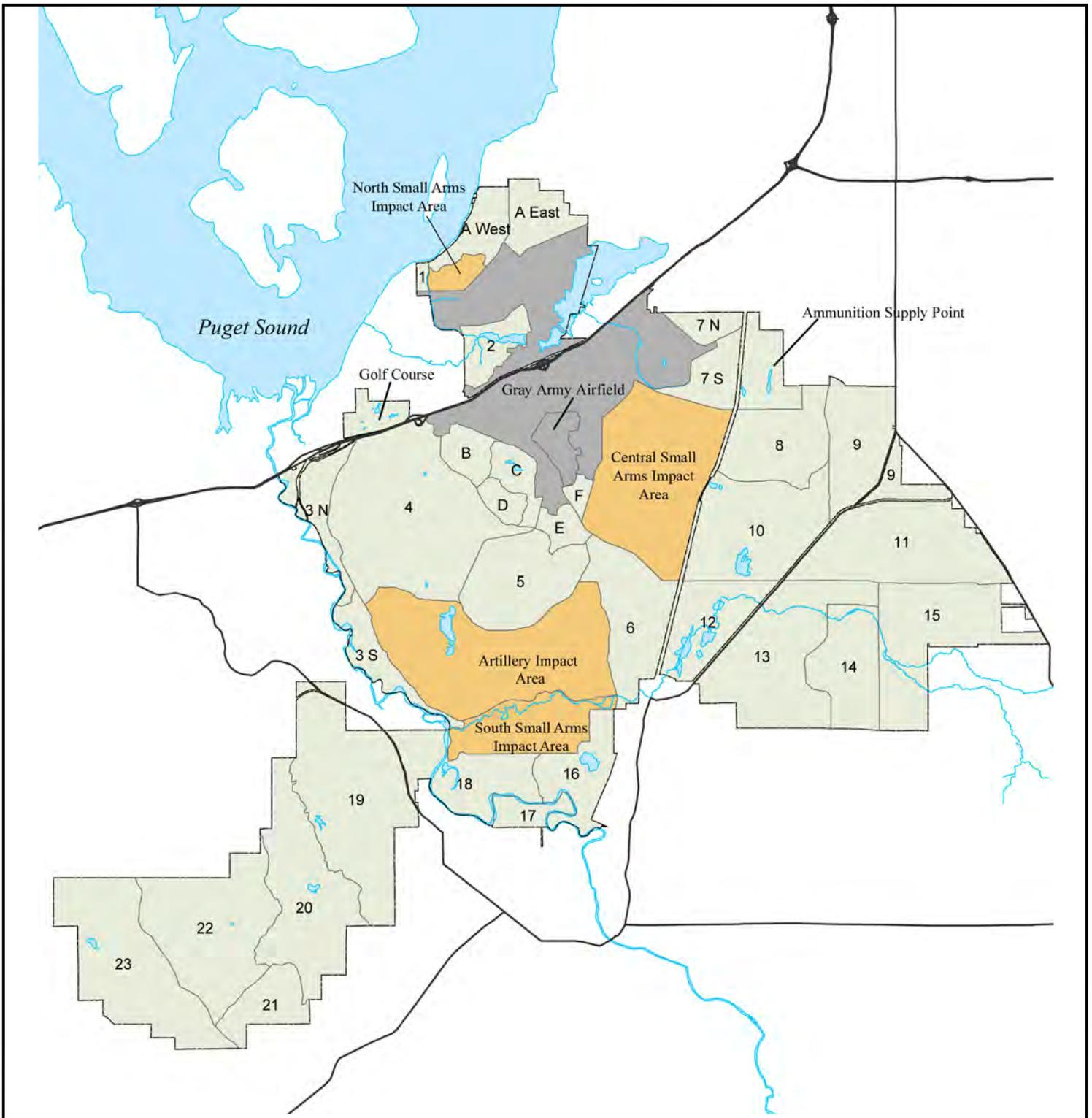
28 **3.9.2 Cantonment Area**

29 The cantonment area serves as the center for most activities at Fort Lewis other than field training.
30 Land uses in the cantonment area (listed in order of greatest extent of land used to lowest) include
31 housing, open space, industrial and maintenance, medical and community services, administrative
32 uses, aviation (GAAF), training, reserve component support facility, and deployment facility. Land is
33 also reserved for future development. The distribution of these land uses in the cantonment area is
34 shown on **Figure 3-12**.

35 There are approximately 5,000 buildings at Fort Lewis, including the MAMC. The majority of these
36 buildings provide housing for Soldiers and their Families (Army 2007e). Housing facilities, some of
37 which are multiplex buildings, include single-family units, bachelor officer quarters, and barracks
38 that provide housing for enlisted personnel. Family housing units, barracks, and bachelor officer
39 quarters are found on the Main Post and North Fort.

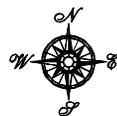
40 **3.9.2.1 Training Areas**

41 The 32 designated TAs on Fort Lewis encompass forestland, wetlands, prairie, brush, and marine
42 environments. TAs are delineated into maneuver, impact, range, and other TAs. Other TAs include



Legend

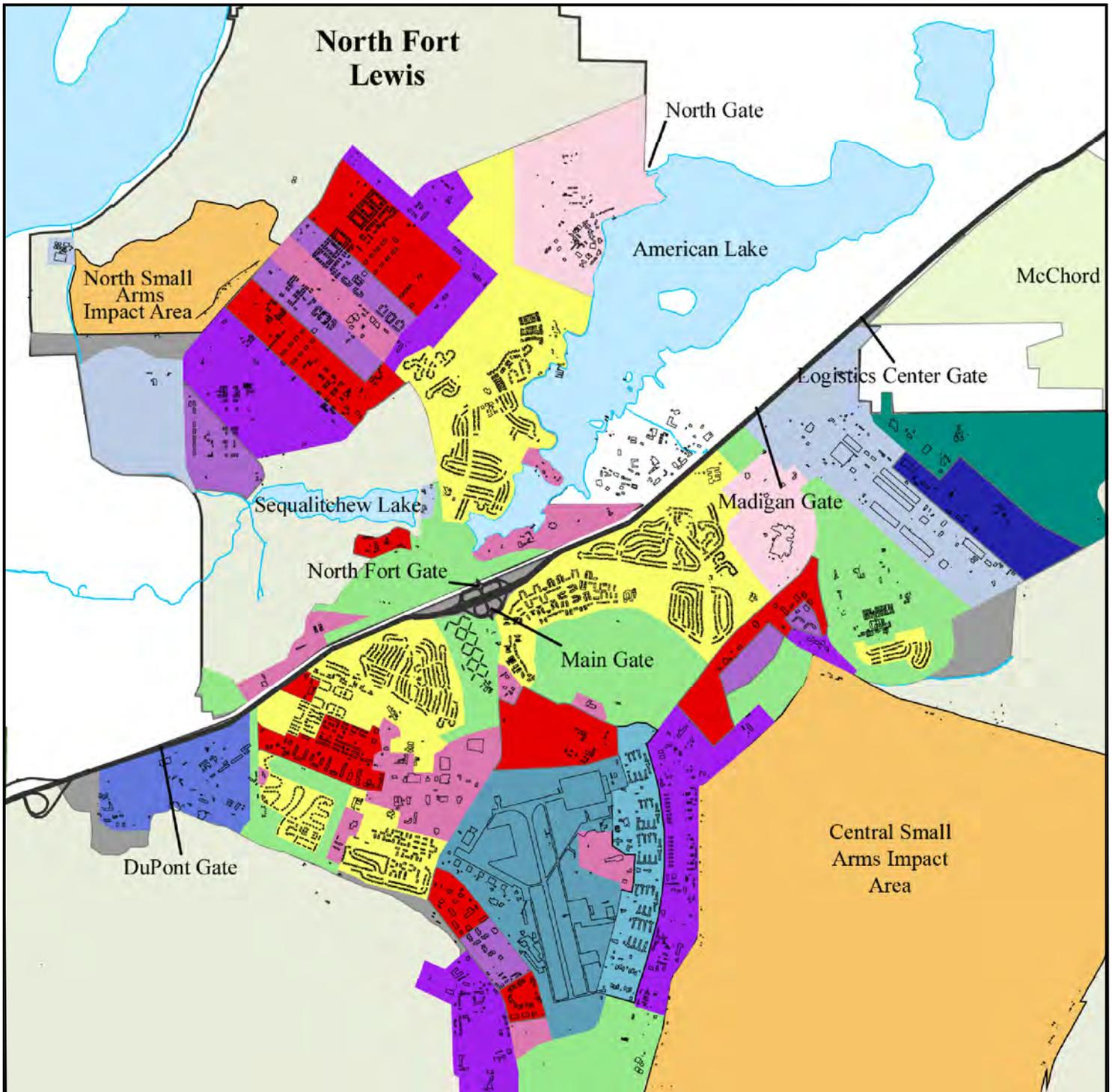
-  Cantonment Area
-  Impact Areas
-  Training Areas



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*Figure 3-11
Major Land Use Areas on Fort Lewis*

ANALYSIS AREA: Thurston & Pierce Counties, Washington	
Date: 7/14/2009	File: Ft. Lewis Figures.dwg
Prepared By: ETC	Layout: 005



Legend

- | | |
|---|--|
|  Training |  Rainier Park |
|  Troop Facility |  Reserve Component Support Area |
|  Administration |  Industrial |
|  Aviation |  Maintenance |
|  Community Services |  Medical |
|  Deployment Facility |  Open Space |
|  Family Housing | |



FORT LEWIS GTA EIS

*Figure 3-12
Major Land Use Areas within the
Fort Lewis Cantonment Area*

ANALYSIS AREA: Thurston & Pierce Counties, Washington	
Date: 7/14/2009	File: Ft. Lewis Figures.dwg
Prepared By: ETC	Layout: 011

1 airborne training sites, ammunition storage areas, and urban combat areas. Training activities that
2 characterize land use at Fort Lewis include off-road tracked vehicle movement, wheeled vehicle
3 movement, gunnery practice, digging activities (tank ditches, vehicle positions, and foxholes), unit
4 assembly areas, and unit deployment exercises. **Figure 3-11** shows the locations of TAs on Fort
5 Lewis. These delineated TAs are established to facilitate their management, which is the
6 responsibility of Range Control.

7 Although the TAs are largely undeveloped, there are developed training facilities that are used by
8 troops to complete training missions. These are located in impact areas, which include the NSAIA,
9 CSAIA, and the SSAIA. These facilities include 67 marksmanship and live-fire ranges and more
10 than 30 non-firing facilities, such as observation posts, drop zones, Combined Arms Collective
11 Training Facilities (CACTFs), and amphibious sites.

12 In addition to working through Range Control, commanders coordinate training plans with the
13 Directorate of Public Works (DPW). Fort Lewis maintains a staff of resource managers at the DPW
14 to help training commanders preserve sensitive areas, while providing realistic training exercises.

15 **3.9.3 Recreation and other Non-military Uses**

16 Certain portions of the Fort Lewis TAs are available to military personnel and the public for outdoor
17 recreation, provided these activities do not interfere with military training. The Outdoor Recreation
18 Program staff, under the Directorate of Morale, Welfare, and Recreation, provides oversight for
19 outdoor recreational programs on the installation, under the guidance of the Outdoor Recreation Plan
20 (provided in Appendix K of the INRMP) and Fort Lewis Regulation 215–1. The mission of the Fort
21 Lewis Outdoor Recreation Program is to provide outdoor recreational and skill development
22 activities for all members of the Fort Lewis community.

23 Common recreational activities on Fort Lewis include hunting, fishing, boating, camping, hiking,
24 picnicking, and shooting. Although there are numerous areas on Fort Lewis that are designated as
25 recreational areas, recreational activities can occur throughout most of the installation, with the
26 appropriate permits and permission from Range Division. The Outdoor Recreation Program manages
27 the hunting and fishing programs on Fort Lewis, maintains designated facilities, and rents
28 equipment. Access to Fort Lewis for recreational activities that do not require registration with the
29 Outdoor Recreation Program is coordinated through Range Division, which issues area access
30 permits.

31 **3.9.4 Tribal Access**

32 The Nisqually, Puyallup, and Squaxin Island tribes have an interest in TCPs of religious or other
33 cultural importance, as well as in lands on which to hunt, fish, and gather. Continued access and
34 healthy, sustainable resources are especially important for Nisqually tribal members who
35 occasionally conduct hunting and fishing activities on Fort Lewis. Tribal needs for access are
36 discussed in **Section 3.6.4**.

37 **3.9.5 Land Uses Surrounding Fort Lewis**

38 Land uses adjacent to Fort Lewis include urban, rural, and mixed residential areas; commercial
39 districts and corridors; and recreational, agricultural, and other open space areas. McChord AFB is
40 located adjacent to the Main Post at its northeast boundary.

1 Development to the north of Fort Lewis consists primarily of single- and multiple-family residential
2 housing interspersed with commercial areas. The nearest off-Post residential communities and their
3 associated commercial areas to the north are the cities of DuPont, Steilacoom, and Lakewood. In
4 addition, the off-Post portion of American Lake and the associated recreational, commercial, and
5 residential land uses are near the Fort Lewis cantonment area.

6 The areas to the east and southeast of the installation are characterized by low-density and rural
7 residential development with extensive subdivisions. To the south and southwest, areas surrounding
8 the installation are characterized by forest land and agricultural open space; the rural communities of
9 Roy and Yelm; the rural and urban communities of Lacey, Olympia, and Tumwater; and open areas
10 associated with the Nisqually River corridor, the Nisqually Refuge, and Puget Sound. The Nisqually
11 Indian Reservation is located adjacent to the Nisqually River southwest of the installation.

12 **3.9.6 Land Use Conflicts**

13 An objective of the Fort Lewis Master Plan is the recognized need to eliminate existing and
14 developing land use conflicts, to coordinate with adjacent jurisdictions to maximize opportunities for
15 mutual benefit, and to minimize conflicts and developmental incompatibilities.

16 Increasing population and an accompanying increase in development of land and intensity of land
17 use activities can potentially result in the following conflicts:

- 18 • increase in environmental restrictions on land use;
- 19 • noise disturbances;
- 20 • competition for resources, such as air space and communications frequencies;
- 21 • demand for support of infrastructure and non-military uses; and
- 22 • sensitivity of use and management of military lands by neighboring residents.

23 All of these issues have affected military training, planning, and management of lands to some
24 degree (Coe-Truman Technologies 1994).

25 The Land Use Deconfliction (deconfliction) process is a management tool that allows consideration
26 of land use and natural resource issues when planning projects on the installation. The deconfliction
27 process is used for land use planning in the cantonment area. During the deconfliction process, units,
28 tenants, and Garrison staff attend organized meetings that focus on combining information sources
29 with institutional knowledge to coordinate and integrate activities and projects related to Fort Lewis.
30 The deconfliction process allows Fort Lewis representatives to ensure that the proposed project does
31 not conflict with other land uses/restrictions/infrastructures (Army 2007d).

32 The primary Fort Lewis GIS database, maintained and operated by DPW, is a repository of data
33 layers that are used as inputs for planning and natural resource management purposes. All Fort Lewis
34 personnel can access GIS database information, which makes deconfliction among programs
35 possible. Fort Lewis intends to work on expanding the GIS and strengthening the deconfliction
36 process. According to the 2007 INRMP, the deconfliction process will be incorporated into the
37 Master Plan update to make it a requirement, and the process will be expanded to consider a wider
38 range of actions, including large military training exercises.

3.10 TRAFFIC AND TRANSPORTATION

3.10.1 Study Area

Figure 2–1 shows the location of Fort Lewis and the surrounding region in Pierce County south of the City of Tacoma. Fort Lewis is bordered by McChord AFB to the northeast; the cities of Lakewood, Steilacoom, and DuPont to the north and northwest; Yelm to the south; and Spanaway to the east. **Figure 2–1** shows I–5 and other prominent landmarks surrounding the installation.

3.10.1.1 Study Intersections and Roadway Characteristics

Figure 3-13 shows the existing traffic control and geometry of the study intersections, and the number of travel lanes and posted speed limits on roadways in the study area. Large volumes of pedestrian and vehicle traffic occur at several areas on Fort Lewis. The Town Center area, which encompasses the I Corps Headquarters; PX and Commissary; Fort Lewis Lodge; Carey Theatre; and several other shopping, lodging, and recreational facilities, is one such location. Other areas include Madigan Hospital and North Fort.

Traffic volumes on Fort Lewis' primary roadways were analyzed to determine current traffic conditions. The following three intersections were analyzed within the Post:

- 41st Division Drive/Nevada Avenue/Tacoma Avenue (Main Post)
- 41st Division Drive/Pendleton Avenue (Main Post)
- 41st Division Drive/A Street (North Fort)

These intersections have some of the highest traffic volumes at Fort Lewis.

The following intersections, located just outside the Fort Lewis gates, were also analyzed:

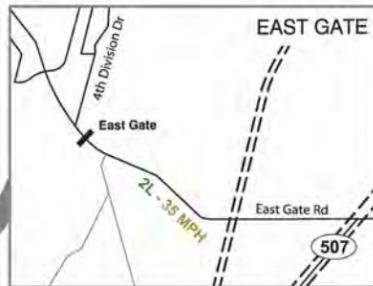
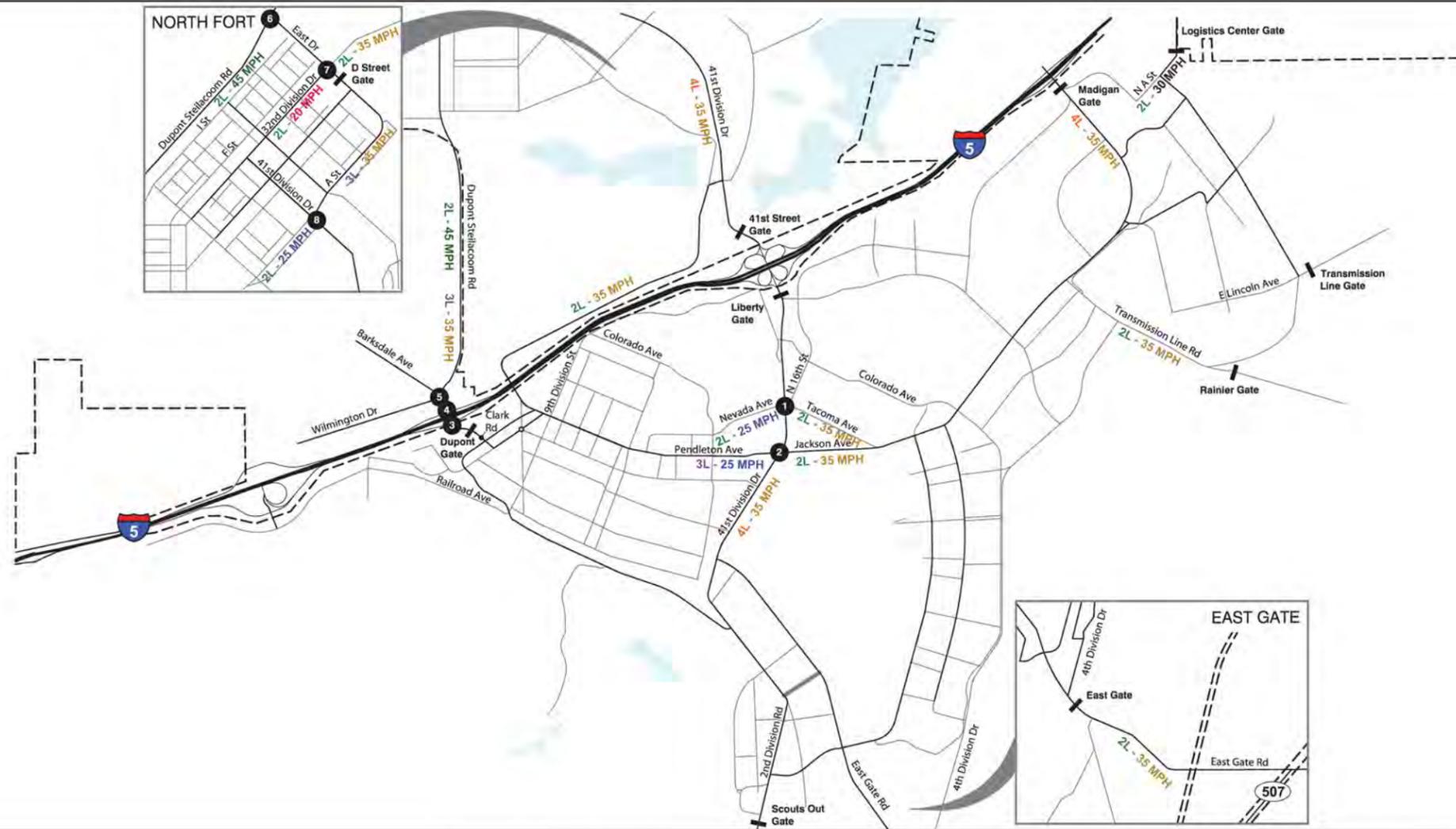
- I–5 Northbound Ramps/Barksdale Avenue/Clark Road (exit 119)
- I–5 Southbound Ramps/Barksdale Avenue/Clark Road (exit 119)
- DuPont Steilacoom Road/Barksdale Avenue/Wilmington Drive
- DuPont Steilacoom Road/East Drive
- North Gate Road/East Drive

On Post, the roadway network is classified into three main types of roads: primary, secondary, and tertiary roadways.

3.10.1.1.1 Fort Lewis Primary Roadways

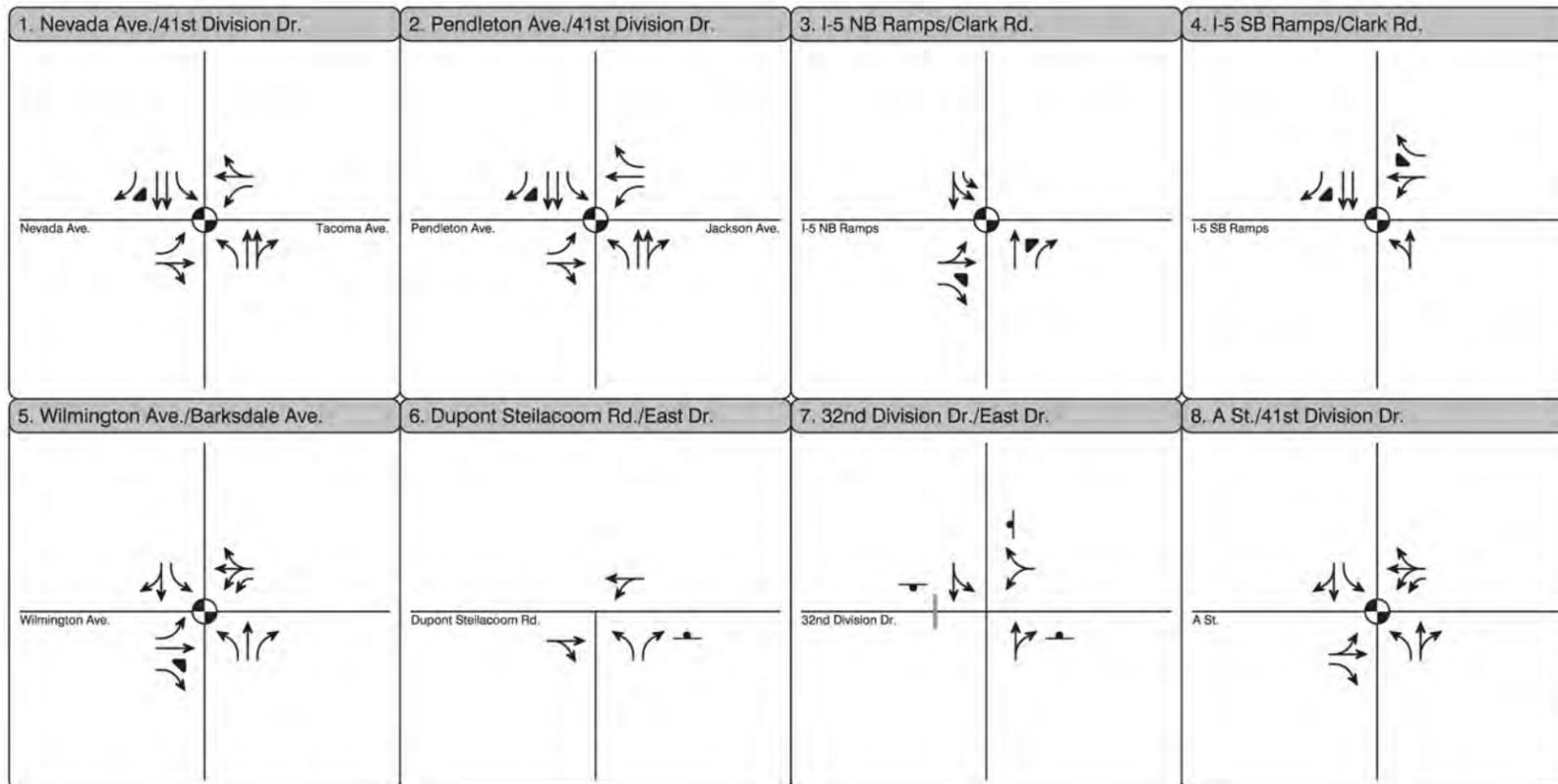
Primary roadways function as arterials, serving as the major through routes within the installation and providing connections to I–5 and the surrounding major highways. The primary roadways are 41st Division Drive, Pendleton Avenue, Jackson Avenue, Stryker Avenue, East Gate Road, Railroad Avenue, Rainier Avenue, 2nd Division Drive, and 3rd Division Drive. The typical posted speed limit on these Primary roads is 35 miles per hour (mph) (56 kilometers per hour [kph]).

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 lanes and a posted speed limit of 35mph (56 kph), 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 and Commissary, bowling alley, movie theatre, and many other retail, office, recreational, and social support services. At the North Fort, 41st Division Drive south of A Street has four lanes and a raised, planted median with concrete curb and gutter on both sides of the roadway.



Legend

- Turn Lane
- 2L Number of Lanes
- 35 MPH Posted Speed Limit
- Study Intersection
- Traffic Signal
- Stop Sign
- Installation Boundary
- Access Control Point (Gate)
- Restricted Access



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*Figure 3-13
Fort Lewis Existing
Traffic Characteristics*

ANALYSIS AREA: Thurston & Pierce Counties, Washington	
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1 There is a concrete sidewalk on the east side of the road, separated from the roadway by a planter
2 strip, and signed and marked 4-foot-wide on-street bike lanes in both directions.

3 Pendleton Avenue, the primary east-west arterial in the Town Center area, is a three-lane arterial
4 with a center two-way left-turn lane and a posted speed limit of 25 mph (40 kph). It is the only street
5 in the Town Center with a continuous pedestrian walkway. The other nearby streets do not have
6 continuous designated pedestrian facilities. Pendleton Avenue continues west under I-5, providing
7 access to North Fort within the secured Fort Lewis boundaries.

8 Several streets in North Fort, including 41st Division Drive (north of A Street), have recently been
9 improved and widened to 32 feet (10 m) (curb to curb) to provide 5-foot-wide (1.5 m) striped bike
10 lanes on both sides. The streets also have new curbs, gutters, and sidewalks.

11 **3.10.1.1.2 Fort Lewis Secondary Roads**

12 Secondary roadways function as collectors, distributing traffic between the primary and tertiary
13 roadways. Secondary roads provide functionality over mobility and typically have two travel lanes
14 and a posted speed limit of 25 mph (40 km). The secondary roads on Post include Liggett Avenue,
15 Bitar Avenue, Colorado Avenue, Nevada Avenue, Tacoma Avenue, Transmission Line Road, and A
16 Street.

17 **3.10.1.1.3 Fort Lewis Tertiary Roadways**

18 Tertiary roadways function as local access roads and streets, providing driveway access to buildings,
19 parking lots, and residential housing areas. These roads and streets typically have two travel lanes
20 and low speed limits of 25 mph (40 kph) or less.

21 **3.10.1.1.4 Off-Post Roadways**

22 Several roadways off Post provide access to and from Fort Lewis to the surrounding area. I-5, a six-
23 lane freeway with a posted speed limit of 60 mph (97 kph), is the main highway that provides access
24 to and from Fort Lewis from the communities to the north, south, and west of the installation.

25 DuPont Steilacoom Road, on the west side of North Fort, is a two-lane arterial road with a posted
26 speed limit of 45 mph (72 kph). This roadway provides access to the cities of DuPont and
27 Steilacoom, and to North Fort via East Drive. East Drive connects North Fort to North Gate Road,
28 providing access to the city of Lakewood. North Gate Road is a two-lane arterial road with a posted
29 speed limit of 35 mph (56 kph).

30 Clark Road provides access to the Main Post for vehicles coming from the south and the city of
31 DuPont.

32 East Gate Road and State Route (SR) 507 provide access to the Main Post from the east. SR 507 is a
33 two-lane state highway with a posted speed limit of 50 mph (80 kph). East Gate Road has two lanes
34 and a posted speed limit of 45 mph (72 kph) outside the cantonment area.

35 The other major state highways surrounding Fort Lewis are SR 512 to the north, SR 510 to the south,
36 and SR 7 to the east.

37 **3.10.1.2 Access Control Points and Operations**

38 Access onto the Post is restricted to authorized personnel only and controlled via 10 Access Control
39 Points (ACPs) or gates, as shown on **Figure 3-13**. The primary ACPs are the Liberty (Main) Gate,
40 the Madigan Gate, the 41st Street (North Fort) Gate, and the DuPont Gate. The secondary gates
41 serving Fort Lewis are D Street Gate, East Gate, Logistics Center Gate, Transmission Line Gate,

1 Rainier Gate, and the Scouts Out Gate. Visitors to Fort Lewis are directed to use the Liberty Gate,
2 where the Visitor’s Center issues temporary passes for limited access onto the Post.

3 From I–5, the main exits to Fort Lewis are:

- 4 • DuPont Steilacoom Road (Exit #119), which provides access to the Main Post via the DuPont
5 Gate and Clark Road;
- 6 • Fort Lewis/North Fort Lewis (Exit #120), which provides access to the Main Post via the
7 Liberty (Main) Gate and the North Fort via the 41st Street Gate;
- 8 • Madigan Hospital/Camp Murray (Exit #122), which provides access to Madigan Hospital and
9 Camp Murray (the adjacent National Guard center located on the north side of I–5); and
- 10 • Thorne Lane/Tillicum/Lakewood (Exit #123), which provides access to the Logistics Center
11 Gate, via Murray Road.

12 **3.10.1.3 Transit Service**

13 Pierce Transit provides bus service on Fort Lewis and to the surrounding communities. Transit route
14 #207 provides service from the Fort Lewis Bus Depot, located at Building 2166 on 12th Street and
15 Liggett Avenue in the Town Center of the Main Post, to Madigan Hospital. Route #207 buses run
16 once per hour on weekdays.

17 Transit route #206 provides service to on-Post and off-Post destinations, including the following:

- Madigan Hospital
- Logistics Center
- American Lake Gardens
- Tillicum
- Lakewood Transit Center
- Lakewood Towne Center
- Lakewood
- Employment Security Office
- Saint Claire Hospital
- Ponders Corner

18
19 Transit route #206 buses run every one-half hour on weekdays. The Transportation Study Report
20 (Fehr and Peers 2009) provides copies of the maps and timetables for both of these routes. North
21 Fort has no transit service.

22 Additionally, Pierce Transit provides regular vanpools to Fort Lewis from surrounding cities.
23 Current vanpools, their destinations, and contact information for each route is listed in the
24 Transportation Study Report (Fehr and Peers 2009).

25 **3.10.2 Existing Traffic Volumes**

26 **3.10.2.1 On-Post Volumes**

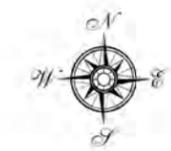
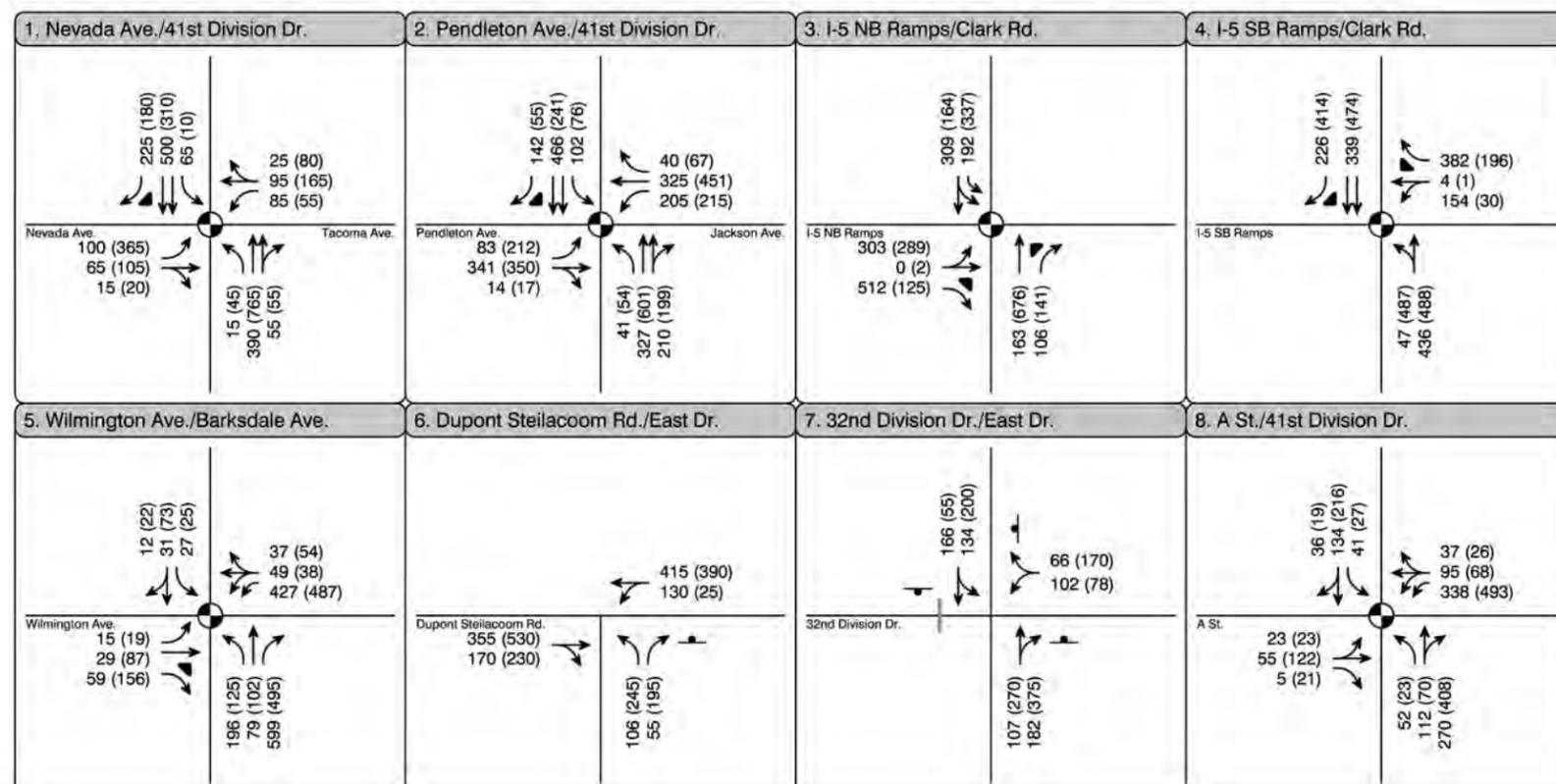
27 **Figure 3-14** shows the existing morning and evening peak hour and average weekday daily traffic
28 volumes and count date for each study intersection. The existing peak hour volumes were obtained
29 from two sources: 1) the manual turning movement traffic counts conducted during fall 2007 or in
30 2008 by the traffic volume counting firm Trafficount, Inc.; and 2) volumes obtained from the July
31 2008 Fort Lewis Comprehensive Traffic/Transportation Study. The firm conducted the counts from
32 0700 to 0900 and from 1600 to 1800, to correspond with the surrounding (off-Post) peak periods of
33 traffic during a typical weekday.

34 **Figure 3-15** shows the peak hour and average weekday daily traffic volumes at each of the 10 ACPs,
35 as well as the roadway peak hour volumes at other key locations. Most of the gate traffic volumes are



Legend

- Turn Lane
- AM (PM) Peak Hour Traffic Volume
- Study Intersection
- Traffic Signal
- Stop Sign
- Installation Boundary
- Access Control Point (Gate)
- Restricted Access



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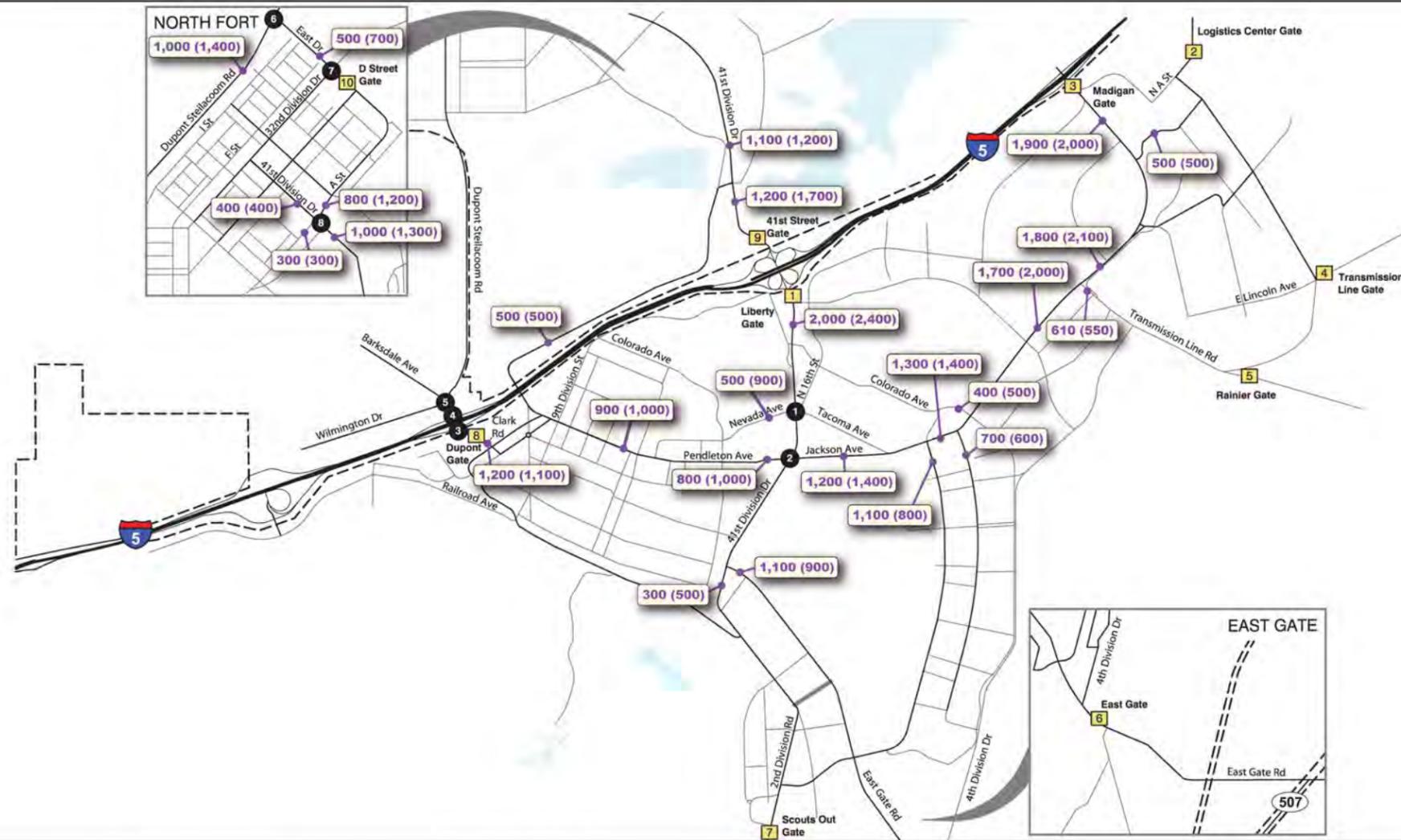


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*Figure 3-14
Existing AM/PM
Peak Hour Traffic Volumes*

ANALYSIS AREA: Thurston & Pierce Counties, Washington	
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Legend

- Turn Lane
- AM (PM) Peak Hour & Average Weekday Traffic Volume
- 610 (550)** Roadway Link Volume
- Installation Boundary
- 5** Access Control Point (Gate)
- Restricted Access

Note:
Peak Hour Traffic Counts were collected in early December 2008.

Roadway link volumes obtained from the Transpo Group July 2008 Fort Lewis Comprehensive Traffic/Transportation Installation Study.

1. Liberty (Main) Gate	2. Logistics Center Gate	3. Madigan Gate	4. Transmission Line Gate	5. Rainier Gate
<div style="display: flex; flex-direction: column; align-items: center;"> <div style="text-align: center;">1,480 (730) [13,840] ↓ 41st Division Dr.</div> <div style="text-align: center;">390 (1,720) [15,210] ↑</div> </div>	<div style="display: flex; flex-direction: column; align-items: center;"> <div style="text-align: center;">480 (90) [3,850] ↓ N.A. St.</div> <div style="text-align: center;">20 (620) [3,870] ↑</div> </div>	<div style="display: flex; flex-direction: column; align-items: center;"> <div style="text-align: center;">1,440 (390) [12,210] ↓ Jackson Ave.</div> <div style="text-align: center;">625 (1,860) [13,440] ↑</div> </div>	<div style="display: flex; flex-direction: column; align-items: center;"> <div style="text-align: center;">← [800] E Lincoln Ave.</div> </div>	<div style="display: flex; flex-direction: column; align-items: center;"> <div style="text-align: center;">← [1,170] Transmission Line Rd.</div> </div>
6. East Gate	7. Scouts Out Gate	8. Dupont Gate	9. 41st Street (North Fort) Gate	10. D Street Gate
<div style="display: flex; flex-direction: column; align-items: center;"> <div style="text-align: center;">← 730 (135) [4,010] East Gate Rd.</div> <div style="text-align: center;">10 (770) [3,990] →</div> </div>	<div style="display: flex; flex-direction: column; align-items: center;"> <div style="text-align: center;">2nd Division Rd. ↑ [120]</div> </div>	<div style="display: flex; flex-direction: column; align-items: center;"> <div style="text-align: center;">1,110 (215) [7,410] ↓ Clark Rd.</div> <div style="text-align: center;">40 (950) [6,800] ↑</div> </div>	<div style="display: flex; flex-direction: column; align-items: center;"> <div style="text-align: center;">525 (730) [8,320] ↓ 41st Division Dr.</div> <div style="text-align: center;">675 (640) [10,010] ↑</div> </div>	<div style="display: flex; flex-direction: column; align-items: center;"> <div style="text-align: center;">270 (130) [3,990] ↓ East Dr.</div> <div style="text-align: center;">290 (645) [3,700] ↑</div> </div>



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*Figure 3-15
Existing Gate and
Roadway Link Traffic Volumes*

ANALYSIS AREA: Thurston & Pierce Counties, Washington	
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Prepared By: TR	Layout: fig3_4_ex_gate.pdf

1 from recent machine-recorded traffic volume counts. These machine-recorded (tube) volume counts
 2 were taken for three consecutive weekdays (Tuesday to Thursday), from December 9 to 11, 2008, at
 3 the following locations:

- 4 • Murray Road SW, south of 150th Street SW (Logistics Center Gate)
- 5 • Jackson Avenue, south of I-5 (Madigan Gate)
- 6 • 41st Division Drive, south of I-5 (Main Gate)
- 7 • 41st Division Drive, north of I-5 (North Fort Gate)
- 8 • Clark Road, south of I-5 (DuPont Gate)
- 9 • East Drive, south of North Gate Rd. (North Gate)
- 10 • East Gate Road, west of SR 507 (East Gate)

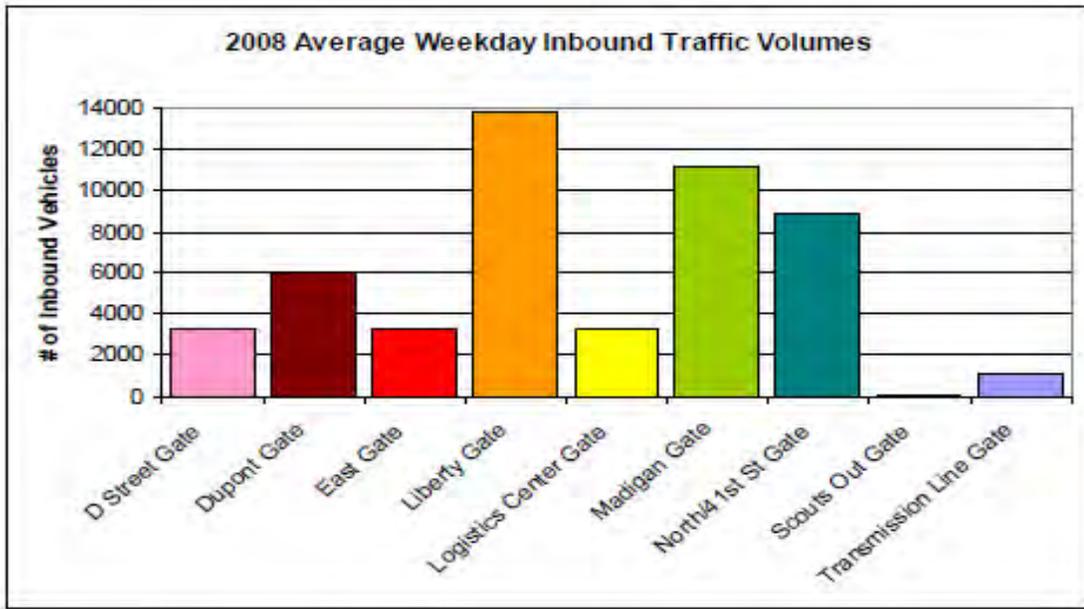
11 The tube traffic counts at these gates show the start of the morning peak period is 0500. This
 12 corresponds to Soldiers arriving on Post for regular physical training, which typically occurs during
 13 the morning hours before work. The typical workday on Post is from about 0700 to 1600. This is
 14 also consistent with the gate volume afternoon peak hour, which is from 1600 to 1700.

15 The entering gate volumes for the minor Rainier Gate, Transmission Line Gate, and Scouts Out Gate
 16 were obtained from the 2006 ACP throughput data provided by Fort Lewis DPW. The DPW staff
 17 also provided the most current gate volume data collected by the Fort Lewis Security Services
 18 Office. These data show that, in 2006, an average of 38,879 vehicles entered Fort Lewis each day
 19 (including weekends and holidays). Based on the estimated average weekday 2006 ACP volumes at
 20 the minor gates and the recent counts at the higher-volume gates, Fort Lewis currently has an
 21 average of 57,396 vehicles entering the Post during an average weekday and generates an average
 22 total (entering and exiting) volume of 114,805 vehicles per weekday. Note that this average weekday
 23 entering volume does not include or account for the lower traffic volumes generated during
 24 weekends and holidays. This is the reason the current average volume is significantly higher than the
 25 2006 average daily traffic volume. The Transportation Study Report (Fehr and Peers 2009) provides
 26 all of the traffic volume count data summary sheets.

27 **Figure 3–16**, obtained from the July 2008 Fort Lewis Comprehensive Traffic/Transportation Study
 28 prepared by The Transpo Group, Inc., indicates that the average weekday traffic volume entering
 29 Fort Lewis was approximately 48,000 vehicles in 2007 and 2008. Note that the Rainier Gate is not
 30 included on this figure. The 2006 ACP throughput data shows that this gate had a daily average of
 31 1,171 vehicles accessing this gate in 2006.

32 A comparison of the 2007 and 2008 Comprehensive Traffic/Transportation Study volume (including
 33 the Rainier Gate volume) to the recent (December 2008) gate counts suggests that there was a one-
 34 year traffic volume increase of 16.7 percent (from 49,171 vehicles to 57,396 vehicles) on Fort Lewis
 35 from late 2007 to late 2008.

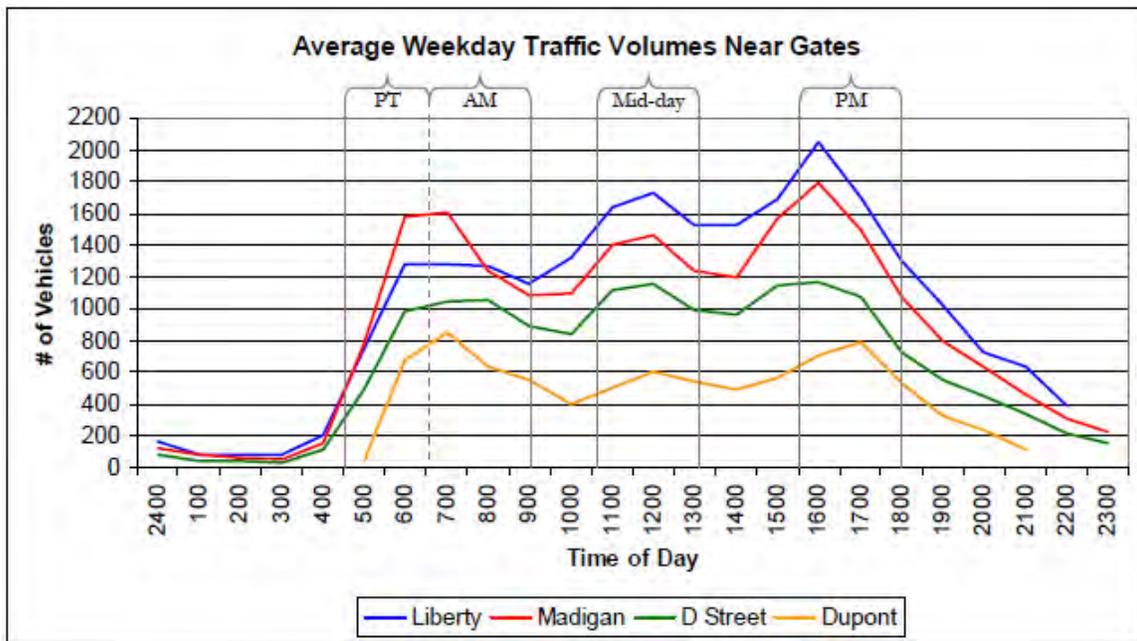
36 **Figure 3–17** shows an hourly breakdown of the average weekday traffic volumes at the four primary
 37 ACPs based on historical daily traffic volumes. The four primary gates, the Liberty (Main) Gate, the
 38 Madigan Gate, the 41st Street (North Fort) Gate, and the DuPont Gate, process 75 percent of the daily
 39 traffic generated on Fort Lewis. **Figure 3–17** and the recent gate counts show that the afternoon peak
 40 hour, from 1600 to 1700, is the highest hour of traffic volume, generating approximately 8.2 percent
 41 of the total average weekday traffic on Fort Lewis. The morning peak hour of traffic on Fort Lewis
 42 generally occurs from about 0600 to 0700 and generates approximately 7.4 percent of the total
 43 weekday traffic.



Source: The Transpo Group, Inc. 2008

1

Figure 3–16 2008 Average Weekday Inbound Traffic Volumes



Source: The Transpo Group, Inc. 2008

2

3

Figure 3–17 Average Weekday Traffic Volumes near Gates

1 The gate volume counts and **Figure 3–17** show that the mid-day (lunchtime) period also generates a
 2 large percentage of the vehicles. The Town Center area experiences a large amount of traffic volume
 3 during the mid-day period, mostly due to the numerous exercise, recreational, shopping, and eating
 4 establishments located in this area of Fort Lewis.

5 **3.10.2.2 Interstate 5 Volumes**

6 The Washington State Department of Transportation (WSDOT) 2007 Annual Traffic Report shows
 7 that I-5 carries, on average, approximately 111,000 vehicles per day at the DuPont Steilacoom Road
 8 exit (#119). North of the Fort Lewis/North Fort Lewis exit (#120), I-5 carries an estimated average
 9 of 127,000 vehicles per day. Just north of the Thorne Lane exit (#123), I-5 carries, on average,
 10 146,000 vehicles per day. Typically, the average weekday traffic volume on public roadways in
 11 metropolitan areas is approximately 10 times the volume during the afternoon peak hour. Therefore,
 12 during the afternoon peak hour, the volumes on I-5 are estimated to range from 11,000 vehicles at
 13 the south exit (#119) to more than 14,600 vehicles at the north exit (#123) to Fort Lewis. The
 14 Transportation Study Report (Fehr and Peers 2009) provides the WSDOT volume data.

15 **3.10.3 Existing Levels of Service**

16 Level of service (LOS) is a qualitative measure describing operational conditions within a traffic
 17 flow, and the perception of these conditions by drivers or passengers. These conditions include
 18 factors such as speed, delay, travel time, freedom to maneuver, traffic interruptions, comfort,
 19 convenience, and safety. LOSs are given letter designations, from A to F, with LOS A representing
 20 the best operating conditions (free flow, little delay) and LOS F the worst (congestion, long delays).
 21 Generally, LOS A and B are high, LOS C and D are moderate, and LOS E and F are low. **Table 3–**
 22 **10** summarizes the relationship between control delay and LOS for signalized and unsignalized
 23 intersections. At signalized and all-way stop-controlled intersections, LOS is based on the weighted
 24 average control delay of all movements measured in seconds per vehicle. At side-street stop-
 25 controlled intersections, LOS is based on the control delay for each minor movement.

26 **3.10.3.1 Study Intersections**

27 **Table 3–11** shows the existing LOS and average control delay for each study intersection. The LOS
 28 was calculated using the procedures in the Highway Capacity Manual (HCM). The *Synchro*
 29 computer software package, which is consistent with the HCM, was used to analyze all intersections.
 30 For side-street stop-controlled intersections, because two directions are free-flow and the other two
 31 directions are stop-controlled, both the overall intersection LOS and the worst-case stop-controlled
 32 approach LOS are shown and movement delays are provided for both. The Transportation Study
 33 Report (Fehr and Peers 2009) provides the LOS data summary sheets.

34 All study intersections operate at LOS D or better for both the morning and afternoon peak hours,
 35 except one off-Post and one on-Post intersection. Off Post, the side-street northbound movement at
 36 the DuPont Steilacoom Road/East Drive intersection operates at LOS E during the morning peak
 37 hour. During the afternoon peak hour, the same intersection operates at LOS F. On Post, the 41st
 38 Division Drive/Pendleton Avenue operates at LOS E during the afternoon peak hour.

39 The July 2008 Fort Lewis Comprehensive Traffic/Transportation Study indicates that the 41st
 40 Division Drive/Pendleton Avenue intersection operates at LOS E during the mid-day peak hour. This
 41 is most likely because of the retail shopping and restaurants located just to the west of this
 42 intersection, in the Town Center.

Table 3–10 Level of Service Definitions

Level of Service	Description of Traffic Conditions	Average Control Delay Per Vehicle (Seconds)
<i>Signalized Intersections</i>		
A	Insignificant Delays: No approach phase is fully utilized and no vehicle waits longer than one red indication.	≤10
B	Minimal Delays: An occasional approach phase is fully utilized. Drivers begin to feel restricted.	>10-20
C	Acceptable Delays: Major approach phase may become fully utilized. Most drivers feel somewhat restricted.	>20-35
D	Tolerable Delays: Drivers may wait through more than one red indication. Queues may develop but dissipate rapidly, without excessive delays.	>35-55
E	Significant Delays: Volumes approaching capacity. Vehicles may wait through several signal cycles and long vehicle queues form upstream.	>55-80
F	Excessive Delays: Represents conditions at capacity, with extremely long delays. Queues may block upstream intersections.	>80
<i>Unsignalized Intersections</i>		
A	No delay for stop-controlled approaches.	≤10
B	Operations with minor delay.	>10-15
C	Operations with moderate delays.	>15-25
D	Operations with some delays.	>25-35
E	Operations with high delays, and long queues.	>35-50
F	Operation with extreme congestion, with very high delays and long queues unacceptable to most drivers.	>50

Source: Transportation Research Board 2000

1
2

Table 3–11 Level of Service and Vehicle Delay for Study Intersections

Intersection	Traffic Control ¹	AM Peak Hour		PM Peak Hour	
		Delay ²	LOS	Delay ²	LOS
1 41 st Division Drive/Nevada Avenue/Tacoma Avenue	Signal	16	B	44	D
2 41 st Division Drive/Pendleton Avenue	Signal	38	D	50	E
3 I-5 NB Ramps/Barksdale Avenue/Clark Road	Signal	23	C	46	D
4 I-5 SB Ramps/Barksdale Avenue/Clark Road	Signal	12	B	46	D
5 DuPont-Steilacoom Road/Barksdale Avenue/Wilmington Drive	Signal	29	C	29	C
6 DuPont-Steilacoom Road/East Drive	SSSC	7	A	>50	F
		44	E - NB	>50	F - NB
7 North Gate Road/East Drive	AWSC	11	B	34	D
8 41 st Division Drive/A Street	Signal	29	C	35	C

Notes:

1. Signal = signalized, SSSC = side-street stop-controlled, AWSC = all-way stop-controlled, NB = northbound
2. Delay is recorded in seconds per vehicle.

3
4
5
6

The Fort Lewis Comprehensive Traffic/Transportation Study also identified other intersections on or around the Post that are currently operating at LOS E or F:

- West Way/Clark Road (morning and afternoon peak hours)

- 1 • Tacoma Avenue/Pendleton Avenue (morning and afternoon peak hours)
- 2 • N 23rd Street/Pendleton Avenue (afternoon peak hour only)
- 3 • 3rd Division Drive/Pendleton Avenue (morning and afternoon peak hours)
- 4 • N 20th Street/Colorado Avenue (afternoon peak hour only)
- 5 • East Gate Road/SR 507 (afternoon peak hour only)
- 6 • Stryker Avenue/41st Division Drive (afternoon peak hour only)

7 The unsignalized intersections of West Way/Clark Road, Tacoma Avenue/Pendleton Avenue, 3rd
8 Division Drive/Pendleton Avenue, and DuPont Steilacoom Road/East Drive all operate at LOS F for
9 all three peak time periods during an average weekday. Therefore, these are likely the worst
10 operating intersections on or around Fort Lewis.

11 **3.10.3.2 Gate Operations**

12 The LOS and traffic throughput capacity at the Fort Lewis gates are not readily measurable due to
13 the varying level of security maintained at these gates, affecting both the service capacity and extent
14 of delay. The level of security changes with the level of threat and the amount of defense posture
15 needed at these gates. Therefore, gate operations are not only affected by traffic flow, but also by
16 security levels.

17 Fort Lewis DPW staff previously indicated that the Liberty (Main) Gate has the longest delays due to
18 the number of visitors and amount of vehicular traffic. The inbound vehicle queues can sometimes
19 back up to the I-5 ramps, causing traffic congestion and worsening the LOSs.

20 During the morning peak hour, Madigan Gate also experiences heavy traffic congestion. Queues
21 extend back along Jackson Avenue from the gate to the I-5/155th Street SW (Berkeley Avenue SW)/
22 Jackson Avenue interchange. The I-5 southbound off-ramp backs up onto the I-5 main line, with
23 vehicles in the queue generally waiting on the paved shoulder of the freeway. This is an on-going
24 problem during the AM peak hour. The other access gates to Fort Lewis are functioning
25 satisfactorily.

26 **3.10.4 Planned Roadway Improvement Projects**

27 **3.10.4.1 Pierce County**

28 Pierce County's 2009 through 2014 Transportation Improvement Program (TIP) identifies numerous
29 road improvement projects near Fort Lewis, primarily east of the installation in the Spanaway area.
30 The relevant capacity and concurrency improvement projects include:

- 31 • Canyon Road E Widening – from 192nd Street E north to 1,000 feet (305 m) south of 176th
32 Street E. This project would widen the existing roadway to provide additional lanes.
33 Construction is not expected to start before 2014.
- 34 • Canyon Road E Widening – from 172nd Street E north to 160th Street E. This portion of
35 Canyon Road E failed concurrency in 2005 and will be widened to provide additional lanes.
36 Construction for this project is expected in 2011.
- 37 • Canyon Road E Southerly Extension – from 192nd Street E south to 260th Street E. This
38 project will construct a new roadway as part of the new extension of the Canyon Road E

1 corridor. Construction of portions of the extension is expected in 2011. However, completion
2 is not expected before 2014.

- 3 • 176th Street E Widening – from B Street E east to 14th Avenue E. This portion of 176th Street
4 E failed concurrency in 2005 and will be widened to provide additional lanes. Construction
5 for this project could begin sometime in 2012 to 2014.
- 6 • 176th Street E Widening – from 14th Avenue E to Waller Road E. This portion of 176th Street
7 E also failed concurrency in 2005. Widening will provide additional lanes, with construction
8 completion anticipated in 2011.
- 9 • 176th Street E Widening – from Waller Road E to 500 feet (152 m) west of 51st Avenue E.
10 This portion of 176th Street E failed concurrency in 2003. The project will widen the roadway
11 to provide additional lanes, with completion of construction anticipated in 2011.
- 12 • Spanaway Loop Road S – from Military Road S to Tule Lake Road S. This road is expected
13 to fail concurrency in 2012. The project will widen and reconstruct the road to provide
14 additional lanes. Preliminary engineering for this project is expected in 2012 to 2014.

15 Additional Pierce County TIP information can be found on the internet version of the County’s
16 2009-2014 TIP at <http://www.co.pierce.wa.us/xml/abtus/ourorg/pwu/tpp/tip/2009-2014%20TIP.pdf>.

17 **3.10.4.2 Washington State Department of Transportation**

18 Review of the WSDOT website identified the following transportation improvement projects near
19 Fort Lewis:

- 20 • Cross Base Highway (SR 704) – WSDOT and Pierce County are planning a new four-lane
21 limited access east-west highway between I-5 and SR 7. The highway will be 6 miles
22 (10 km) long and will run from the I-5/N Thorne Lane/Murray Road SW interchange to the
23 SR 7/176th Street E intersection. The design of this highway will accommodate future
24 expansion to six lanes. The project will relocate the existing I-5/N Thorne Lane /Murray
25 Road SW interchange 300 feet (91 m) southwest and reconstruct it to accommodate
26 additional traffic and relieve congestion on I-5. The project will also build a connection to a
27 new single lane southbound connector road from Gravelly Lake Drive SW to N Thorne Lane.
28 At the east end of the project, modification to the SR 7/176th Street E intersection will include
29 additional turn lanes. The Cross Base Highway will provide access via three signalized
30 intersections: two in American Lake Gardens and one at Spanaway Loop Road South
31 Extension. At American Lake Gardens, the two intersections will be at 150th Street SW and
32 Woodbrook Road.
- 33 • 150th Street SW will provide access onto Fort Lewis via the Logistics Center Gate. The
34 project will also provide another access onto Fort Lewis at approximately the midpoint of the
35 project, at A Street. On Fort Lewis, a new overpass will be constructed over the Burlington
36 Northern Santa Fe (BNSF) railroad line. Lincoln Road will be realigned to connect to the new
37 A Street access onto the Post, and a new access road between Fort Lewis and McChord AFB
38 will be constructed. The first phase of construction began in 2008 at the Spanaway Loop
39 Road S/176th Street E intersection. Currently, the completion date for the Cross Base
40 Highway project is unknown. It is possible that completion could occur by 2015, the horizon
41 year for this study. An FEIS (dated September 2003) and a ROD (dated July 2004) for this
42 project address the mitigation measures at the impacted Pierce County roads and intersections
43 east of Fort Lewis.
- 44 • Tacoma/Pierce County High Occupancy Vehicle (HOV) Program – This program includes a
45 series of region-wide projects intended to build HOV lanes on I-5, SR 16, and SR 167. These

1 projects will widen the roadways to ease traffic congestion in Tacoma and the metropolitan
2 areas north of Fort Lewis. Design and construction of six funded projects are scheduled for
3 completion by 2016.

- 4 • Tacoma Rail Bypass of Point Defiance – This project will re-route passenger trains, including
5 Amtrak Cascades to a bypass rail line to increase speeds and improve travel time. Most
6 freight trains will continue to use the existing BNSF tracks in the Point Defiance area of
7 Tacoma and along Puget Sound through Tacoma, Steilacoom, and DuPont.

8 Additional information on these WSDOT projects can be found in the Transportation Study Report
9 (Fehr and Peers 2009) or at [http://www.wsdot.wa.gov/projects/?s=county-pierce,funding,location,
10 route#listing](http://www.wsdot.wa.gov/projects/?s=county-pierce,funding,location,route#listing).

11 **3.10.4.3 City of DuPont and Town of Steilacoom**

12 The City of DuPont and the Town of Steilacoom do not have any road improvement projects
13 identified near Fort Lewis.

14 **3.10.4.4 City of Lakewood**

15 The City of Lakewood's Six Year Comprehensive TIP 2009-2014, identified one road improvement
16 project near Fort Lewis. This project, on Union Avenue from Berkeley Street SW to N Thorne Lane,
17 will widen the street to add a two-way left-turn lane, bicycle lanes, sidewalks, and street lighting.
18 The expected year of completion for this project is 2014.

19 **3.11 SOCIOECONOMICS**

20 This section describes the affected environment for the following:

- 21 • demographics
- 22 • housing
- 23 • economic development
- 24 • public finance
- 25 • quality of life
- 26 • environmental justice in minority and low-income populations
- 27 • protection of children from environmental health risks and safety risks

28 The ROI for Fort Lewis comprises Pierce and Thurston counties. Fort Lewis, in which most of the
29 construction activity would occur and where all new personnel and civilian employees would be
30 located, is located entirely within Pierce County. The City of Tacoma is located north of the
31 installation; the cities of Lacey and Olympia are located to the south. The counties of Pierce and
32 Thurston represent the functional economic region for Fort Lewis.

33 **3.11.1 Demographics**

34 **3.11.1.1 Region of Influence**

35 The estimated population of the ROI totaled 1,050,700 in April 2008, an increase of more than
36 15.6 percent since 2000 (Washington Office of Financial Management 2008a). Several large
37 communities are located in the ROI: the City of Tacoma, located north of Fort Lewis, with an
38 estimated 2008 population of 202,700; the City of Olympia, located to the west-southwest of Fort
39 Lewis with an estimated 2008 population of 44,800; and the City of Lacey, located west-southwest
40 of Fort Lewis, with a 2008 population of approximately 38,040 residents (Washington Office of

1 Financial Management 2008a). The total Fort Lewis-related population (civilian and military) in FY
2 2009 was approximately 104,012 (Piek 2009).

3 More than 10,200 civilian workers are employed at Fort Lewis (Vista Technology Services 2008).
4 Assuming each is a head of household, this would represent a population of approximately 26,520
5 persons (applying an average household size of 2.6 as contained in the 2000 Census). The 31,350
6 active duty military personnel are accompanied by approximately 46,142 Family members, which
7 results in a total connected population of about 77,492 persons (Vista Technology Services 2008), or
8 approximately 7.4 percent of the entire 2008 population of the ROI.

9 **3.11.2 Housing**

10 **3.11.2.1 On-Post**

11 Fort Lewis has on-Post housing units for both unaccompanied and accompanied personnel. There are
12 currently 3,492 family housing units of various types for accompanied Soldiers.

13 According to the 2007 Joint Housing Market Analysis, there is a validated on-Post housing
14 requirement for 6,093 family housing units by 2012 (Robert D. Niehaus, Inc. [RDN] 2008). With a
15 current inventory of 3,492 family housing units, a serious housing deficiency exists on-Post that will
16 continue to grow during the next 5 years. The analysis anticipates that another 2,601 units will be
17 needed by 2012.

18 Unaccompanied personnel are accommodated in barracks that collectively provide 11,821 spaces.
19 Several projects are planned or underway to provide more billeting for unaccompanied Soldiers. By
20 2013, an additional 1,743 barracks spaces must be available at Fort Lewis (RDN 2008).

21 **3.11.2.2 Off-Post**

22 An estimated 370,306 housing units are located in the ROI (RDN 2008). The proportion of owner-
23 occupied housing units is 62.2 percent.

24 The off-Post population in the Fort Lewis market area (within a 20-mile (32 km) commute of the
25 installation's main work areas) is estimated at 901,488 persons, having increased at an average rate
26 of 1.7 percent per year since 2000; population growth increased at an average rate of 1.9 percent per
27 year from 1990 to 2000. The annual growth rate is projected to continue to slow to 1.4 percent
28 through 2012, resulting in an estimated population of 966,384 in 2012.

29 Vacancy rates and rentals in all areas within the ROI are fairly stable through time. The rental
30 vacancy rate was estimated to be 5.4 percent in 2007; which is lower than observed in 1990 and 2000
31 (RDN 2008). Of the overall rental housing stock, 30.9 percent is considered substandard and
32 28.8 percent of the non-mobile home rental inventory is classified as unsuitable by DoD criteria.

33 The increase in military personnel at Fort Lewis would lead to declining vacancy rates during the
34 next 5 years; vacancy rates for 2013 are projected to be 5.3 percent in the rental market.

35 **3.11.3 Economic Development**

36 Characteristics of economic development include employment and its distribution across industrial
37 sectors, unemployment, earnings and sources of income, and the contribution made to the regional
38 economy by the military installations, their personnel, and retired service members.

1 **3.11.3.1 Employment**

2 In 2006, more than 3.8 million jobs in existed in the State of Washington, of which about 146,380
3 were military and federal/civilian jobs (Bureau of Economic Analysis 2008a).

4 More than 374,000 people were employed in the ROI in 2007, 73.4 percent of whom worked in
5 Pierce County (Bureau of Labor Statistics 2008). In Pierce County, the largest share of employment
6 is concentrated in the health care industry, with 12.5 percent of jobs. Local government employed
7 12.1 percent, the retail trade sector employed 11.9 percent, and construction accounted for an
8 8.6 percent of workers (Washington Department of Employment Security 2008). The largest
9 employer in Pierce County is the Fort Lewis installation (Economic Development Board for
10 Tacoma-Pierce County 2008).

11 The unemployment rate in both counties of the ROI gradually increased from lows of between
12 4.6 percent in Thurston County and 5 percent in Pierce County to an average 5.3 percent for the first
13 11 months of 2008 in Thurston County and 5.4 percent in Pierce County (Bureau of Labor Statistics
14 2008).

15 **3.11.3.2 Earnings and Income**

16 Total non-farm wage and salary earnings in the ROI totaled just more than \$35 billion in 2006,
17 approximately 76 percent of which was contributed by Pierce County (Bureau of Economic Analysis
18 2008b). The contribution to total earnings by the military sector is higher in Pierce County
19 (approximately 9.8 percent) compared to 2.4 percent for the state and 0.4 percent for Thurston
20 County.

21 Two major military installations are located within the ROI: Fort Lewis and McChord AFB. These
22 installations are important to the health and stability of the regional economy and support businesses
23 and jobs through: 1) payroll expenditures by military and civilian personnel, 2) direct procurement of
24 goods and services by the installations for operations and maintenance functions, and 3) government
25 contract awards to private firms located in the region.

26 **3.11.3.2.1 Payroll**

27 Personal income associated with the military totaled \$2.66 billion in 2006 in Pierce and Thurston
28 Counties (Bureau of Economic Analysis 2008b). Wages paid to personnel (active duty and civilian)
29 at Fort Lewis totaled more than \$2.02 billion in 2007 (Piek 2009).

30 **3.11.3.2.2 Procurements**

31 Expenditures on grants and contracts by the installation can vary measurably from year to year. The
32 value of grants and contracts let by the Army in FY 2006 in Pierce and Thurston counties, as
33 reported by the DoD, was \$453.3 million (DoD 2008). The large majority (greater than 99 percent)
34 of DoD prime contracts awarded to firms in the ROI have been made to companies located in Pierce
35 County; these account for approximately 9.4 percent of all DoD awards statewide. The value of
36 prime contract awards from the Army in Pierce County totaled more than \$449 million in FY 2006
37 (DoD 2008).

38 In 2007, expenditures at Fort Lewis that had the greatest effect on the local economy (after earnings
39 paid to personnel) were contracts, services, and construction; military construction, and federal
40 impact aid funding. During 2007, contracts, services, and construction accounted for approximately

1 \$336.3 million in expenditures and military construction accounted for approximately \$312 million.
 2 Federal impact aid funding accounted for another \$13 million in expenditures at Fort Lewis.

3 **3.11.3.2.3 Multiplier Effects**

4 The injection of funds into a regional economy has what is referred to as a direct effect. This
 5 spending creates a demand for goods and services that, in turn, increases output and employment in
 6 numerous support industries. This is referred to as the induced effect, and the link between the two is
 7 the multiplier effect.

8 **3.11.3.3 Public Finance**

9 The primary sources of revenue for Pierce and Thurston counties are: 1) sales taxes, 2) property
 10 taxes, 3) transfers from the state government, and 4) transfers from the federal government. In 2008,
 11 property taxes and intergovernmental transfers are the largest sources of revenue for both counties
 12 (Pierce County 2008, Thurston County 2007). Property taxes accounted for 19.2 percent of Pierce
 13 County’s revenue 22.7 percent of Thurston County’s 2008 revenue. Intergovernmental transfers
 14 accounted for 21.6 percent of Pierce County’s revenue 11.3 percent of Thurston County’s 2008
 15 revenue. Charges for services and fees make up 14.9 percent of Pierce County’s revenues and
 16 12 percent of Thurston County’s revenues (Pierce County 2008, Thurston County 2007).

17 The major operating expenditure categories for the counties are: 1) public safety, 2) health and social
 18 services, 3) utilities, 4) capital expenditures, and 5) transportation. The provision of health and social
 19 services consumes approximately 14 percent of operating expenditures in Pierce County and
 20 21 percent in Thurston County. Expenditures on public safety comprise approximately 19 percent of
 21 the operating expenditures for each county (Pierce County 2008, Thurston County 2007).

22 **3.11.4 Quality of Life**

23 **3.11.4.1 On-Post**

24 Numerous facilities and services located on Fort Lewis contribute to the quality of life of on-Post
 25 residents and military personnel and their families residing off-Post.

26 **3.11.4.1.1 Child Care**

27 Childcare programs at Fort Lewis are available for children ages 6 weeks to 12 years. These services
 28 are provided at five on-Post centers and in Family Child Care Homes. **Table 3–12** summarizes the
 29 current enrollment in Fort Lewis’ childcare programs.

30 **Table 3–12 Summary of Current Enrollment in Fort Lewis Childcare Programs**

Facility	Enrollment
Clarkmoor Child Development Center	248
Clarkmoor Hourly Child Development Center	92
Madigan Child Development Center	247
Madigan Infant and Toddler Development Center	56
Beachwood Child Development Center	269
Family Child Care Homes	400

31

1 Before and after school care for school-aged children is provided by the School Aged Services (SAS)
 2 program located at the North Fort SAS Complex. In the North Fort Outback School Age Center, 105
 3 first graders are enrolled; 225 second through fifth graders are enrolled. Approximately 60 sixth
 4 through eighth graders are enrolled in the Teen Zone program.

5 Between 2009 and 2011, seven additional child and student care facilities are slated for construction,
 6 and three existing facilities will be expanded. **Table 3–13** summarizes the increases in enrollment
 7 projected with the new and expanded facilities.

8 **Table 3–13 Summary of Planned Future Childcare Programs, 2009–2011**

Facility	Future Enrollment
MAMC Warrior Hourly Care Center	45
Cascade School Age Center	195
SKIES Center	135
North Fort Child Development Center	144
Hillside Child Development Center	232
Hillside Youth Center	140
Clarkmoor, Madigan, and Beachwood Child Development Centers ¹	180
Madigan 24/7 Child Development Home	20

Note:

1. These child development centers will be expanded to accommodate the additional children.

9
 10 **3.11.4.1.2 Health Care**

11 MAMC has a 204-bed capacity (that can be expanded to 318 during a disaster) and houses 14
 12 operating rooms and 15 x-ray rooms. MAMC contains outpatient clinics specializing in family
 13 medicine, internal medicine, and pediatrics. MAMC provides services to Soldiers, retirees, and their
 14 Families. Care is supplemented by dental clinics, veterinary services, and other medical offerings
 15 (e.g., blood bank, mental health).

16 MAMC houses 492 doctors, 475 registered nurses, 192 licensed practical nurses, and more than 120
 17 residents and interns. MAMC hosts 19 residency programs and 8 fellowship programs. MAMC
 18 averages 3,882 outpatient clinic visits, 35 inpatient admissions, and 185 emergency room visits per
 19 day.

20 **3.11.4.1.3 Public Schools**

21 In addition to operating the public schools in the City of Lakewood (immediately adjacent to Fort
 22 Lewis), the Cloverpark School District operates the schools on Fort Lewis and McChord AFB. There
 23 are 25 schools within the Cloverpark School District. Most of the enrollment in the on-Post schools
 24 comes from on-Post and off-Post military dependents. Middle school students residing on-Post are
 25 bused to either Woodbrook or Mann middle schools; high school students residing on-Post are bused
 26 to Lakes High School. In 2008, the five on-Post elementary schools were over-subscribed with 2,744
 27 students enrolled in buildings that have a capital capacity of 2,543.

28 **3.11.4.1.4 Other Facilities**

29 There are a number of additional on-Post facilities that contribute to the quality of life for Soldiers
 30 and their Families. They include a PX and Commissary, recreational facilities, chapel, mini-mall,
 31 Golf Course, and various other support facilities.

1 **3.11.4.2 Off-Post**

2 The communities that surround Fort Lewis provide numerous recreational, medical, retail, food, and
3 other community services and facilities. Of the wide array of off-Post services and facilities, public
4 schools are highly important.

5 **3.11.4.2.1 Community Public Schools**

6 There are 23 school districts in the ROI, with a total combined student enrollment of 239,164 in 2008
7 (Washington Superintendent of Public Instruction 2008).

8 Personnel assigned to Fort Lewis may reside throughout the ROI, and their children make up
9 noticeable portions of the student membership in some school districts. There can be substantial
10 fiscal implications for school districts that have a high proportion of their student members residing
11 on military installations.

12 School districts rely on several funding sources, especially local property tax assessments, funds
13 from the state, and federal funds. Because military installations are exempt from local taxes, local
14 school districts are eligible for federal impact aid funds. These payments are designed to offset the
15 potential loss of property tax payments to affected school districts. The impact aid received is highly
16 weighted in proportion to the students who reside on the military installations instead of in the
17 communities.

18 The number of federally connected students, primarily the children of military and appropriated fund
19 civilian personnel in this area, is highly concentrated in the Cloverpark School District, which serves
20 the off-Post area immediately adjacent to Fort Lewis and operates the on-Post schools. For 2008, the
21 Cloverpark School District’s average daily attendance was 11,229, of which 4,086 (36 percent)
22 consisted of federally connected students (National Association of Federally Impacted Schools
23 2008).

24 Smaller, yet noticeable, concentrations are evident in the Steilacoom Historical School District
25 (17 percent of average daily attendance) and Yelm School District (7 percent of average daily
26 attendance). Although the share of average daily attendance that federally connected students
27 comprise is noticeable, the impact aid contribution to the budget in these two school districts is small
28 (4 percent for the Steilacoom Historical School District and less than 1 percent for Yelm School
29 District). This is explained by the fact that the great majority of the enrolled students reside in the
30 communities and not on Post; thus, less impact aid is directed to these school districts.

31 **3.11.5 Environmental Justice**

32 EO 12898, “Federal Actions to Address Environmental Justice in Minority Populations and Low-
33 Income Populations,” requires each federal agency to identify and address any disproportionately
34 high and adverse environmental or economic effects that its programs and policies might have on
35 minority or low income populations. CEQ defines minorities as members of the following population
36 groups: American Indian or Alaskan Native, Asian or Pacific Islander, or Black or African American
37 (CEQ 1997). A minority population should be identified where the minority population of the
38 affected area either exceeds 50 percent or is meaningfully greater than the minority population
39 percentage in the general population.

40 Minority populations within the ROI comprise approximately 24 percent of the overall population in
41 Pierce County and 16.6 percent of the overall population in Thurston County (U.S. Census Bureau
42 2000). The populations of the census tracts including and immediately adjacent to Fort Lewis have a

1 higher percentage of minority population than across the ROI as a whole. The proportion of minority
2 population, however, was less than CEQ’s 50-percent threshold. Fort Lewis’ residential population,
3 as with other military populations, contributes to that higher minority percentage in the immediate
4 area of the Post. Of the total U.S. Military population, 37.5 percent of active duty members identify
5 themselves as minorities (Army 2007a).

6 Low-income populations are identified using the Census Bureau’s statistical poverty threshold,
7 which varies by household size and number of children. For example, the poverty threshold for a
8 family of four with two children was \$17,463 in 2000 and rose to \$21,200 by 2008 (Department of
9 Health and Human Services 2008). Nationwide, the proportion of people in poverty was 11.3 percent
10 in 2000 and 12.5 percent in 2007. Pierce and Thurston counties have poverty levels below
11 20 percent: Pierce County poverty level is estimated at 11.4 percent for the years 2005 through 2007
12 and Thurston County’s poverty level is estimated at 10.6 percent during the same period.

13 The Census Bureau defines a “poverty area” as a census tract or block numbering area where 20
14 percent or more of the residents have incomes below the poverty threshold (U.S. Census Bureau
15 2008c). The 2000 Census indicates that there were no “poverty areas” in Thurston County; however,
16 21 of 158 Census tracts in Pierce County met the definition of a “poverty area” (U.S. Census Bureau
17 2000).

18 **3.11.6 Protection of Children**

19 EO 13045, “Protection of Children from Environmental Health Risks and Safety Risks,” seeks to
20 protect children from disproportionately incurring environmental health or safety risks that might
21 arise from government policies, programs, activities, and standards.

22 Children are present on Fort Lewis in many settings, including family housing neighborhoods,
23 elementary schools, day care centers, and recreational areas. During the 2007 through 2008 school
24 year, 2,441 school-aged children were enrolled in the public schools on Fort Lewis.

25 **3.12 HAZARDOUS MATERIALS AND WASTES**

26 During public scoping, the public expressed concerns regarding the effects on the environment from
27 a potential release of hazardous/toxic chemicals during operations or because of an accident at Fort
28 Lewis. The ROI for the management of solid wastes and hazardous materials and wastes is the Army
29 installation where the proposed activities would occur. Solid waste management and the storage, use
30 and transport of hazardous materials and disposal of hazardous wastes at Fort Lewis are conducted in
31 compliance with all applicable regulations. Specific regulations generally govern the use and storage
32 of hazardous materials and disposal of hazardous wastes. In addition, the Fort Lewis Environmental
33 Management Manual was developed as the part of an overall Environmental Management System
34 (EMS) with the goal of full conformance with the International Organization for Standardization
35 (ISO) 14001 standards by FY 2009. The EMS addresses organizational structure, planning activities,
36 responsibilities, practices, procedures, processes, and resources for developing, implementing,
37 achieving, reviewing, and maintaining environmental policy. Finally, Fort Lewis complies with EOs
38 and all federal and state laws, regulations, and requirements in its waste management efforts.

39 **3.12.1 Solid Waste**

40 Army solid waste policy is based on the concept of Integrated Solid Waste Management (ISWM)
41 planning and development of an ISWM Plan. The ISWM Plan is designed to minimize the initial
42 input into the waste stream. The Fort Lewis Environmental Division (ED) coordinates solid waste
43 management and planning with DPW, Directorate of Family and Morale, Welfare and Recreation

1 (DFMWR), DRMO, Army Contracting Agency, Fort Lewis Resource Management Office (RMO),
2 MAMC, Residential Communities Office (RCO), and other installation organizations, tenants, and
3 activities as required. Fort Lewis' solid waste management program includes separate operations for
4 collection and disposal of municipal solid waste, construction and demolition waste, and regulated
5 medical waste. Non-hazardous solid waste is landfilled off-Post only or recycled. The Army has
6 mandated goals regarding waste reduction and recycling, including a requirement to divert at least
7 50 percent of construction and demolition waste and 40 percent of other non-hazardous solid waste
8 by 2010.

9 Waste varies from common household to commercial and industrial sources. Approximately
10 12,864 tons (11,670 metric tons) of solid waste were generated at Fort Lewis in 2007, more than
11 one-third of which (4,511 tons [4,090 metric tons]) was recycled (Army 2008b). Non-hazardous
12 solid waste is landfilled, either on- or off-Post, or recycled. Waste generated on Fort Lewis is
13 collected by a private contract provider, and taken to the 304th Landfill in Graham, Washington for
14 disposal. Until 2003, a small portion of the municipal solid waste generated on Fort Lewis was
15 disposed of in a landfill on North Fort Lewis (cell No. 6 in Landfill No. 5); this landfill is now
16 closed.

17 In April 2007, Fort Lewis opened a new, permanent recycling center. Since the opening, recycling
18 has increased 20 percent. The facility also includes space for on-site training and education. Since
19 the Recycle Center opened, it has had a recorded use of up to 140 customers per day. The new
20 facility has six bays used to off-load heavy items such as recyclable wood, commercial refuse, and
21 yard waste.

22 Fort Lewis is in the process of developing a plan to implement a Qualified Recycling Program
23 (QRP) to further improve recycling activities installation-wide. Department of Defense Instructions
24 (DoDI) 4715.4 outlines the requirements for the new QRP at Fort Lewis that will eventually end up
25 serving both the environment and the financial bottom line.

26 Construction and demolition debris are also being recycled at Fort Lewis. In just 2 years, Fort Lewis
27 diverted for reuse more than 20,000 tons (18,000 metric tons) of waste concrete, asphalt, and
28 masonry generated at construction and demolition projects (Army 2008a). In FY 2007, Fort Lewis
29 converted 28,253 tons (25,630 metric tons) of concrete and 8,417 tons (7,636 metric tons) of asphalt
30 into an aggregate product for reuse in construction, road maintenance, and repair. As a result, Fort
31 Lewis saved \$220,020 in disposal costs and approximately \$366,700 in cost avoidance for
32 purchasing new materials (Army 2008a). Crushed concrete is used for road and parking lot
33 applications as well as filler for sidewalk improvements. Recycled asphalt is mainly used for tactical
34 vehicle trail surfacing as a road binder and dust palliative. This program is now an established
35 business practice, with \$60,000 per year allocated for crushing waste concrete and asphalt.

36 In 2006, Fort Lewis and the U.S. Army Corps of Engineers (Seattle District) replaced the traditional
37 approach to facility removal (by crush and haul techniques) with a combination of deconstruction
38 and material diversion. In the installation's first application of this new technique, 12 World War II-
39 era wood buildings were removed rather than demolished, achieving 100 percent diversion of non-
40 hazardous solid waste through reuse and recycling. Combined, the buildings covered 48,000 square
41 feet (SF). Subcontractors recovered 215 tons (195 metric tons) of structural and non-structural
42 materials for resale in local markets (Army 2008a). Material such as lumber, flooring, trusses,
43 porcelain bathroom fixtures, aluminum, steel, brick, and siding were segregated on site before
44 transport to reuse markets. The total estimated value of these products is \$207,000. Additionally,
45 some of the products were reused for repair and improvements to training facilities, as well as for
46 beautification projects around the Post. This project earned the 2006 Washington State Recycling

1 Association Recycler of the Year Award and the 2006 Secretary of the Army Environmental Award
2 for Pollution Prevention (Army 2008a).

3 Sewage sludge is another solid waste generated at Fort Lewis. The two primary means of managing
4 sewage sludge at the Solo Point Wastewater Treatment Plant are on-site composting/treatment and
5 off-site land application. The preferred method of sewage sludge management at Fort Lewis is
6 composting/treatment. Currently, Fort Lewis is able to compost/treat a limited quantity of the total
7 sewage sludge generated. The main benefit of on-site composting versus off-site land application is
8 the elimination of contamination and potential clean-up liability. Composting of sewage sludge
9 results in compost that can be used at Fort Lewis with a resulting cost benefit. Composting also
10 achieves the installation sustainability goal of “zero net waste” with respect to sewage sludge.

11 **3.12.2 Hazardous Materials and Wastes**

12 Units and activities at Fort Lewis typically use hazardous materials such as fuels, paints, solvents,
13 lubricants, coolants, sealers, adhesives, refrigerants, compressed gases, batteries, cleaners, and
14 sanitation chemicals. Hazardous materials also include munitions; pesticides and herbicides;
15 petroleum, oils, and lubricants (POLs); and petroleum storage tanks. In accordance with the
16 Pollution Prevention Act (PPA) and Emergency Planning and Community Right-to-Know Act
17 (EPCRA), source reduction, recycling, and treatment activities involving EPCRA Section 313
18 chemicals must be reported on Toxic Release Inventory (TRI) Form R. EPCRA Section 311 requires
19 that facilities with chemicals stored above certain quantities must submit either copies of their
20 material safety data sheets (MSDSs) or a list of MSDS chemicals. EPCRA Section 312 requires
21 submission of an annual inventory report (Tier II report) for the same chemicals to the State
22 Emergency Response Commission, Local Emergency Planning Committee, and local fire department.

23 Hazardous waste is generated because of facility and equipment maintenance, medical care
24 activities, Soldier training, and motorpool maintenance operations. Hazardous wastes generated at
25 Fort Lewis include medical and biohazardous waste; asbestos; lead-based paint (LBP); and
26 polychlorinated biphenyls (PCBs). The management of hazardous waste at Fort Lewis is
27 accomplished by using a centralized bar-coded container tracking system. This system monitors all
28 waste from generation through disposal. This centralized approach includes technical specialists
29 within DPW that assist units and activities with Resource Conservation and Recovery Act (RCRA)
30 compliance and provide transport of all hazardous waste generated within the installation to the
31 conforming storage facility. Fort Lewis operates as a state and federally permitted large quantity
32 hazardous waste generator (RCRA ID# WA92 14053465). Fort Lewis currently operates 418
33 individual hazardous waste accumulation points located throughout the installation. Hazardous
34 wastes are directed to the installation’s storage facility. Contract services are used to collect, recycle,
35 and/or dispose of hazardous wastes off site. During FY 2007, a total of 415,300 pounds (188,400 kg)
36 of hazardous waste were generated on Fort Lewis (Smith 2009).

37 Specific regulations generally govern the use, storage, and transport of hazardous materials, and
38 disposal of hazardous wastes. Management of hazardous materials and wastes at Fort Lewis
39 continues to follow Army, federal, and state regulations in order to minimize potential impacts to
40 human health or the environment. AR 200–1 governs all aspects of managing hazardous materials
41 and regulated waste by military or civilian personnel and on-Post tenants and contractors at all Army
42 facilities.

43 Programs used to manage hazardous materials and wastes at Fort Lewis include IRP, Military
44 Munitions Response Program (MMRP), and Compliance-Related Cleanup (CC). Fort Lewis has
45 several plans in place to help manage hazardous materials and waste including a Pollution

1 Prevention (P2) Plan; Installation Contingency Plan (ICP); Facility Response Plan (FRP); Integrated
2 Pest Management Plan (IPMP); Hazardous Material Management Plan (HMMP); and Ozone
3 Depleting Chemical Management Plan.

4 As outlined in Army Pamphlet 710–7 and the HMMP, Fort Lewis implements centralized hazardous
5 materials management. Fort Lewis mandates the use of a Hazardous Materials Control Center
6 (HMCC) to manage the purchase, storage, use, and recovery of hazardous materials. The HMCC
7 controls procurement through the Authorized Use Lists (AULs), the Restricted Use List (RUL), and
8 signature cards (Army Form 1687). The AUL and the RUL limit and reduce hazardous material use
9 and substitute more environmentally preferable less toxic products. The signature cards identify
10 personnel who are authorized to order, turn-in, and/or receive hazardous materials.

11 The Installation AUL lists all the hazardous materials authorized for general purchase on Fort Lewis.
12 In addition, certain units have received Unit-specific AULs from the Pollution Prevention Program.
13 Unit-specific AULs list specialized hazardous materials that a specific unit is authorized to use in
14 addition to the hazardous materials on the Installation AUL. Purchasers can only order and use
15 hazardous materials on the Installation AUL or their Unit-specific AUL.

16 There is also a Fort Lewis RUL issued by the Pollution Prevention Program. This list is periodically
17 updated and includes various chemicals that are restricted from use on Fort Lewis. These chemicals
18 include ozone-depleting compounds, banned and severely restricted pesticides, persistent
19 bioaccumulative toxic (PBT) chemicals, and other chemicals of concern. Use of a product with a
20 restricted chemical requires written approval from the Pollution Prevention Program.

21 Fort Lewis also has a new product review procedure in which products new to Fort Lewis undergo a
22 health, safety, and environmental review before being authorized for use. This is coordinated by the
23 Pollution Prevention Program.

24 The HMCC supplies facilities ranging in size from major industrial sites to individual motor pools.
25 The HMCC serves a portion of every directorate and major subordinate command at 220 sites,
26 providing centralized management and visibility of all hazardous materials stored and used on the
27 installation. Delivery service started in 2003 and they assist in supporting the Pollution Prevention
28 Environmental Advisors with the collection and transport of unused hazardous materials that qualify
29 for entry into the Re-Issue Program and reduce costly waste disposal fees through redistribution to
30 other organizations. For example, the availability of products entered through the Re-Issue Program
31 resulted in a procurement cost avoidance of \$413,826 and a waste disposal cost avoidance of
32 \$542,986, for a total savings of \$956,812 in 2008.

33 Delivery service has been the key to the success of the HMCC material disposition program that now
34 serves 85 percent of Fort Lewis customers and 50 percent of McChord AFB customers (Army
35 2008a). The HMCC will expand the delivery program with two additional drivers and trucks to
36 provide delivery service to all of Fort Lewis, McChord, MAMC, and Camp Murray.

37 Per EO 13423 guidance, Fort Lewis is in the process of developing a plan to implement a Green
38 Procurement Program (GPP) to maximize the use of environmentally preferable products, such as
39 the use of less toxic materials, and to reduce waste generation. The DoD Green Procurement Strategy
40 and Army Green Procurement Guide outline the requirements for GPPs at Army installations.

41 The P2 plan encompasses activities that reduce the quantity of hazardous, toxic, or industrial
42 pollutants at the source by changing production, industrial, or other waste-generating processes. The
43 goal is to reduce the generation of hazardous wastes by significantly reducing the use of products

1 containing hazardous material compounds. EOs, Army regulations, and state environmental laws
2 have been enacted to provide the method and means by which federal facilities will prevent pollution
3 and reduce wastes. Fort Lewis developed a P2 Plan in 1993, with the objectives of minimizing
4 environmental impacts associated with facility operation, protecting human health from exposure to
5 harmful hazardous substances, and reducing hazardous substance use and hazardous waste
6 generation (Army 2008a). The P2 plan addresses hazardous substances listed in the Superfund
7 Amendments, RCRA, Solid Waste Amendments, and the Washington Department of Ecology’s
8 Dangerous Waste regulations. The plan is updated annually to address changes in use of hazardous
9 materials on the installation and to comply with the state-required P2 plan process.

10 The Fort Lewis ICP establishes procedures, responsibilities, and resources for the emergency
11 response to accidental spills or releases of hazardous substances. FRPs are prepared for sites that
12 have the potential to harm the environment substantially from release of significant quantities of
13 petroleum, oils, or lubricants to surface waters supporting fish and wildlife, groundwater providing
14 drinking water, and navigable waters of the United States. These plans are incorporated into one
15 document identified as the Integrated Contingency Plan at Fort Lewis.

16 **3.12.3 Munitions, Ranges, and Unexploded Ordnance**

17 Ammunition, live fire, and UXO are of concern principally in TAs and ranges. Training exercises
18 and testing activities at Fort Lewis expend a variety of ordnance. Ordnance is expended in a variety
19 of grenades, mortars, howitzers, artillery, rockets, and missiles during training exercises and testing
20 activities. DoD 6055.9–STD, *DoD Ammunition and Explosives Safety Standards*, defines UXO as
21 “explosive ordnance that has been primed, fused, armed, or otherwise prepared for action, and that
22 has been fired, dropped, launched, projected, or placed in such a manner as to constitute a hazard to
23 operations, installations, personnel, or material and remains unexploded either by malfunction or
24 design or for any other cause” (AP1.1.1.95). Grenades, mortars, and artillery weapons used in live-
25 fire training can produce UXO. Expended ammunition, although inert as an explosive, may
26 constitute a hazardous material, such as lead contamination. Soils with lead contamination may be
27 found at gun and artillery practice ranges where lead munitions are used.

28 Ordnance impact areas and buffer zones are off limits to unauthorized personnel. In addition, impact
29 areas are posted with warning signs indicating the potential risks of UXO in the impact area.
30 Although most UXO is found in designated impact and dud areas, which are well delineated and
31 easily recognizable, UXO is routinely encountered outside these areas on the installation. The Fort
32 Lewis explosives ordnance disposal (EOD) unit eliminates explosives hazards on ranges by
33 detonation of UXO in place, or, if safe to do so, by removing the hazard to the EOD range and
34 detonating it there.

35 **3.12.4 Biohazardous Wastes**

36 Medical wastes include wastes generated by hospitals, clinics, physicians’ offices, dental offices,
37 veterinary facilities, and other medical laboratories and research facilities. Biohazardous waste can
38 typically include human blood and blood products, cultures and stocks of infectious agents and
39 associated biological wastes, isolation wastes, contaminated and unused sharps, animal carcasses,
40 contaminated bedding material, and pathological wastes.

41 The Army follows the MEDCOM 40–35 Management of Regulated Medical Waste guidelines for
42 the handling, use, and disposal of biohazardous wastes. All biohazardous waste is managed under the
43 national contract with Stericycle. Other infectious waste is sterilized before being shipped to a
44 landfill (Army 2005c).

1 **3.12.5 Pesticides and Herbicides**

2 Pesticides and herbicides are required for insect and rodent control and for the control of unwanted
3 vegetation, including noxious weeds. Pest management on Fort Lewis is guided by the Fort Lewis
4 IPMP developed in 2006. As mandated by AR 200–1, this plan is a comprehensive document that
5 outlines the organization and implementation of all pest control procedures on Fort Lewis.

6 **3.12.6 Asbestos, Lead-Based Paint, and Polychlorinated Biphenyls**

7 Asbestos is a substance known to cause lung disease. Construction, demolition, or renovation of
8 facilities may expose asbestos-containing material or LBP. In addition, during activities such as site
9 scarification and grubbing, underground piping that contains asbestos may surface (Van Hoesen
10 2009a). When a building renovation, repair, or demolition project is planned, a detailed asbestos
11 survey must be performed so that asbestos-containing materials are properly managed. Fort Lewis
12 DPW presumes that asbestos is present in any building constructed before 1985. Such buildings
13 include the credit union, mini-mall, Popeye’s, and the roller rink. Even in the late 1980s and 1990s,
14 after asbestos was banned in most building materials, small amounts of asbestos were still used in
15 adhesives, glues, and roofing materials. Consequently, asbestos is potentially present in many
16 buildings at Fort Lewis. Asbestos regulations stipulate that buildings are assumed to contain asbestos
17 until proven otherwise, and relatively few of the buildings on the installation have been tested.
18 Asbestos testing at the bowling alley revealed that the substance is present in the building, and a
19 partial demolition and renovation has been scheduled to address the issue.

20 Lead, a heavy metal that is harmful to human health, may also be present in paints used in some
21 buildings in the project site. Before 1978, LBPs were used extensively in homes and other structures,
22 including those on Fort Lewis. Buildings constructed before 1978 are assumed to contain LBPs
23 unless lead testing has proven otherwise. The credit union and mini-mall were constructed before
24 1978 and may contain lead-based paints.

25 There are no federally regulated PCBs at Fort Lewis (Smith 2009). All transformers that formerly
26 contained PCBs have been drained and mineral oil was used to replace the PCBs. Some light fixture
27 ballasts and communications equipment may still contain state-regulated PCBs (Smith 2009).

28 **3.12.7 Radon and Low-Level Radioactive Waste**

29 Based on a radon survey completed at Fort Lewis in 1998, radon mitigation systems were installed
30 until funding ran out. The mitigation involved reducing the levels of radon gas below the EPA-
31 recommended level of 4 picocuries per liter. The Family housing units identified as having radon in
32 excess of the EPA-recommended level had mitigation systems installed before privatization of the
33 housing (Rosacrans 2009). The remaining high-radon buildings will be mitigated when funding
34 becomes available.

35 Small amounts of low-level radioactive waste are generated at Fort Lewis. The use of radioisotopes
36 for medical purposes generates short-lived (half-life less than 90 days), low-level waste. Low-level
37 radioactive waste is also generated from commodity items such as unusable compasses, dials,
38 targeting devices, gauges, rocket sights, and chemical weapons detection equipment. These wastes
39 include the radioactive isotopes tritium (H3), thorium 232, radium 226, americium 241, nickel 63,
40 promethium 141, cesium 137, cobalt 60, and strontium 90. Current Army policy prohibits the use of
41 depleted uranium (DU) ammunition for training worldwide (AR 385–62). The Installation Safety
42 Office manages low-level radioactive materials program and MAMC manages the low-level
43 radioactive medicine program.

1 **3.12.8 Hazardous Waste Spills and Contaminated Sites**

2 POLs are used at Fort Lewis, including engine fuels (gasoline and diesel), motor oils and lubricants,
3 and diesel and kerosene heating fuels. All underground and aboveground storage tanks are managed
4 in conformance with applicable federal, state, and Army regulations. Fort Lewis has several plans in
5 place to help manage POLs and other hazardous materials. These include the P2 and Integrated
6 Contingency Plan plans that specify the proper storage, handling, and transport of hazardous
7 materials; spill prevention procedures; and procedures to follow in the case of a spill or other
8 accident. They also include the Spill Prevention, Countermeasure, and Control Plan (SPCCP).

9 The IRP is an ongoing DoD-administered program for identifying, evaluating, and remediating
10 contaminated sites on federal lands under DoD control. The program was implemented in response
11 to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)
12 requirements to remediate sites that posed a health threat. Section 211 of the Superfund Amendments
13 Reauthorization Act (SARA) amended CERCLA and established the Defense Environmental
14 Restoration Program (DERP), through which DoD funds and conducts its environmental restoration
15 programs.

16 In 1996, Fort Lewis conducted a RCRA Facility Assessment that identified 81 sites representing
17 potential environmental hazards, most of which were located in the cantonment area (Army 2008a).
18 The identified contaminated sites include active and former landfills; solid and biomedical waste
19 incinerators; hazardous waste treatment, storage, and disposal facilities; petroleum storage areas;
20 maintenance areas; TAs; firing ranges; and areas containing UXO. One of these hazardous sites, a
21 former Nevada Avenue waste pit, is located to the northeast of the PX. This site was used in the
22 1960s to dispose of an unspecified amount of material containing petroleum hydrocarbons and
23 metals, and consequently has contaminated soils. A second potentially hazardous site, a former silver
24 recovery unit, is located northwest of the Commissary. Various other potentially hazardous sites
25 occur at Fort Lewis, including former refueling areas, weapons and tank ranges, pesticide rinse areas,
26 and transformer storage areas. In 1989, the Logistics Center at Fort Lewis was designated as a NPL
27 site based on soil and groundwater contamination. Additionally, Fort Lewis has 51 Defense Site
28 Environmental Restoration Tracking System sites (Army 2005c).

29 Off-Post, the American Lake Gardens, located west of McChord AFB and north of Fort Lewis, was
30 placed on the NPL in 1984. The groundwater at this site contained VOCs, which were believed to
31 have come from former landfills at McChord AFB. A groundwater treatment plant has been in
32 operation since 1993.

33 Fort Lewis is currently engaging in a master plan process for several subareas at the installation.
34 ADPs for each neighborhood have been developed or are being drafted. These ADPs provide
35 detailed information regarding contaminated sites within each area. This information is summarized
36 in the following paragraphs.

37 The entire North Fort ADP area is an old World War I to pre-World War II artillery and mortar range
38 and requires special awareness measures during construction. The MMRP site known as the former
39 B Range encompasses all of the North Fort ADP area. Inert Stokes Mortars have been encountered
40 during construction activities on North Fort Lewis that may be related to historic B Range usage
41 (Van Hoesen 2009a). As a precautionary measure, the Fort Lewis MMRP has selected a land use
42 control remedy to provide ordnance awareness during construction activities on North Fort. In
43 addition, there is a landfill area to the south and southwest of the North Fort ADP area. Finally,
44 several small IRP sites are located throughout North Fort (Urban Collaborative 2008f).

1 Very few IRP sites are located within the Historic Downtown ADP area. A drinking well restriction
2 area and a voluntary cleanup site are located near the Historic Downtown ADP area, but do not
3 affect the area. Arcs from ranges and explosives storage areas do not affect this area (Urban
4 Collaborative 2008c).

5 The East Division ADP area has minimal environmental constraints, with an old munitions area
6 located northeast of the site and several IRP sites located between the airfield and 2nd Division Drive.
7 There are no dangers from explosives stored on or near the East Division ADP area (Urban
8 Collaborative 2008a).

9 There are several concerns with past contamination in the Logistics Center ADP area. Underlying the
10 whole area is a CERCLA site for contaminated groundwater (HDR 2008a). The DRMO yard, by
11 itself, has restrictions to prevent residential land use as does the old landfill site, number two. In
12 addition, contaminated soils underlie the entire area.

13 The entire Madigan ADP area is an investigation site for the Logistics Center NPL plume of
14 contaminated groundwater (Urban Collaborative 2008e). Monitoring wells are located in the area to
15 assess the degree of contamination, if any. No new drinking water wells can be drilled in this area
16 without EPA's approval. In addition, fill from over-excavation of the MAMC is located in the
17 Madigan ADP area. Construction here will require investigation and possibly special measures to
18 achieve a suitable soil substrate. The MAMC also has an emergency septic system located
19 underground in a field west of the facility. Arcs from ranges and explosives storage areas do not
20 affect this area.

21 The area to the north and east of the Old Madigan ADP area is an investigation site for the Logistics
22 Center NPL plume of contaminated groundwater (Urban Collaborative 2008g). Monitoring wells are
23 located in the area to assess the degree of contamination, if any. No drinking water wells may be
24 placed within these areas. The estimated timeline for cleanup of the groundwater plume is 30 years
25 or more. In addition, a CERCLA site is located over much of the western SOF compound. This is a
26 former range that has been remediated and requires no further action. Arcs from ranges and
27 explosives storage areas do not affect this area.

28 Most of the Jackson ADP area was once the site of the Evergreen firing range. However, all
29 remediation in this area has been completed and the old environmental cleanup sites have been
30 closed. Hence, the Jackson ADP area is not heavily constrained by environmental contaminants
31 (Urban Collaborative 2008d). Two locations, however, have potential groundwater contamination:
32 the area to the southwest that was the former landfill and the area to the north that is located near the
33 Logistics Center ADP area. In both of these areas, drinking water wells are discouraged and require
34 EPA's approval before installation. Arcs from ranges and explosives storage areas do not affect this
35 area.

36 Most of the Hillside ADP area is an investigation site for the Logistics Center NPL plume of
37 contaminated groundwater (Urban Collaborative 2008b). Monitoring wells are located in the area to
38 assess the degree of contamination, if any. Hence, no drinking water wells may be planned in the
39 Hillside ADP area. A practice grenade range was once located in the center of the Hillside ADP area.
40 However, this area has been remediated and requires no further action. Finally, a former skeet range
41 is located in the northwest corner. This area requires further action and cannot be developed. Arcs
42 from ranges and explosives storage areas do not affect this area.

43 There are currently no IRP sites in the Miller Hill ADP area (HDR 2008b). Some past lead
44 contamination from the historic rifle ranges is present on the southern slopes of the hill itself and

1 access is restricted. This site is designated and controlled under RCRA guidelines. A lead abatement
2 project is underway, and any future development must consider this constraint.

3 **3.13 AIRSPACE**

4 The Federal Aviation Administration (FAA) is responsible for the control and use of navigable
5 airspace in the U.S. The definition of airspace includes vertical and horizontal boundaries and time
6 of use. In addition to airspace, the FAA manages the air navigation system, equipment, airports, and
7 the rules and regulations relating to powered flight. The FAA is responsible for managing the
8 airspace for commercial airliners and air carriers, general aviation, and government agencies,
9 including the U.S. military.

10 The FAA has designated six classes of airspace. Airspace designated as Class A, B, C, D, or E is
11 controlled airspace. Class G airspace is uncontrolled airspace. Within controlled airspace, air traffic
12 control (ATC) service is provided to aircraft in accordance with the airspace classification (Class A,
13 B, C, D, or E). Aircraft operators are also subject to certain pilot qualification, operating rules, and
14 equipment requirements. Within uncontrolled airspace (Class G), no ATC service to aircraft is
15 provided, other than possible traffic advisories when the ATC workload permits and radio
16 communications can be established. Essentially, the controlled airspace system protects instrument
17 flight rules (IFR) aircraft from visual flight rules (VFR) aircraft during instrument meteorological
18 conditions and in near busy airports.

19 In addition to the classifications above, airspace may also be identified as special use airspace
20 (SUA). This term refers to airspace defined for a particular purpose and for the benefit of a particular
21 user, usually the military. Some military flight activities are not compatible with civilian uses of
22 airspace, and some military activities potentially conflict with other uses of military airspace.
23 Airspace restrictions are needed around military installations to ensure safety and to avoid possible
24 conflicts of airspace use. SUA classifications are not mutually exclusive; for example, a Military
25 Operations Area (MOA) can underlie a Restricted Area.

26 Restricted Areas and MOAs are two examples of SUA used around military installations. Restricted
27 Areas are defined to exclude non-participating and incompatible aircraft without the permission of
28 the controlling agency. Operations within Restricted Areas would normally include artillery firing,
29 aerial gunnery and bombardment, and high-speed and density aerial operations.

30 The purpose of MOAs is to authorize and disclose military operations that exceed the speed limit of
31 250 knots that would ordinarily exist below 10,000 feet (3 km) mean sea level (MSL). Civilian
32 aircraft operating under VFR may operate within MOAs without a clearance or communication
33 requirement; in practice, however, these areas are often avoided by civilian traffic. ATC will not
34 issue a clearance to IFR traffic that crosses an active MOA because it cannot provide separation.
35 Instead, the civilian IFR traffic will be routed around the MOA.

36 Fort Lewis has 55 square miles of FAA-designated SUA that includes Restricted Areas and MOAs.
37 Restricted Area R-6703 extends up to 14,000 feet (4 km) MSL. Fort Lewis has access to the airspace
38 in area R-6703, Subareas A, B, and D from 0700 to 2300 daily Monday through Friday (FAA 2009).
39 Subarea C is scheduled by Notice to Airmen (NOTOM). The primary purpose for Restricted Area
40 R-6703 is live-fire training with artillery, mortars, small arms, helicopters, USAF aircraft, and
41 demolitions (Army 2007e).

42 In addition to Restricted Area R-6703, Fort Lewis' SUA includes three MOAs: Rainier 1, Rainier 2,
43 and Rainier 3. Roughly, these MOAs extend from Fort Lewis and Lacey south to Rainier, east to

1 Yelm, and north to McChord AFB. They include airspace from 2,000 feet (0.6 km) MSL to
2 9,000 feet (2.7 km) MSL, excluding the airspace of R-6703A, B, C, and D.

3 The airfield at Fort Lewis, GAAF, consists of one runway (15/33) oriented on a northwest/southeast
4 axis, associated taxiways, and ramp space to support military aircraft operations. The runway is
5 150 feet (46 m) wide by 6,125 feet (1,867 m) long. GAAF's control tower can support VFR and
6 limited IFR operations 24 hours a day (Army 1994). Approximately 100 aircraft operate out of
7 GAAF, including four fixed-wing aircraft and 34 small, 36 medium, and 30 large helicopters
8 (Clayton 2009b).

9 GAAF supports the 4th Battalion 160th Special Operations Aviation Regiment, Washington Army
10 National Guard, Army Reserve, medical units, and private aircraft activities. Most of the helicopter
11 operations are conducted within the limits of the Post under VFR conditions. Limited fixed-wing
12 activity also occurs at GAAF. Most of the fixed-wing aircraft supporting missions conducted at Fort
13 Lewis involve troop transport missions or low-level flights over the various drop zones for airborne
14 training. Although most of these fixed-wing aircraft missions originate out of McChord AFB, limited
15 operation of fixed-wing aircraft also occurs at GAAF.

16 McChord AFB is approximately six nautical miles (11 km) northeast of GAAF. The airfield at
17 McChord consists of two runways. The primary runway (16/34) is oriented on a northwest/southeast
18 axis and is 150 feet (46 m) wide by 10,108 feet (3,080 m) long. Runway 160/340 also is oriented
19 northwest/southeast and is 60 feet (18 m) wide by 3,000 feet (914 m) long. Runway 16/34 is capable
20 of handling the largest aircraft in the Air Force or civilian fleets. The McChord AFB aircraft control
21 tower also has VFR and IFR capability 24 hours a day (Army 1994).

22 3.14 FACILITIES

23 Army real property (facilities) includes land, facilities, and infrastructure. Land includes Army-
24 owned lands (real estate), leaseholds, and other interests in land. Facilities encompass all aspects of
25 facilities management. Facilities include buildings, structures, and other improvements and
26 appurtenances to support the Army's mission, such as cantonment areas, training ranges, housing,
27 schools, and recreational facilities. Infrastructure is the combination of supporting systems that
28 enable the use of Army land and resident facilities, primarily utility infrastructure. Utility
29 infrastructure includes electrical, gas, steam, water, wastewater, and stormwater, and
30 communications serving the Army installations.

31 Many of the Army facilities are addressed in other sections of this document. Existing land uses and
32 recreational facilities are described in **Section 3.9**. Roadways and other ground transportation
33 infrastructure serving the Army installations are described in **Section 3.10**. Housing and schools are
34 described in **Section 3.11**. Solid waste and hazardous material/waste facilities are described in
35 **Section 3.12**. Energy is addressed in **Section 3.15**.

36 The following resources also guide facilities management at Army installations:

- 37 • Fort Lewis Regulation 200-1, Environmental Quality: Environmental Protection and
38 Enhancement;
- 39 • Fort Lewis Regulation 350-2, Training Support;
- 40 • Fort Lewis Regulation 350-30, Fort Lewis Range Regulations;
- 41 • AR 200-1, Environmental Quality: Environmental Protection and Enhancement;
- 42 • AR 210-20, Installations: Real Property Master Planning for Army Installations;
- 43 • AR 350-19, Training: The Army Sustainable Range Program;

- 1 • AR 420–1, Facilities Engineering: Army Facilities Management;
- 2 • AR 420–49, Utility Services;
- 3 • AR 420–90, Fire and Emergency Services;
- 4 • 43 United States Code (USC) 1701, et seq., as amended, Federal Land Policy and
- 5 Management Act;
- 6 • TC 25–1, Training Land; and
- 7 • TC 25–8, Training Ranges.

8 RPMPs provide the framework for facilities management, including design and construction activities
9 for land development on military installations. There are several components to the RPMP: the Long-
10 Range Component (LRC), Capital Investment Strategy (CIS), and Short-Range Component (SRC).
11 The LRC establishes goals and objectives for future development of the installation. The CIS and
12 SRC are continuously evolving mechanisms for implementing the overall objectives of the LRC. The
13 existing and programmed facilities within the 13 ADP areas are summarized in the following
14 subsections.

15 **3.14.1 Real Estate**

16 The Fort Lewis boundary includes approximately 10,603 acres within the cantonment area and
17 75,573 acres of TAs (Army 2007d). The Fort Lewis ADPs provide detailed additional information
18 regarding the availability of developable land for expansion of facilities within each area. This
19 information is summarized in the following paragraphs.

20 **3.14.1.1 North Fort ADP Area**

21 The North Fort ADP area is not heavily constrained and developable land is available (Urban
22 Collaborative 2008f). The area is flat with elevation changes occurring in the lands surrounding the
23 developable area.

24 **3.14.1.2 Historic Downtown ADP Area**

25 Much of the Historic Downtown ADP area is already developed; however, there is land available for
26 development. The Historic Downtown ADP identifies proposed sites for new facilities to
27 accommodate growth of the installation.

28 **3.14.1.3 East Division ADP Area**

29 The East Division area is not heavily constrained by natural features or environmental or airfield
30 restrictions. However, the area is completely developed with World War II-era wooden facilities that
31 require replacement (Urban Collaborative 2008a). The existing facilities and functions housed in this
32 area can be relocated and moved to allow demolition and reconstruction of the area and
33 consolidation of associated facilities.

34 **3.14.1.4 Logistics Center ADP Area**

35 The Logistics Center ADP area is primarily flat with a prominent knoll to the east and a slope into
36 the Murray Creek drainage. Natural constraints to development within the Logistics Center ADP
37 area include the wetlands located south of the Logistics Center and Murray Creek to the west. These
38 natural constraints limit expansion availability in their relative areas (HDR 2008a). Because

1 contaminated soils underlie most of the Logistics Center area, residential development is restricted
2 and continuation of the industrial use represents the best use for the area.

3 **3.14.1.5 Old Madigan ADP Area**

4 Within the Old Madigan ADP area, Fort Lewis has created a partnership with EQR/Lincoln through
5 a privatized housing initiative. As part of that agreement, land is leased to EQR/Lincoln for use for
6 housing. The Madigan neighborhood in this area is one of these leased areas (Urban Collaborative
7 2008g). Murray Creek geographically splits the Old Madigan ADP area into east and west sections.
8 A land use control is in place east of the Madigan ADP area that restricts housing in locations where
9 contamination has been found. Within this area, there is a former range that has been remediated and
10 requires no further action. This site can be developed.

11 **3.14.1.6 Jackson ADP Area**

12 The developed portion of the Jackson ADP area is relatively flat; however, substantial hills are
13 present in the wooded areas to the northwest and southeast. Development should be minimal in these
14 areas. The Jackson ADP area is largely undeveloped and new construction options are largely
15 unencumbered by existing facilities (Urban Collaborative 2008d).

16 **3.14.1.7 Hillside ADP Area**

17 The Hillside ADP area is relatively flat and a high-voltage power line currently runs both north to
18 south and east to west through the center of the area. A maintenance easement is in place 50 feet
19 (15 m) to each side of the center of this power line. Future development within the Hillside ADP area
20 will be restricted within this easement (Urban Collaborative 2008b).

21 **3.14.1.8 Miller Hill ADP Area**

22 The Miller Hill area encompasses approximately 523 acres (212 ha), most of which remain
23 undeveloped. Miller Hill rises approximately 150 feet (46 m) above the surrounding cantonment area
24 (HDR 2008b). Subarea A represents the wooded hill proper; Subarea B represents the developable
25 area near the Stone Education Center; APZ 1 is a Subarea considered undevelopable because of its
26 location within the airfield accident potential area.

27 **3.14.1.9 Gray Army Airfield ADP Area**

28 The GAAF area encompasses approximately 550 acres (220 ha), the vast majority of which is
29 developed to support the airfield operations (HDR 2008c). The area around GAAF is encompassed
30 by more than 635,000 SF of airfield-related facilities (HDR 2008c). Within the airfield itself, there
31 are very limited opportunities for additional development. Immediately outside the airfield fence
32 line; however, there are constraints imposed by the airfield are the clear zone and approach-departure
33 surface which impose height restriction requirements. Height restriction requirements emanate from
34 the runway in all directions, affecting development in the airfield area and past the fence line,
35 prohibiting development of multi-story facilities within the zone itself. To the south, there is little
36 development as the Fort Lewis TAs are entered from this area. In accordance with the Airfield
37 Master Plan, there is room to extend the runway 3,000 feet (914 m) to the south without affecting
38 ranges, with the concurrent additional space for hangars and ramp parking.

1 **3.14.1.10 Madigan ADP Area**

2 Overall, the existing facilities in the area are in good condition and should remain in a long-term
3 planning process. The ADP area has a substantial acreage of buildable land.

4 Constraints in the Madigan ADP area include wellhead protection areas, oak preserves, wetlands,
5 and airfield criteria. In addition, no new drinking water wells may be drilled in the area, because it is
6 an investigation site for an NPL plume of contaminated groundwater. An emergency trauma helipad
7 exists on the MAMC site east of the Madigan ADP. The clear zones and imaginary surfaces
8 associated with the helipad are situated in the east portion of the ADP. Any development in this area
9 must account for these restrictions. In addition, a large site that contains fill from the over-excavation
10 of the MAMC is located on the MAMC site. Construction in this area would require investigation
11 and possible special measures to achieve a suitable soil substrate. MAMC also has an emergency
12 septic system located underground in a field west of the facility.

13 **3.14.1.11 3rd Brigade ADP Area**

14 The 3rd Brigade ADP area includes residential, administrative, commercial, light industrial, and open
15 space uses. Residential areas consist of barracks buildings and administrative buildings. Other
16 support facilities include a fitness center, dining facility, chapel, light industrial warehouses, motor
17 pools, maintenance buildings, and recreational facilities that include a fitness center and open space.

18 Few constraints exist in the 3rd Brigade ADP area (Urban Collaborative 2009c). These include an old
19 landfill and IRP sites located throughout the area.

20 **3.14.1.12 American Lake ADP Area**

21 Land uses in the American Lake ADP area are primarily residential, surrounded by open space on or
22 near the northwest and southwest shore of American Lake. ADP plan options provide housing to
23 help meet the existing housing shortfall in addition to GTA housing needs. Key constraints in the
24 American Lake area consist of wetland buffers (Urban Collaborative 2009a).

25 **3.14.1.13 Greene Park ADP Area**

26 The Greene Park ADP area is located north of I-5 and south of the North Fort ADP area. The Greene
27 Park ADP area contains TA 2 and the Sequelitchew Lake Recreation Area. Sequelitchew Lake is
28 used for training as well as recreational fishing. Planned facilities within the Greene Park area
29 include replacement housing, travel camp improvements, and expansion to park areas. Key
30 constraints in the Greene Park ADP area include a landfill, a high-tension power line, and historic
31 buildings (Urban Collaborative 2009a).

32 **3.14.2 Buildings and Structures**

33 Fort Lewis has facilities within two primary locations: the cantonment area and the TAs. The
34 following subsections summarize the existing and planned facilities for both the cantonment area and
35 the TAs.

36 **3.14.2.1 Cantonment Area**

37 The cantonment area serves as the support center for activities at Fort Lewis, other than field
38 training. The cantonment area supports residential, administrative, commercial, and industrial
39 activities, as well as GAAF and the MAMC. The cantonment area contains the PX, Commissary,
40 services, a mini-mall, fast food restaurants, a welcome center, the library, and other facilities. The

1 GAAF presently supports the Washington Army National Guard, Army Reserve, medical units, and
2 private aircraft activities. The aircraft at GAAF include both fixed- and rotary-winged aircraft.

3 In FY 2008, there was approximately 18.1 million square feet of building space at Fort Lewis
4 (Waehling 2009). There are approximately 4,400 buildings on Fort Lewis, about one-half of which
5 are used for housing (Army 2007e). Family housing and barracks, which are located in the
6 cantonment area, consist of units of varying ages and states of repair. Approximately 5,500 to 6,000
7 Soldiers are currently accommodated in the barracks. Fort Lewis has a projected housing deficit of
8 approximately 2,000 units (Urban Collaborative 2008b). Housing and school facilities in the Fort
9 Lewis area are addressed in **Section 3.11** and are not addressed in detail in this section of the
10 document.

11 The Fort Lewis ADPs provide detailed information regarding the currently planned and programmed
12 facilities, as well as the facilities that are required but have not yet been programmed within each
13 area. This information is summarized in **Section 2.2.5**.

14 **3.14.2.2 Training Areas**

15 The Fort Lewis TAs cover approximately 75,570 acres (30,600 ha) (Army 2007e) and consist of
16 ranges, impact areas, drop zones, tank trails, and maneuver areas. The TAs are used 325 days per
17 year by more than 200 military units.

18 The TAs at Fort Lewis include direct and indirect fire ranges support weapons qualification, artillery
19 and mortar firing, and other live fire training requirements. In addition, TAs at Fort Lewis include
20 ammunition storage areas, urban combat areas, drop zones, landing strips, and amphibious training
21 sites. TAs are currently available at Fort Lewis for off-road vehicle movement, wheeled vehicle
22 movement, gunnery practice, digging (tank ditches, vehicle positions, and foxholes), unit assembly
23 areas, and unit deployment exercises. There are 115 firing ranges that support weapons qualification
24 training activities; these ranges are located in four impact areas on the installation (Army 2005c).

25 **3.14.3 Infrastructure**

26 In 2007, an infrastructure system analysis was performed for Fort Lewis. The following subsections
27 summarize the information on infrastructure from this analysis.

28 **3.14.3.1 Water Supply**

29 The Fort Lewis water system is classified as a Group A system, which is defined as a water system
30 with 15 or more connections or 25 or more people per day for 60 or more days per year (John Gallup
31 and Associates and AMEC Earth and Environmental Inc. [JGA and AMEC] 2007). The entire
32 system is owned and operated by the Army.

33 A WaterCAD model was developed with scenarios for average day and maximum day, attempting to
34 maintain the system pressures between 20 and 100 pounds per square inch (psi) along with velocities
35 under 10 feet (3 m) per second. A fire flow analysis was also included to determine locations of
36 concern. Because of the number of water tanks around the installation, there were three different
37 iterations of each scenario all with different initial depth settings for the tanks, including: 1) tanks
38 full, 2) tanks empty, 3) tanks at an average level that was determined by executing an extended day
39 scenario, and 4) determining the depths of the tanks when they converged. It was determined that the
40 system was unable to function with the tanks empty. Negative pressures were produced for all
41 scenarios.

1 According to installation personnel, there were pressure issues in the area east of the airfield also
2 known as the East Division Area. This was not supported by the model, but could be caused by
3 closed valves or damaged pipes not considered by the model. The model indicated several areas that
4 were not adequately looped to the system. The two major areas include North Fort and Davis Hill.
5 There were also many cases of dead-end water mains that did not loop back to the system. These
6 dead ends cause pressure issues throughout the system. The fire flow analysis determined that the
7 system performs well with stresses at different locations within the system. There is little change in
8 the system from average day to maximum day to fire flows. The low pressures and high velocities
9 observed are a result of the dead ends and lack of supply loops to major areas in the system. The area
10 of greatest concern is located proximal to fire flow analysis around junctions J-422 and J-269. This
11 area includes Veterans Administration Hospital located to the northeast of North Fort and is supplied
12 by an 8-inch water main with a demand of more than 150,000 gallons per day (gpd) (568,000 L per
13 day).

14 Recommendations for the existing system include:

- 15 • replacing all the old and outdated pipe,
- 16 • looping dead ends within the system to help with available fire flows,
- 17 • performing normal updates and maintenance to the existing water storage facilities,
- 18 • replacing all fire hydrants to standardize the type and manufacturers of the various fire hydrants,
19 and
- 20 • adding additional on-site water storage to meet the required demands.

21 **3.14.3.2 Wastewater Treatment Systems**

22 The sanitary sewer collection system at Fort Lewis comprises 47 miles of gravity sewers ranging in
23 size from 4 to 30 inches (10 centimeters [cm] to 76 cm) in diameter (JGA and AMEC 2007). The
24 portions of the sewer system east of GAAF include lift stations and approximately 6,300 feet
25 (1,900 m) of force mains that range in diameter from 4 to 16 inches (10 cm to 41 cm). During recent
26 years, new construction on North Fort has replaced a significant amount of older sewer trunk lines in
27 that area. At present, the sanitary sewer system is divided into seven basins, A through F. Basins A
28 through D are predominately on the Main Post and include the MAMC and the Logistics Center
29 Area. Basins E and F are on North Fort and include the Beachwood Housing area. Historically, the
30 system has been plagued with infiltration from groundwater and possibly some inflow from cross
31 connections to the stormwater system. Flows fluctuate from approximately 2.2 mgd (8.3 million L
32 per day) in the summer/dry season to 6 mgd (22.7 million L per day) in the winter/wet season (JGA
33 and AMEC 2007).

34 The estimated flows for the sanitary sewer system at Fort Lewis were less than the pipe capacities
35 (JGA and AMEC 2007). The sanitary sewer system at Fort Lewis was analyzed for future loading
36 conditions using the same methodology as for existing loading conditions. Pipe segments with
37 negative slopes identified as problems under existing loading conditions are anticipated to be
38 problematic under future loading conditions.

39 Analysis of the existing wastewater loading at Fort Lewis identified several deficiencies with the
40 existing sanitary sewer collection system. Most of the deficiencies were due to pipes set at negative
41 slopes, according to the invert elevations provided. Analysis of Fort Lewis's sanitary sewer system
42 for future loading conditions resulted in six potential problem areas, in addition to the problems
43 identified under the existing loading conditions. The following three categories of improvements are
44 recommended for the sanitary sewer system at Fort Lewis: 1) replacement of vitrified clay pipes, 2)

1 improvements to resolve existing capacity problems, and 3) upgrades required for the future loading
2 conditions (JGA and AMEC 2007). Before implementing capital improvements, a detailed master
3 plan should be completed for the sanitary sewer system at Fort Lewis.

4 **3.14.3.3 Stormwater Management**

5 Fort Lewis is located adjacent to Puget Sound, with all stormwater draining toward Puget Sound via
6 American Lake or Sequilitchew Lake. Several existing pipes and culverts currently appear to be
7 undersized (JGA and AMEC 2007).

8 **3.14.3.4 Telecommunications**

9 The telephone system at Fort Lewis is government owned and is maintained by the 1115th Signal
10 Battalion. Qwest provides outside telephone service to the Fort Lewis system. Communications
11 facilities are divided into four major areas on the installation: the Main Post, North Fort, the TAs,
12 and the MAMC. There are approximately 160 miles (260 km) of aerial cable and 34 miles (55 km) of
13 underground cable in the four areas. System improvements in the North Fort subsystem are planned
14 in conjunction with programmed construction in that area.

15 **3.15 ENERGY DEMAND/GENERATION**

16 Energy consumption is perhaps the major infrastructure and budgetary challenge to the Army.
17 Increased energy costs created an Army utility budget shortfall of \$93 million for FY 2001 and were
18 estimated to require an additional \$218 million for FY 2002 through 2007. Increased energy costs
19 are non-discretionary, which forces garrison commanders to take funds from other accounts to pay
20 for utilities, placing other mission areas at risk. The Army developed an Energy Strategy for
21 Installations to address the rising costs of energy and increased risk to other mission areas. This
22 strategy is based on five major initiatives:

- 23 • eliminate energy waste in existing facilities;
- 24 • increase energy efficiency in renovation and new construction;
- 25 • reduce dependence on fossil fuels;
- 26 • conserve water resources; and
- 27 • improve energy security (Army 2005e).

28 Implementation of these initiatives will improve the working, training, and living environment at
29 Army installations and save critical resources that can be used to support other Army missions, such
30 as training and force deployment. The ROI for energy demand and infrastructure is defined as the
31 service areas for the service providers.

32 In FY 2008, the combined total annual energy cost for Fort Lewis and YTC exceeded \$22 million
33 (Waehling 2009). The following paragraphs describe Fort Lewis' ongoing energy saving programs
34 and plans summarized from the report entitled "Sustainable Fort Lewis, 2007 Annual Progress
35 Report" (Army 2008a).

36 In 2004, Fort Lewis purchased 12,000 megawatt hours (MWH) of energy from renewable energy
37 sources, approximately 5 percent of the installation's energy needs. In 2007, Fort Lewis purchased
38 21 percent of its electrical needs from renewable sources. Under contract with the Western Area
39 Power Administration, Fort Lewis will purchase the equivalent of 52,364 MWH of renewable energy
40 certificates annually through 2010.

1 In 2007, Fort Lewis partnered with Bonneville Power Administration (BPA) to execute a Utility
2 Energy Savings Contract (UESC) for energy savings in structures on the installation. The first of
3 several energy savings projects is underway and consists of upgrades to lighting, building insulation,
4 and heating, ventilating, and air conditioning (HVAC) control systems that will result in more than
5 \$5 million worth of energy savings within the first 3 years.

6 An Energy Engineering Analysis Program (EEAP) audit was conducted at Fort Lewis, McChord
7 AFB, and YTC in August 2007. The final report is still in process.

8 The Army plans to construct all new facilities to meet the silver level in the Leadership in Energy
9 and Environmental Design (LEED) ratings system, which is used by the U.S. Green Building
10 Council, beginning with the FY 2008 military construction program (Army 2007h). LEED is a
11 voluntary, consensus-based national standard for developing high-performance buildings, including
12 water savings and energy efficiency.

13 **3.15.1 Electricity**

14 The electrical distribution system at Fort Lewis is supplied by Tacoma Power and consists of four
15 substations located around the Post, each of which is fed from a 115-kilovolt (kV) pole line and
16 collectively contain five 20-megavolt-ampere (mVA) transformers (JGA and AMEC 2007).

17 Each transformer is connected to secondary switchgear owned by Fort Lewis, which provides
18 electrical service to the Post via 13.8kV overhead and underground distribution circuits. Based on
19 utility billing information, peak demand for the installation was in January 2007 and was
20 39.4 megawatt (MW) or 41.1mVA (JGA and AMEC 2007). For FY 2008, 818,549 million British
21 thermal units (MBTUs) of electricity were required at Fort Lewis (Waehling 2009).

22 Evaluation of the proposed project list indicates approximately 34.1 mVA of new connected load
23 will be added. To accommodate the additional loads, the following electrical distribution system
24 changes are required:

- 25 • new overhead or underground distribution circuits for the additional loads north of I-5; and
- 26 • improvements, as needed, to existing Post distribution circuits to handle proposed project
27 load increases.

28 Based on the evaluation of the proposed project list, the following electrical distribution system
29 changes are recommended to improve the electrical system reliability, flexibility, and future
30 capability:

- 31 • New transformer, secondary feeder breakers, and bus tiebreaker at the Sequalitchew
32 substation located north of I-5.

33 **3.15.2 Natural Gas and Fuel Oil**

34 Fort Lewis uses natural gas as its primary heat source. Natural gas is provided by Puget Sound
35 Energy (PSE). PSE currently owns the major gas pipelines on the installation. Fuel oil is used as a
36 backup when gas supplies are turned off, and is purchased by contract (Army 2008a). The total
37 quantity of natural gas consumed on Fort Lewis in 2008 was 1,145,684 MBTUs (Waehling 2009).

38 No existing gas piping deficiencies have been identified (JGA and AMEC 2007). The existing main
39 gas supply is sufficient to accommodate the gas requirements for all currently planned projects.

1 Any major expansion of the gas pipe system will require the involvement and design work of PSE.
2 The cost of this additional work will be determined and be a part of a new gas supply contract. The
3 following items must be considered for any potential future gas system modifications:

- 4 • New gas lines are expected to be hot-tapped to the existing lines in various places. Only
5 experienced companies will be considered for hot tapping due to the critical nature of such
6 approach.
- 7 • Lines will be pressure tested and all leaks will be fixed immediately.
- 8 • All underground steel gas piping will have cathodic protection.
- 9 • All aboveground steel gas piping will be insulated and heat traced.

10 **3.15.3 Steam**

11 The central steam for Fort Lewis is supplied by Building 3292 and is the major steam plant at Fort
12 Lewis (JGA and AMEC 2007). This building also has hot water boilers to supply the north part of
13 the East Division Area barracks.

14 According to installation personnel, the central boiler heating plant has spare heating capacity.
15 AMEC requested additional information to quantify the excess capacity; however, the required
16 information was not provided. Because of the low cost of electrical energy, it is currently
17 recommended that new central heating steam plants are not part of the future energy plans as noted
18 in the “Fort Lewis Energy Sustainability Roadmap” May 2004 (JGA and AMEC 2007). Fort Lewis
19 used 117,013 MBTUs of steam in FY 2008 (Waehling 2009).

20