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## **3 AFFECTED ENVIRONMENT**

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The CEQ regulations implementing NEPA (40 CFR Part 1500) require documentation succinctly describing the environment of the area(s) to be affected by the alternatives under consideration, as well as a discussion of the impacts in proportion to their significance. The affected environment under the Proposed Action ranges from site-specific physical, natural and cultural resources to broader regional concerns (i.e. air quality variables, noise, infrastructure, socioeconomic conditions, community facilities and services and transportation and traffic).

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### **3.1 Land Use, Plans, Aesthetics and Coastal Zone Management**

#### **3.1.1 Land Use**

Local land uses outside of Fort Belvoir are predominantly residential, although commercial and industrial development, such as the Lorton Valley Industrial Park and a number of retail malls, occur along Richmond Highway (US 1) and near Interstate 95 (I-95). Locally there are a number of sizable tracts in public ownership, including Huntley Meadows Park, Pohick Bay Regional Park, Mason Neck State Park, the Washington Grist Mill Park, Mount Vernon Estate and Parkway, Gunston Hall Plantation, Woodlawn Plantation, Potomac River National Wildlife Refuge and Mason Neck National Wildlife Refuge. Many of these tracts occur along the Potomac River, resulting in a fairly continuous band of natural habitat along the river.

Land use on the Main Post is varied (Table 3-1). The current land use categories are designated in the Land Use Plan of the Real Property Master Plan – Long Range Component (RPMP-LRC) adapted by Fort Belvoir in 1993. These categories may change because the RPMP-LRC is undergoing revision. Unimproved acreage is the largest land-use category, covering 6,417 acres (2,599 ha) or 70.56 percent. This land use type consists of natural areas requiring little or no maintenance, which include wetlands, riparian areas, forests, open areas, refuges and a forest and wildlife corridor (FWC). In addition, Fort Belvoir also has nearly 11 miles (17.7 km) of mostly undeveloped shoreline.

Using natural and constructed boundaries, such as Accotink Bay and US 1, Fort Belvoir is divided into six planning districts of major land areas: Upper and Lower North Post, Davison Army Airfield, South Post, South Post Core, and Southwest Area. The site area is located in the Southwest Area and was identified in the RPMP-LRC as medical services land use category.

Table 3-1  
Land Uses at Fort Belvoir

Land Use Category	Acre (ac)	Hectares (ha)
Training Range	1,838	744
Administrative/Education	1,102	446
Recreation	1,006	407
Troop and Family Housing	641	259
Community Facilities	451	183
Airfield	388	157
Research and Development	340	138
Service and Storage	314	127
Industrial	129	52
Medical Services	103	42
Environmentally Sensitive Areas	3,335	1,350

Source: US Army Garrison Fort Belvoir, 2001b

### 3.1.2 Plans

According to the Fairfax County Planning Commission, the land bounded by the site area has been designated for transportation, historic preservation and residential development. A strip along the north side of US 1 between Telegraph and Pohick Roads is designated for commercial development.

The site area is located in the Mount Vernon District of Fairfax County. The Fairfax County Board of Supervisor's considers the widening of US 1 essential to support the flow of traffic in this area and prefers that US 1 and OCR not be shifted closer to Pohick Church. The Fairfax County Comprehensive Plan calls for widening of US 1 with: a raised median for landscaping; protected left turn lanes; continuous sidewalks and trails; and accommodations for the handicapped and bicycles. Fairfax County Department of Community and Recreational Services, indicated that there are no existing or planned parks or other recreational facilities in the vicinity of the site area.

The site area lies in the LP-2 Community Planning Sector (Lorton-South Route 1) of the Lower Potomac Planning District, in Fairfax County Planning Area IV. This planning district is characterized by large institutional land uses, including Fort Belvoir. The Lorton region has long had a negative image for many metropolitan Washington residents because it was the site of Lorton Prison and currently has a Fairfax County landfill, and Lower Potomac regional sewage treatment plant. The population in the Lower Potomac Planning District decreased between 1970 and 1980, however rapid residential and commercial development in the 1980s brought renewed

growth to the area and an increase in population. Residential and some community-serving retail uses exist along US 1. The closest retail area is the Gunston Shopping Plaza, located south of Pohick Road.

The National Capital Planning Commission (NCPC) is the central planning agency for the federal government in the National Capital Region, which encompasses the District of Columbia and the following jurisdictions: Montgomery and Prince George's Counties in Maryland; the City of Alexandria, Arlington, Fairfax, Prince William and Loudoun Counties in Virginia. The NCPC prepares the Federal Elements of the Comprehensive Plan for the National Capital (CPNC), which establishes goals and planning policies for the growth and development of the National Capital Region and provides a framework for policy decisions pertaining to development in this area. The NCPC reviews plans and programs proposed by state, regional, and local agencies for their impact on the federal interest.

US 1 would continue to serve as an alternate corridor to I-95 for commuters traveling to and from employment centers such as Fort Belvoir, Alexandria and Washington, DC. There has been an increase in the Fort Belvoir civilian (commuter) workforce due to the influx of commands and agencies, which have been filling vacated facilities. Relocations of civilian-workforce agencies from high-rental properties in the Metropolitan Washington D.C. area to new facilities at Fort Belvoir are also occurring.

The US Army Garrison Fort Belvoir, to meet the needs dictated by the Department of the Army and the Department of Defense, endeavors to expand its mission capabilities and continues to revise the Fort Belvoir Master Plan. Several projects are well articulated in the current Master Plan and are in the advanced stages of planning and design. Environmental assessments (EAs) have been or are now being prepared for these projects (Table 3-2, Projects 1 through 6). The remaining projects are in the earlier stages of conceptualization and planning, and their eventual implementation may or may not occur, or later plans may evolve to encompass different elements.

Other recent and proposed planned expansions on or near Fort Belvoir that may affect the alignment of the civilian-military workforce include:

- ?? Headquarters Complex (north of Backlick Road and west of Beulah Street)
- ?? Post Exchange (PX)
- ?? North Post Elementary School
- ?? Commercial shopping mall at the Telegraph / Beulah Road intersection on the North boundary of the North Post area.

Table 3-2  
Proposed Projects for Fort Belvoir

<b>Tompkins Basin Recreation Area – (1)</b>	An EA is being drafted for construction of recreational facilities in the Gunston Cove/Tompkins Basin area, at the end of Warren Road. Proposed are rental cabins, tent / recreational vehicle sites, a lodge and a 150-room hotel.
<b>Defense Threat Reduction Agency (DTRA) – (2)</b>	DTRA has permanently relocated approximately 1,000 personnel to a secure compound at the McNamara HQC.
<b>Army Material Command (AMC) – (3)</b>	An EA has been prepared for the relocation of 1,600 AMC personnel from rented facilities in Alexandria to vacant facilities on Fort Belvoir.
<b>DeWitt Hospital Replacement - (4)</b>	A new healthcare facility to replace DeWitt Hospital would be located north of the Post Exchange (PX) and south of Kingman Road.
<b>National Army Museum – (5)</b>	This public facility is proposed for construction on a 50-acre (20-ha) site along US 1. It is anticipated over a million visitors would attend yearly.
<b>Defense Communications - Electronics Evaluation and Testing Agency (DCEETA) Complex – (6)</b>	An EA has been prepared for the construction of a T Block building to accommodate approximately 250 new employees in the North Post area.
<b>North Post Transportation Study - (7)</b>	A recent study identifying and examining transportation alternatives to improve post security for the North Post area.
<b>Administrative Park Complex – (8)</b>	A study investigated several sites to accommodate a several million square foot office park either in EPG, North Post, South Post or the Southwest Area. No decision has been made on the site, or if the proposal would go forward.
<b>Renovation of Dogue Creek Marina - (9)</b>	This proposed project would involve dredging Dogue Creek and replace all marina facilities.
<b>New North Post Chapel – (10)</b>	The Chapel would be built on a six-acre (2.4 ha) site south of the Woodlawn Methodist cemetery, northeast of the Abbot / Franklin Road Intersection.
<b>US Army Intelligence &amp; Security Command (INSCOM) – (11)</b>	Plans call for a new office building at the Beulah Road / Kingman Road intersection.
<b>Residential Communities Initiative (RCI) – (12)</b>	Privatization of Post Housing would entail renovation, demolition reconstruction of 2200 units and adding 1000 new units.

### 3.1.3 Aesthetics

Visual aesthetic qualities associated with Fort Belvoir are attributable to its diverse terrain, unique natural resources and historic structures. The upland forest in the Southwest Area of South Post is relatively undisturbed. Thus, motorists who travel OCR are provided an attractive rural scenic drive as they travel between the Pohick Creek Bridge and Pohick Episcopal Church, and east on US 1.

### **3.1.4 Coastal Zone Management**

The Commonwealth of Virginia has developed and implemented a federally approved Coastal Resources Management Program (CRMP) describing current coastal legislation and enforceable policies under the Coastal Zone Management Act (CZMA). Under CRMP, federal actions subject to consistency with the program include commercial fishing; recreational fishing in freshwater tidal rivers; encroachments on subaqueous lands; encroachments on wetlands; encroachments on primary sand dunes; land-disturbing activities needing erosion and sediment control; actual or potential wastewater discharges; control of septic and other on-site domestic waste systems; coastal land management; and air pollution control.

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## **3.2 Natural Resources**

Fort Belvoir is located in the Washington D.C. Metropolitan area, which is an area that is rapidly changing from undeveloped natural areas to developed land uses. In this urbanized area, Fort Belvoir represents a significant tract of native vegetation, particularly in terms of size, diversity and proximity to other large undisturbed tracts such as Pohick Bay Regional Park, Huntley Meadows Park and Mason Neck National Wildlife Refuge. To preserve its ecological significance, Fort Belvoir actively manages and conserves natural resources within its boundaries.

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### **3.2.1 Physiography**

Fairfax County is divided into two Physiographic provinces: the Coastal Plain and the Piedmont Plateau. These two provinces are subdivided into five sections in Fairfax County from west to east: The Piedmont Lowland, the Piedmont Upland, the mixed Piedmont Upland and high Coastal Plain Terraces, the high Coastal Plain, and the low Coastal Plain Terraces (Hobson, 1996). Most of Fort Belvoir lies in the high and low Coastal Plain Terraces of the Coastal Plain Physiographic Province.

The Fall Line forms the boundary between the resistant, metamorphic rocks of the Piedmont Plateau on the west and the softer, sedimentary rocks of the Coastal Plain Province on the east (Terwilliger, 1991). The Fall Line runs northeast-southwest through Virginia and is roughly parallel to I-95 in the vicinity of Fort Belvoir. This places the Main Post area in the Coastal Plain Province. Regional configurations of major fault systems as well as deflections of the Potomac River along the Fall Line suggest tectonic influence; however, no evidence of recent structural disturbances exists in the Fort Belvoir area (BRAC EIS, 1991; USGS, 1985).

#### **3.2.1.1 Geology**

There are several geologic formations associated with the Coastal Plain Physiographic Province including the Potomac Formation, Bacon's Castle Formation, Shirley Formation, and Tertiary

Alluvium (Porter, et al, 1963). The major geologic unit in the Fort Belvoir area is the Potomac Formation, a seaward-thickening wedge of unconsolidated sediments that has a moderate east dip (Table 3-3). A wedge of interlayered fluvial-deltaic and marginal-marine sediments unconformably overlies an older basement complex (BRAC EIS, 1999).

The Coastal Plain deposits consist of marine and marginal sediments that were deposited during successive periods of transgressing and regressing shorelines. The sedimentary formations dip slightly eastward and are exposed at the surface along outcrops, such as along the Pohick Creek and in the Alexandria-Fredericksburg (Amtrak-VRE) railroad cut in Lorton. Many beds exist only as fragmental erosional remnants sandwiched between more continuous strata above and below.

Table 3-3  
Regional Geology in the Fort Belvoir Area

Age	Formation	Subunits	Characteristics	
<b>Tertiary</b> Unconformity		Alluvium	terrace deposits of sands, gravels, cobbles	
<b>Cretaceous</b>  (early)  Unconformity	Shirley		massive marine sediment wedge; occurs south of Occoquan River. <i>Not present on Fort Belvoir.</i>	
	Bacon's Castle			
	<b>Potomac</b> Fluvial-deltaic & Marginal marine sediments  200 - 300 foot (60 – 90 m) thick	Albirupean (upper)		inter-fingering lenses of felspathic sands, silt, and clay of differing thickness. <i>Not present on Fort Belvoir</i>
		Iron Ore Clays		<i>Not present on Fort Belvoir</i>
		Aquia Creek (middle)		inter-fingering lenses of sand, silt, and clay of differing thickness.
		Mt. Vernon Clays		a thick clay wedge of chocolate-colored silt, clays interbedded with layers of sandy clays and sand lenses.
		Rappahannock (lower)		inter-fingering lenses of felspathic sands, silt, and clay of differing thickness.
James River Clays		also called Nanjemoy-Marlboro		
<b>Upper Ordovician</b> (early Paleozoic)	-	-	Granitic Intrusives	
<b>Precambrian</b> (Proterozoic)	Piedmont Plateau	basement complex	undifferentiated meta-sedimentary/meta-igneous rocks. Primarily metamorphic gneiss and schist.	

Sources: Larson and Froelich, 1977; Law Engineering and Environmental Services, 1995; Ward, 1895; Mixon et al., 1989, as cited in Hobson, 1996.

The Potomac Formation is characterized by lens-shaped (lenticular) deposits of interbedded sand, silt, clay and gravel underlain by residual soil and weathered crystalline rocks (US Air Force, 1975). The sand facies in the Potomac Formation is predominantly buff to gray, fine to coarse-grained pebbly felspathic sands with minor lenticular clay and silt beds. The clay facies is predominantly composed of red-brown, green and gray clay with lenses of sands and has a high shrink-swell potential.

The sand and clay lenses of the Middle and Lower Potomac outcrops occur along the steep-sided slopes of ravines leading down to the Potomac River shoreline in the Main Post area. In this area, the Potomac Formation is 36 to 98 feet (11 to 30 m) thick and is comprised of greater than 80% clay, primarily found along slopes (USGS, 1985, as cited in US Army Garrison Fort Belvoir, 1998a). At the site area, thin deposits of Tertiary alluvium and terrace deposits rest on sand and clay lenses of the Middle and Lower Potomac.

### **3.2.1.2 Geomorphology**

The land features on Fort Belvoir have been influenced by the effects of fluvial dissection by rivers and streams. Surface features range from smooth uplands to bluffs and V-shaped stream valleys (ravines) that rise abruptly from floodplains. The dominant geomorphic process is active riverine erosion and deposition during overbank flooding.

Lowlands and valley bottoms are typically underlain with alluvium. Surface drainage is commonly poor due to the shallow water table. The dominant geomorphic process in sloping valley sides is characterized by gravitational mass wasting. Drainage usually occurs as surface runoff, with runoff being greatest on the steeper slopes and increases with the removal of vegetation and disturbance due to construction. This condition greatly increases the rate of erosion and the probability of creep and slumping (excerpted from information in the Fort Belvoir files).

The site area is located in a zone of physiographic transition between well-to-moderately well-drained uplands and poorly drained lowlands. Sands, silts and clays underlie the uplands. Uplands that are underlain by clayey soils form undulating and rolling hills. The dominant geomorphic process in these areas is mass wasting which includes downhill creep, landslides, slumping and rockfalls.

### **3.2.1.3 Topography**

The terrain of the Main Post of Fort Belvoir consists of two nearly level plateaus that run south-southeast towards the Potomac River, and slope steeply to lowlands that are primarily associated with the floodplains of the Accotink, Dogue, and Pohick Creeks (USGS, 1983). Steep-sided ravines surround the two plateaus on the east, south, and west sides, which give rise to numerous upland tributaries. Uplands and plateaus make up about 40 percent of the land area in the Main

Post, while lowlands make up another 40 percent, and steep slopes make up the remaining 20 percent.

The gently sloped lowland areas between the plateaus are associated with the floodplains of Accotink, Dogue and Pohick Creeks. Slopes range from 10% grade at their upland fringes to almost level along the active floodplains. In the floodplains, numerous relict channels provide local relief of 2 to 10 feet (0.6 to 3 m). Additional lowland areas exist between the shoreline and the steeply-sloping terrain that surround the two plateaus.

The land ranges in elevation from approximately mean sea level (MSL) along the Potomac River to approximately 230 feet (70 m) MSL at the Beulah / Woodlawn Road intersection, located on the eastern plateau. The western plateau, named the Pohick Bay Plateau, is located in the forested training area south of US 1, which includes the site area. This plateau is lower in elevation with the highest point being 170 feet (51.8 m) MSL and is more gently sloping than the eastern plateau. This high point is located approximately 800 feet (244 m) south of the Britten Road / US 1 intersection, directly south of the Davison Army Airfield.

The site area lies on that portion of the Pohick Bay Plateau that falls between the Accotink Creek drainage area to the east and the Pohick Creek drainage area to the west (Figure 3-1). The OCR/US 1 intersection is located near the high point of the plateau at 160 feet (49 m) above MSL. From this point, the plateau slopes gradually to the south and southwest into the Pohick Creek drainage area. The site area is generally flat to gently rolling topography except for a steep 18-foot (5.5-m) northeast-southwest embankment that parallels the east side of OCR. This embankment would be modified by VDOT's plan to realign OCR (Subchapter 3.2.2).

The site area east of the Belvoir Woods Parkway (BWP) / US 1 intersection has a predominantly north-facing slope. This area drains into the Accotink Creek watershed area (Figure 3-2) 0.9 miles (1.45 km) to the east between Davison Army Airfield and the Fairfax County Parkway.

#### **3.2.1.4 Soils**

The Natural Resources Conservation Service (NRCS), formerly the Soil Conservation Service (SCS) surveyed the Fort Belvoir soils in 1982 (US SCS, 1982). The SCS soil survey described and delineated 19 named soil series in Fort Belvoir. Some series occur in more than one phase. The survey data were incorporated into the Fort Belvoir Geographic Information System (GIS). In addition to the 19 named soil series, there are areas of mixed alluvium (Entisols) and tidal marsh (Histosols) that are not sufficiently defined to be classified as a series. Of the area included in the survey, 1,898 acres (768 ha) are described as urban built-up and 587 acres (238 ha) are described as non-series units cut and fill (US Army Garrison Fort Belvoir, 2001b).

Cut and fill soils generally have an unknown source and are likely to be made of material selected for high structural stability brought on construction sites. Urban land is generally composed of native soils on ridge tops or other well-drained flatter areas that have been



minimally to drastically altered by construction and landscape management. Areas in the urban built-up unit that are not under buildings or paving are vegetated and soil fertility is maintained by amendment.

Predominant soils series in the site area are: Beltsville silty loam (33%); Dumfries sandy loam (16%), Mattapex silt loam (8.5 %), and Lunt fine sandy loam (8.5%). Textures range from coarse sand to silt, but are mostly fine sand to silt. No prime farmlands exist in the proximity of the site area. The predominate characteristics of the Beltsville, Mattapex and Dumfries soil series are: moderate to well-drained; moderate water capacity; and a moderate to severe erosional hazard (Appendix A).

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## **3.2.2 Water Resources**

### **3.2.2.1 Groundwater**

Fairfax County is underlain by three main groundwater aquifers: Bacon's Castle Formation and the Middle and Lower Potomac (Table 3-3 and 3-4). Groundwater on Fort Belvoir is found predominantly in the Lower Aquifer. This aquifer, as well as the Middle Aquifer, is represented by a thick zone of interbedded layers of fine to coarse poorly sorted sands that are separated by less permeable confining clay wedges (US Army Garrison Fort Belvoir, 2001b).

The Lower Aquifer is the principal source of potable water below Fort Belvoir and is recharged at outcrops from vertical movement from overlying, water-bearing, sand bodies of the Potomac Formation. Groundwater flow in this aquifer is generally towards the southeast (US Army Garrison Fort Belvoir 2001d) and is recharged in the north and west section of Fort Belvoir (Grogin and Widdowson, 1998). Precipitation is the sole source of recharge for the aquifers in the Fort Belvoir area. The small amount of acreage in the site area makes it insignificant as a recharge area for any shallow, unconfined aquifers that may be present.

The depths to the groundwater table and to the underlying aquifers are influenced by varying surface elevations from 70 to 225 feet (21 to 69 m) MSL in the site area. Although no ground water data are available for the immediate area, the site area is expected to have a perched water table and depth to water would be shallow, ranging between 10 to 35 feet (3 to 11 m) below ground surface. However, at some locations, very fine-grained low-permeability sediment, such as clay or fine silt, is present in the subsurface, creating isolated local or regional confining layers. These confining layers may locally restrict vertical movement of groundwater. In areas near streams, the water table may be at or near the ground surface.

Table 3-4  
Groundwater in the Coastal Plain on Fort Belvoir

Unit	Subunits	Characteristics
Potomac Formation	<b>Upper Aquifer</b> (Albirupear)	<i>Not present at Fort Belvoir</i>
	<b>Middle Confining</b> (Iron Ore clays)	less permeable clays and fine-grained silts <i>Not present at Fort Belvoir</i>
	<b>Middle Aquifer</b> (Aquia Creek)	sand layers are the main water-bearing unit; water flow is not well documented in the vicinity of the site area.
	<b>Lower Confining</b> (Mount Vernon clays)	less permeable clays and fine-grained silts
	<b>Lower Aquifer</b> (Rappahannock)	sand layers are the main water-bearing unit on Fort Belvoir; principal source of potable water in Belvoir is the lower 100 feet. Groundwater flow is to the southeast.
	Nanjemoy-Marlboro	less permeable clays and fine-grained silts

Source: Grogin and Widdowson, 1998.

Groundwater from the Piedmont Plateau is mostly soft to moderately hard, while the groundwater in the Potomac Formation is soft sodium bicarbonate water. Quality depends on the extent of mixing with salt water. On Fort Belvoir, wells can deliver up to 250 gallons (950 liters) per minute or more. Even though groundwater on the installation is potable it is only used for irrigation (BRAC, EIS, 1999).

### 3.2.2.2 Surface Water

Fort Belvoir is located in the Potomac River watershed, the second largest tributary of the Chesapeake Bay, and in the lower reaches of three major tributaries to the Potomac: Accotink Creek, Dogue Creek, and Pohick Creek (Figure 3-2). Surface water quality of Accotink Creek and its tributaries may decrease during periods of development and construction because of increased runoff and subsequent surface erosion. An estimated 10,000 tons (10.2 metric tons) of silt are contributed to the Potomac River annually in the surface water runoff of these three tributaries (BRAC, EIS 1999).

National Water Quality Assessment (NAWQA) is a national program developed by the United States Geological Survey (USGS) that began in 1991 to focus on the water quality of more than 50 major river basins. Sampling for the 1992 through 1996 NAWQA indicated that nutrient and pesticide concentrations in the streams of the Potomac River Basin (Ator et al., 1998) are among the highest in the nation. These concentrations are generally related to urban and agricultural land in the contributing watersheds. Although the water quality of streams running through Fort Belvoir has not been determined, water quality of Gunston Cove was rated 'fair' based on a 1985 study conducted by the Interstate Commission on the Potomac River Basin (ICPRB). During the study, water quality tests were conducted and samples analyzed for such indicators as pH, dissolved oxygen and suspended solids (BRAC EIS, 1991).

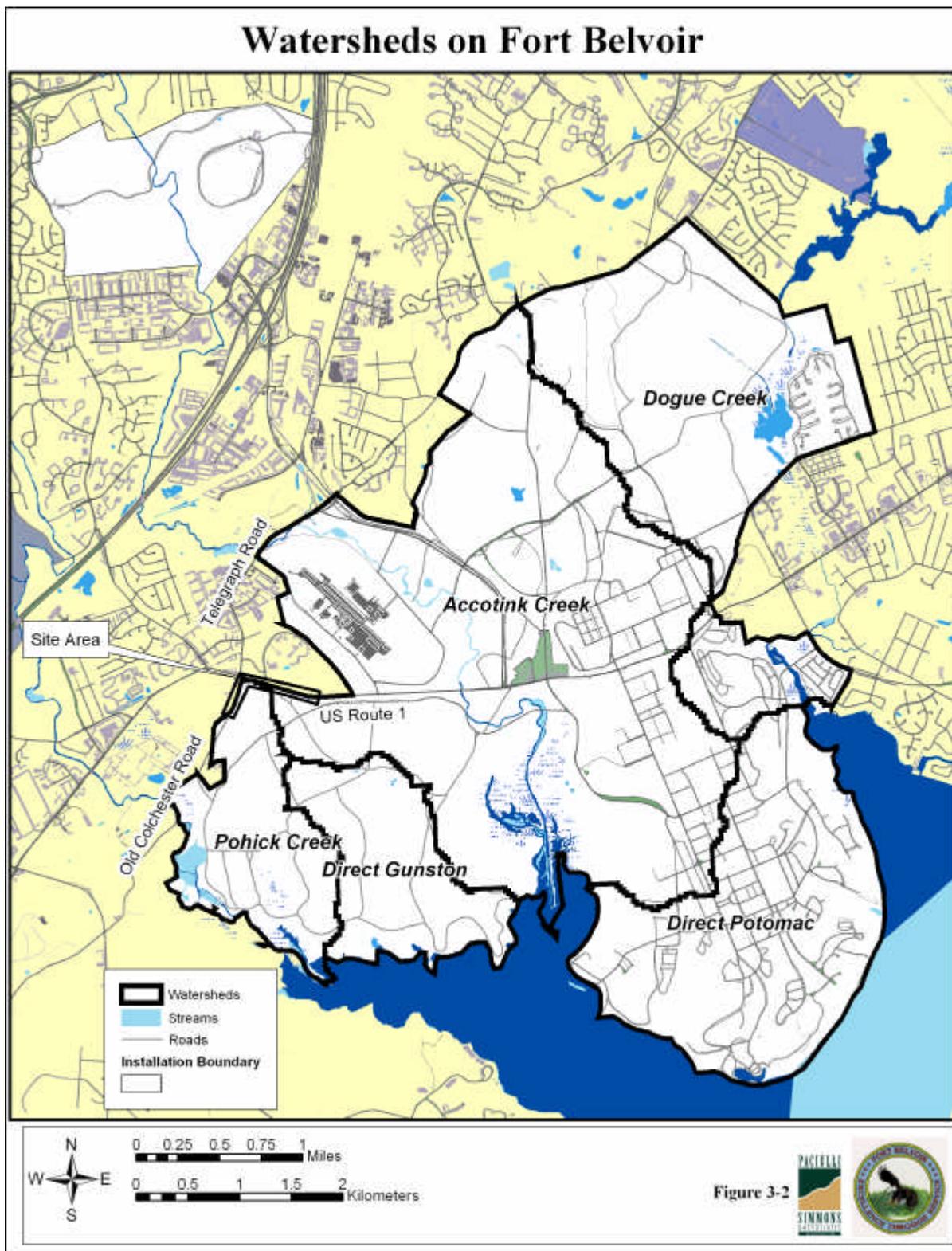


Figure 3-2

Overall, the results of the NAWQA Program indicate that Accotink Creek north of Fort Belvoir is significantly impacted by urbanization (Ator, et al., 1998). Dogue and Pohick Creeks, while not sampled, could be expected to have similar types of impacts. The water resources survey for Fort Belvoir indicates that the aquatic resources deserve ‘high conservation priority’. For instance, the Pohick Bay watershed possesses significant natural resources with high conservation priority. Pohick Creek, although not included in the NAWQA study, receives effluents from the Norman J. Cole, Jr. Pollution Control Plant, which receives approximately half of the sewage generated in Fairfax County (US Army Garrison Fort Belvoir, 2001b).

Fort Belvoir’s stormwater system consists mostly of open channels that receive sheet flow and point source flow from the post’s three major watersheds. All storm water is ultimately discharged to the installation’s watercourses through approximately 22.4 miles (36 km) of drainage ditches and 60 miles (97 km) of storm drains.

Three surface water drainage features are located in the site area (from east to west):

- ?? An ephemeral swale, located along the south side of US 1 approximately 500 feet (152 m) west of the east terminus of the project. Water in this swale drains into the Accotink Creek watershed.
- ?? A low-lying wooded swale that is connected to an uplands non-jurisdictional wetlands area located 250 feet (76 m) south of US 1 midway between the Belvoir Woods Parkway (BWP) and the gravel road mentioned previously. Water in this swale drains into the Accotink Creek watershed.
- ?? An ephemeral swale that occurs within the steep ravine 375 feet (114 m) south of the OCR / US 1 intersection. Surface water in this swale flows under OCR and parallels the west side of the road until it drains into Pohick Creek near the Norman J. Cole, Jr. Pollution Control Plant, 0.75 mi (0.12 km) south of the site area.

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### **3.2.3 Environmentally Sensitive Areas**

Department of Defense (DoD) installations protect significant natural resources by designating them as special natural areas or “environmentally sensitive areas”. Such a designation allows an installation to focus its management on conservation, and to make resource access and use decisions accordingly. Environmentally sensitive areas on Fort Belvoir include the forest and wildlife corridor (FWC), floodplains, wetlands, wildlife refuges, steep slopes, stream valleys, mature forests and Chesapeake Bay Resource Preservation Areas (RPAs).

#### **3.2.3.1 Forest and Wildlife Corridor (FWC)**

A forest and wildlife corridor (FWC) is an area of forested wildlife habitat that connects two or more large forested areas of wildlife habitat. Such a corridor allows animal movement between the larger areas, thus maintaining a diverse gene pool and species survival. Fort Belvoir has

defined a 742-acre (300-ha) FWC that runs through the North and South Post of Fort Belvoir. The minimum 300-foot (91-m) wide corridor connects Huntley Meadows Park, northeast of Fort Belvoir with the Mason Neck National Wildlife Refuge, southwest of Fort Belvoir (Paciulli, 1993). Within Fort Belvoir proper, this corridor connects the 146-acre (59-ha) Jackson Miles Abbott Wetlands Refuge and with the 1,360-acre (551-ha) Accotink Bay Wildlife Refuge.

### **3.2.3.2 Floodplains**

As part of the National Flood Insurance Program, the Federal Emergency Management Agency (FEMA) has mapped flood hazard areas on Fort Belvoir. The flood insurance rate maps identify the areas that would be inundated by a 100-year flood and show the areas that would be inundated by a 500-year flood. There are 100-year floodplains associated with Pohick Creek and Bay, Accotink Creek and Bay, Dogue Creek, Gunston Cove and the Potomac River. In general, the 100-year floodplain is narrowest along shorelines with steep elevations and broadens where slopes are more gradual.

Floodplains are considered environmentally sensitive areas and are considered a constraint for planning and development. Based upon FEMA's Flood Insurance Rate Map (515525 0125D) and a site reconnaissance during preparation of this EA, no 100-year floodplain was identified in the site area.

### **3.2.3.3 Wetlands**

Fort Belvoir completed a baseline inventory of wetlands on the Main Post in 1997 (Paciulli, 1997a). The survey consisted of aerial photo interpretation combined with ground-truthing, following methods outlined in the *1987 Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory, 1987). Wetland types were classified according to the USFWS classification system (Cowardin, et al., 1979). The purpose of the survey was to identify and map the general locations and types of wetlands on the post, not to serve as jurisdictional determinations (US Army Garrison Fort Belvoir, 2001b).

The regional upland pattern in Fort Belvoir is characteristic of the upper Coastal Plain/Lower Piedmont, with wetlands typically occurring in association with the drainage network. The larger tributary waterways to the Potomac, such as Accotink Creek, Dogue Creek, and Pohick Creek, tend to have wide areas of tidal wetlands (marsh and mudflats) at their outfalls. Upstream from the outfalls the marsh wetland gives way to floodplain bottomland hardwood forest in the riparian zone. The floodplain bottomland hardwood forest areas tend to be wider in the lower reaches (US Army Garrison Fort Belvoir, 2001b).

Areas with beaver activity are an exception, such as Dogue Creek where beavers have flooded large areas, converting floodplain bottomland forest to freshwater marsh. Fort Belvoir has another characteristic wetland type: the seepage swamp wetland. This type of wetland occurs in steep-sloped areas along the Potomac River tributaries. The occurrences of this wetland type tend

to be limited. Based upon a site reconnaissance during preparation of this EA, no jurisdictional wetlands were identified in the site area.

#### **3.2.3.4 Wildlife Refuges**

The western edge of the Accotink Bay Wildlife Refuge – is located along the east side of OCR. The north limit of the refuge is along Stewart Road, located 210 feet (64 m) south of the site area.

#### **3.2.3.5 Chesapeake Bay Preservation Areas**

Under the *Federal Facilities Strategy* and *Federal Work Plan* of 1998 and the 1990 Memorandum of Agreement (MOA) between the USEPA and DoD, Fort Belvoir's actions are consistent to the extent practicable with the Fairfax County Chesapeake Bay Preservation Ordinance (CBPO). The CBPO was enacted pursuant to the Chesapeake Bay Preservation Act (CBPA), Sections 10.1-2100, et seq., of the Code of Virginia (VAC). This ordinance, currently under revision, divides the Fairfax County into Resource Protection Areas (RPAs) and Resource Management Areas (RMAs) designed to protect water quality in the Chesapeake Bay and its tributaries. According to the county CBPO, all land in Fairfax County is designated as an RPA or RMA because all the land meets the criteria of either an RPA or RMA (Fairfax County, 1993). Therefore, all non-RPA portions of the county are considered RMAs.

Non-water dependent uses, such as building construction, are generally not allowed in RPAs without a waiver. RPAs are comprised of 100-year floodplains or any area within 100 feet (30.5 m) of one or more of the following: tidal wetlands, tidal shores, perennial streams, or non-tidal wetlands connected or contiguous to tidal wetlands or perennial streams.

All land outside of an RPA is classified as an RMA. RMAs are lands that protect the RPAs, and, if improperly used or developed, have the potential to cause significant water quality degradation. These lands may include minor floodplains, highly-erodible soils, steep slopes, highly permeable soils, and certain non-tidal wetlands (Fairfax County, 1993).

The Fort Belvoir *Real Property Master Plan* considers Fairfax County designated RPAs, including floodplains, as environmentally sensitive areas (US Army Garrison Fort Belvoir, 2001b). Development is allowed in RMAs, but the development must meet certain performance criteria including “Best Management Practices” (BMPs); preservation of natural vegetation; minimal disturbance of land; and control of storm water runoff. The site area is in an RMA with the closest RPA associated with the Accotink Creek tributaries located approximately 325 feet (100 m) east of the eastern terminus of the site area.

### 3.2.4 Vegetation and Wildlife Habitats

Fort Belvoir developed an Integrated Natural Resources Management Plan (INRMP) that embodies the principles of ecosystem management to preserve native biodiversity. Through the INRMP, Fort Belvoir aims neither to manage for single species nor to increase the number of species or communities on-post. It embraces biodiversity conservation through an ecosystem-based natural resources management plan (US Army Garrison Fort Belvoir, 2001b).

The installation possesses a wide variety of habitats, from fairly extensive areas of undisturbed mature forest to significant areas of grassy habitat characterized by old-field seral succession, with transition areas in between them. There are also extensive stream, marsh, and riparian habitats on the installation, which support many wildlife species common to the eastern United States. An installation-wide vegetation study of Fort Belvoir (Paciulli, 1998a) identified 17 plant community types, four of which possess state conservation rankings of rare or “very rare”. These 17 types are included in the broader categories of mixed hardwood forests, pine forests, floodplain hardwood forests, wetlands, old-field grasslands and urban land.

In the site area, the dominant plant community is oak/ericad (heath family) forest (US Army Garrison Fort Belvoir, 2001b). This habitat type is dominated by a 40-year old canopy of white oak (*Quercus alba*) and chestnut oak (*Q. prinus*), northern (*Q. rubra*) and southern red oak (*Q. falcata*), scarlet oak (*Q. coccinea*) and black oak (*Q. velutina*) with American holly (*Ilex opaca*), black gum (*Nyssa sylvatica*) and some American beech (*Fagus grandifolia*). The understory trees are flowering dogwood (*Cornus florida*) and American beech (*Fagus grandifolia*). The ground layer is largely open, but with a significant amount of sweet lowbush (*Vaccinium angustifolium*), blueberry (*Vaccinium pallidum*) and scattered patches of huckleberry (*Gaylussacia* sp.) and catbrier (*Smilax glauca*). Some stands of Virginia pine (*Pinus virginiana*) occur in the dominant community.

Forested habitat is ecologically important for roosting, rearing, foraging, and refuge for avifauna and mammals (Table 3-5). Based on information from installation-wide surveys the post contains potential habitat for 43 species of mammals, 263 species of birds, 32 species of reptiles, 27 species of amphibians and 60 species of fish (Ernst and Miller, 1997; Ernst and Belfit, 1997, as cited in US Army Garrison Fort Belvoir, 2001b).

Due to previous disturbance and the existing roadways, potential wildlife habitat in the vicinity of the site area is limited. Species that can be expected to occur would be those that are highly tolerant of human disturbance (Table 3-6).

Table 3-5  
Wildlife Species Typical of Upland Hardwoods on Fort Belvoir

Scientific Name	Common Name
<b>Mammals</b>	
<i>Sylvilagus floridanus</i>	Eastern cottontail rabbit
<i>Sorex longirostris</i>	Southeastern shrew
<i>Blarina brevicauda</i>	Northern Short-tailed shrew
<i>Peromyscus leucopus</i>	White-footed Mouse
<i>Microtus pinetorus</i>	Pine Vole
<i>Sciurus carolinensis</i>	Eastern Gray Squirrel
<i>Glaucomys volans</i>	Southern Flying Squirrel
<i>Tamias striatus</i>	Eastern Chipmunk
<i>Marmota monax</i>	Woodchuck
<i>Odocoileus virginianus</i>	White-tailed Deer
<b>Birds</b>	
<i>Corvus brachyrhynchos</i>	American crow
<i>Turdus migratorius</i>	American robin
<i>Sturnus vulgaris</i>	European starling
<i>Passer domesticus</i>	House sparrow
<i>Cyanocitta cristata</i>	Blue jay
<i>Otus asio</i>	Eastern Screech Owl
<i>Strix varia</i>	Barred Owl
<i>Melanerpes carolinus</i>	Red-billed Woodpecker
<i>Picodes pubescens</i>	Downy Woodpecker
<i>Picodes villosus</i>	Hairy Woodpecker
<i>Colaptes auratus</i>	Northern Flicker
<i>Sayornis phoebe</i>	Eastern Phoebe
<i>Myiarchus crinitus</i>	Great crested Flycatcher
<i>Parus carolinensis</i>	Carolina Chickadee
<i>Parus bicolor</i>	Tufted Titmouse
<i>Sitta carolinensis</i>	White-breasted Nuthatch
<i>Thryothorus ludovicianus</i>	Carolina Wren
<i>Regulus calendula</i>	Ruby-crowned Kinglet
<i>Catharus fuscescens</i>	Veery
<i>Catharus minus</i>	Gray-cheeked Thrush
<i>Catharus ustulatus</i>	Wood Thrush
<i>Hylocichla mustelina</i>	Swanson's Thrush
<i>Vireo olivaceus</i>	Red-eyed Vireo
<i>Vermivora peregrina</i>	Tennessee Warbler
<i>Dendroica magnolia</i>	Magnolia Warbler
<i>Dendroica coronata</i>	Yellow-rumped Warbler
<b>Amphibians</b>	
<i>Plethodon cinereus</i>	Red-backed Salamander
<i>Plethodon glutinosus</i>	Slimy Salamander
<i>Bufo americanus</i>	American Toad
<i>Bufo woodhousei fowleri</i>	Fowler's Toad
<i>Rabna catesbeiana</i>	Bullfrog
<i>Rana clamitans</i>	Green Frog
<i>Rana palustris</i>	Pickerel Frog
<b>Reptiles</b>	
<i>Coluber constrictor</i>	Northern black racer (Snake)
<i>Elaphe obsoleta</i>	Rat Snake
<i>Thamnophis sirtalis</i>	Eastern garter snake
<i>Terrapene carolina</i>	Eastern Box Turtle

Derived from Ernst, et al., 1990 and Abbott, 1988

Table 3-6  
Wildlife Species that may use Open Areas and Edge Habitat along Fort Belvoir Roads

Scientific Name	Common Name
<i>Sylvilagus floridanus</i>	Eastern cottontail rabbit
<i>Microtus pennsylvanicus</i>	Meadow Vole
<i>Marmota monax</i>	Woodchuck
<i>Zapus hudsonicus</i>	Meadow Jumping Mouse
<i>Falco sparverius</i>	American Kestrel
<i>Spizella passerina</i>	Chipping Sparrow
<i>Spizella pusilla</i>	Field Sparrow
<i>Melospiza melodia</i>	Dark-eyed Junco
<i>Junco hyemalis</i>	Morning Dove
<i>Zenaidura macroura</i>	Northern Cardinal
<i>Cardinalis tristis</i>	Rufous-sided Towhee
<i>Pipilo erythrophthalmus</i>	American Goldfinch
<i>Tyrannus tyrannus</i>	Eastern Kingbird
<i>Passerina cyanea</i>	Indigo Bunting
<i>Carpodacus mexicanus</i>	House Finch

Derived from Ernst, et al., 1990 and Abbott, 1988

### 3.2.5 Rare, Threatened and Endangered Species

The Endangered Species Act (ESA) of 1973 and subsequent amendments provide for the conservation of threatened and endangered species of animals and plants and the habitats in which they are found. The Department of the Army ensures that consultations are conducted as required under Section 7 of the ESA for any action that “may affect” a federally listed threatened or endangered species according to Army Regulation (AR) 200-3, Natural Resources – Land, Forest, Wildlife Management. The Army also complies to the extent practicable with state rare, threatened and endangered species regulations.

According to, Virginia Department of Conservation and Recreation, Division of Natural Heritage (DNH) three federal, or state-listed species of animals are known to occur on Fort Belvoir:

- ?? The bald eagle (*Haliaeetus leucocephalus*) has been proposed for delisting by the federal government, however it is still federally-listed as threatened and state-listed as endangered. The shorelines of major creeks, rivers and lacustrine areas on Fort Belvoir provide valuable nesting, foraging and loafing habitat for resident and migratory bald eagles.
- ?? The wood turtle (*Clemmys insculpta*), a state-listed threatened species, inhabits forested floodplains and nearby fields, wet meadows and farmlands. Because this species over-winters on the bottoms of creeks and streams, a primary habitat requirement is the presence of water (Terwilliger and Tate, 1995). There is an established population of wood turtles at Huntley Meadows Park, northeast of the Jackson Miles Abbott Wildlife Refuge. There have been three wood turtle

sightings on Fort Belvoir in the vicinity of the Jackson Miles Abbott Wetland Refuge, indicating that this species may become established on the installation. However, Dr. Joseph Mitchell in a post-wide search in 2002 did not find any wood turtles. Although highly terrestrial, wood turtles must remain in moist habitats. Thus, suitable habitat for the wood turtle has not been observed in the site area.

- ?? The peregrine falcon (*Falco peregrinus*), a state-listed endangered species, occurs along the Accotink Creek/Accotink Bay stream system during fall migration. Peregrine falcons have been recorded during three fall migrations (six sightings in 1998, four in 1999, and three in 2000) at Fort Belvoir.

The Bald Eagle tends to nest in areas that are close to the shore and far away from human disturbances. The site area is not in close proximity of the Accotink Creek corridor in which the bald eagle and peregrine falcons frequent. The loggerhead shrike uses areas of short grassland and closely grazed pasture that do not occur in the proposed site area. The upland sandpiper, sighted in other parts of Fairfax County, prefers habitat of open farming areas that do not exist in the site area. The pygmy shrew has been documented by Ernst, et al., 1990, however, it is not expected to inhabit the site area. The preferred habitat, wet meadows and fields, of the Henslow's sparrow do not exist in the site area. The sparrow has been sighted to the west of Fort Belvoir, however, its secretive nature makes it hard to confirm whether or not it exists on Fort Belvoir.

USFWS has indicated that one plant species is federally-listed as threatened, the sensitive joint-vech (*Aeschynomene virginica*), and one federally-listed species as endangered, the small whorled pogonia (*Isotria medeoloides*), occur in adjacent counties and may occur in Fairfax County. According to the vegetation surveys summarized in Fort Belvoir's INRMP (US Army Garrison Fort Belvoir, 2001b) neither species has been found on Fort Belvoir.

Three state agencies – the Virginia Department of Agriculture and Consumer Services (VDACS), Office of Plant and Pest Services; the Virginia Department of Game and Inland Fisheries (VDGIF); and Virginia Department of Conservation and Recreation, Division of Natural Heritage (DNH) – will be consulted for potential occurrences of federal or state rare, threatened or endangered animal species in selected areas on Fort Belvoir. A previous review indicated no documented occurrences in the site area (US Army Garrison Fort Belvoir, 2001a) and was further confirmed by site reconnaissance during December 2002 and January 2003.

In December 2001, the site area was checked for the occurrence of habitat for the small whorled pogonia (*I. medeoloides*) by Dr. Donna Ware of William and Mary College. She stated potential habitat for this rare plant is located in the interior areas of the Southwest Area. Some ground layer “associates” of the small whorled pogonia are present near to the site area, e.g. strawberry bush (*Euonymus americanus*) and catbrier (*Smilax glauca*). A lot of decaying wood debris litters the ground. However, with the exception of a few microsites, the overriding presence of a dense shrub layer and/or greenbrier (*Smilax rotundifolia*) infestations make the likelihood of the

occurrence of this plant negligible. Other parts of the site area are dominated by forest types unsuitable for orchid growth, such as Virginia pine (*Pinus virginiana*) or are highly disturbed, such as the dumpsite and remains of building a foundation referenced in Subchapter 3.3.3. Dr. Ware believes that if the forest is disturbed less than 80 feet (24.4 m) from existing roads (OCR and US 1), as is the case for the site area, potential habitat for the plant would not be affected (Ware, 2002).

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### **3.3 Cultural Resources**

Fort Belvoir encompasses a unique collection of historic properties associated with the pre-installation history and the early development of the installation as a training camp (US Army Garrison Fort Belvoir, 2001c). These resources include buildings and structures, as well as archeological sites. Fort Belvoir's current cultural resources program is the result of an extensive series of identification, evaluation, management, and interpretation efforts dating back to the 1920's. The Fort Belvoir *Integrated Cultural Resources Management Plan (ICRMP)* identifies the post's cultural resources and provides guidelines for the management of these resources. According to the ICRMP, the Fort Belvoir Historic District has several National Register-eligible properties, all of which are listed in the Virginia Landmark Register.

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#### **3.3.1 Fort Belvoir Historic District**

The Fort Belvoir Historic District consists of 196 contributing resources, primarily built in the 1930s and 1940s. The district is significant for its Colonial Revival architecture and community plan of typical military post dating between the 1920s and 1930s. The district constitutes the geographic and historic center of the post and encompasses the installation's administrative and residential core to include a central parade ground surrounded by the main administrative buildings. The ICRMP notes that the district should be expanded to include several clusters of officer housing similar to the 1920s Arts-and-Crafts-style dwellings included in the present boundaries (US Army Garrison Fort Belvoir, 2001c).

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#### **3.3.2 Pohick Church and Old Colchester Road (OCR)**

Two properties adjacent to the site area are considered historically significant by the Department of Interior and Virginia Department of Historic Resources (VDHR): the Pohick Episcopal Church at the OCR / US 1 intersection and Old Colchester Road (OCR).

The Pohick Church, originally constructed in 1772, is located on the southwest corner of the OCR / US 1 Intersection. The entire 39.5-acre (16-ha) church property to include the church cemetery is listed on the National Register of Historic Places (NRHP) and is designated as a historic district according to the Fairfax County Planning Commission. A one-story, brick Vestry House, built in 1932, is located immediately to the east of the church, while a brick Parish House, built in 1968, is located immediately to the south. Other features include a brick wall that

surrounds a portion of the church property. The wall extends southward along OCR to the Parish House. Aside from the church, graveyard, brick wall, Vestry House and Parish House, the majority of the church’s remaining property is wooded.

OCR is a 4.2-mile (6.77 km) long two-lane undivided rural road that has historically been known as part of the Potomac Path, King’s Highway (also known as the Boston Post Road) and the Alexandria-Colchester Road. The road runs northeast from the town of Colchester located on the Occoquan River, across the north end of Mason Neck, to the US 1 intersection. The asphalt-paved, hard surface road varies in width from 20 to 24 feet (6 to 7.3 m), has open ditches, narrow shoulders, earth embankments, metal guardrails, numerous curves and a single-lane bridge. The wooden-decked bridge over Pohick Creek is constructed of steel girders on an older stone foundation, which is encased in concrete. The present road, follows both the topography and alignment of the original 18<sup>th</sup> century dirt roadway with at least two exceptions: 1) a 1,000-foot (305 m) ‘by-pass section’ between Stewart Road and the Pohick Creek Bridge was straightened to eliminate two sharp curves; and 2) a vertical realignment south of Gunston Road.

Table 3-7  
Eligibility Criterion for Road Inclusion in the National Register of Historic Places (NRHP)

Criterion	Comment
<b>A - Transportation Road</b>	Originally developed in 1662, became part of the north-south colonial transportation corridor known as the King’s Highway. In 1807, OCR was bypassed when a bridge linked Occoquan to Alexandria via US 1. After that, the road only served as a dirt road that connected the town of Colchester with Pohick Church. As it exists today, OCR is a mid-20 <sup>th</sup> century road that follows an 18 <sup>th</sup> century course.
<b>A – Military Road</b>	Used by General Rochambeau, commander of the French Army, for troop movements between 1781-82, to and from the Battle of Yorktown. Camp was made in the town of Colchester, however at no time did General Rochambeau march along this segment of OCR with his men.
<b>B – Significant Individual</b>	No association with any significant individuals. George Mason family traveled the road between Colchester and Pohick Church, however, no significant event was documented. It was a rural road used to get from one place to the next.
<b>C – Distinctive Characteristics</b>	Although OCR is characteristic of a mid-to-late 20 <sup>th</sup> century road, it displays characteristics of an 18 <sup>th</sup> century route.
<b>D – Archaeological Sites</b>	No associated archeological sites occur along the route. Archaeological resources that predate road construction may be present, however past road construction probably destroyed them. Scattered artifacts or road-related features that pertain to road’s period of significance are not considered significant under this criteria.

Source: URS, 2002

In Spring 2002, the URS Corporation evaluated OCR using the National Register Criteria (Table 3-7 and Table 3-8). URS assessed the road's characteristics, period of significance and road integrity and concluded that it was not eligible for the NRHP.

In October 2002, however, the National Park Service (NPS) evaluated OCR and determined it to be eligible for listing on the NRHP under 36 CFR 63.2 (NPS, 2002). The Keeper of the National Register determined that the OCR roadway is historically significant for its role in the history of Fairfax County transportation under the National Register Criterion A. OCR is considered to be one of the earliest transportation routes in northern Virginia and consequently played a prominent role in the area's historic development. In addition, the OCR roadway, despite minor alterations over its 300-year history, retains sufficient integrity to convey its historic importance.

Based on the eligibility determination made by the Keeper of the National Register, a Determination of Effects was performed on VDOT's planned intersection improvements along OCR (URS, 2003). This evaluation determined that the proposed intersection improvements have designed sufficient measures to minimize impacts to OCR.

Table 3-8  
Summation of Integrity Aspects for OCR

Aspect	Quality
<b>Location</b>	The roadway has undergone minimal deviation from its historical route.
<b>Design</b>	Has had four alterations in the 20 <sup>th</sup> century: a) a 'bypass section' south of the site area; b) the 'river road' spur in the town of Colchester; c) a vertical realignment south of Gunston Road; and d) widening to accommodate turn lanes.
<b>Setting</b>	Roadside setting has been altered by post-1950 construction, such as suburban residences, driveways, the Norman J. Cole, Jr. Pollution Control Plant and a Fairfax County maintenance building. This construction has created new landscapes of cleared lots, established lawns and planted trees. Only two buildings along the route are on the National Register: Fairfax Arms in the town of Colchester (circa 1750's) and The Pohick Church (circa 1807).
<b>Materials</b>	OCR is asphalt covered with a single-lane, timber-decked bridge across Pohick Creek.
<b>Workmanship</b>	The current OCR roadway reflects modern highway design and construction practices.
<b>Feeling</b>	The changes in material and late-20 <sup>th</sup> century intrusions, such as residences, driveways, plant and maintenance buildings, give OCR a mid-20 <sup>th</sup> century appearance and feeling.
<b>Association</b>	Prior to 1807, OCR was in continuous use. It then became a rural, country road when it was bypassed in favor of US 1. The construction of the Alexandria to Fredericksburg railroad link in 1872, fostered a further decline in OCR usage.

Source: URS, 2002

### 3.3.3 Archeological Sites

According to the ICRMP, archaeological resources on Fort Belvoir have been extensively surveyed and a total of 302 archaeological sites have been identified, one of which – the Belvoir Manor Ruins and Fairfax Gravesite (44FX4) – is listed in the NRHP (US Army Garrison Fort Belvoir, 2000c). Archeological investigations have been conducted at Fort Belvoir since the 1930's. By the early 1990s, Fort Belvoir completed archeological surveys of all the undisturbed portions of the post.

In 1992, a disturbance assessment was made during a Phase I Cultural Resources Survey of the US 1 Project Corridor (Polk, et al., 1992). The survey determined that three archeological sites were located in the area of potential effect (APE) boundary. A second site reconnaissance of the three sites to determine archeological significance was made by Ms. Loretta Lautzenheiser in 2002 (Table 3-9). She determined that all three sites were severely disturbed; lacked archeological potential; and were not suitable candidates for the NRHP.

Table 3-9  
Archeological Sites Identified in the Site Area

Site #	Comments
44FX1657	Has 2 Concrete foundations. The one closest to US 1 has been pushed out of place. The structure originally mapped in 1879, was identified as a possible school (Polk, et al., 1992). While there is no firm evidence to refute this, a collection of wine bottles suggests another use. Numerous surface artifacts (early to mid 20 <sup>th</sup> century in age) recovered from trash piles is likely a result of trash dumping. Based on the number of trash piles, it is probable they were a result of building demolition. While the original recommendations suggest that the site retained intact soil stratigraphy and structural features, more recent investigations suggest that the area has been severely disturbed. Significant ground disturbance has been associated with the site. While there are numerous surface artifacts, they cannot be firmly associated with site deposits. Based on this investigation, it appears that this site does not appear to retain integrity and would not have the ability to yield significant information.
44FX1679	Low density Native American non-diagnostic lithic scatter of indeterminate age with no subsurface integrity. Artifacts, such as fire-cracked rock, debitage, and a quartzite ax were recovered from the humus level. Based on limited artifacts and information obtained, the site does not appear to have the ability to yield important prehistory information.
44FX1680	Low density Native American non-diagnostic lithic scatter of indeterminate age with no subsurface integrity. Site area has been essentially destroyed by military training and there would be no involvement with this site area.

Source: Lautzenheiser, Loretta et al., 2002.

## **3.4 Climate and Air Quality**

### **3.4.1 Climate**

Virginia's climate is classified as humid subtropical. Fort Belvoir's proximity to the Atlantic Ocean on the east and its low altitude are the major forces influencing its climate. January and February are the coldest months at Fort Belvoir, with an average temperature of 34<sup>0</sup>F (-1<sup>0</sup>C). July is the hottest month with an average temperature of 79<sup>0</sup>F (21<sup>0</sup>C). Prevailing winds are from the north during the winter months. This means that Virginia is characterized by warm or hot summers and mild winters, and receives sufficient precipitation to support woodland.

Temperature and precipitation patterns across Virginia vary by topography and distance from the coast. Virginia is located in a zone of prevailing westerly atmospheric motion. Occasional weather systems that move up the coast from the south are responsible for the heaviest storms and more than half the total annual precipitation (Terwilliger, 1996).

Average annual precipitation is 42 inches (107 cm), and is generally well distributed throughout the year with the highest precipitation in the summer months and lowest in the winter. The Atlantic Ocean and Gulf of Mexico are the principal sources of moisture. Moist, tropical air flows from the southwest in summer and early fall. The frost-free season is 265 days at Fort Belvoir. Snowfall averages 20.6 inches (52 cm), and rarely stays on the ground for more than a few days (US Air Force, 1998).

The greatest potential for flooding occurs in late winter and early spring, however storms in the late summer and fall can also cause flooding. Thunderstorms are common in the summer months, occurring an average of 44 days per year at Fort Belvoir (US Air Force, 1998). Hurricanes, which typically affect the weather in the United States during August, September, and October, have the potential to cause destructive high winds, torrential rains and flooding on Fort Belvoir if they enter Virginia or pass close offshore.

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### **3.4.2 Local Ambient Air Quality**

Ambient Air Quality is monitored by the Virginia Department of Environmental Quality (VDEQ) at several locations in the Northern Virginia Area (Table 3-10) for National Ambient Air Quality Standards (NAAQS) governing carbon monoxide (CO), lead (Pb), nitrogen oxide (NO<sub>x</sub>), ozone (O<sub>3</sub>), particulate matter smaller than 10 microns (PM 10), sulfur dioxide (SO<sub>2</sub>), and total suspended particulates (TSP). At these air monitor stations, sensitive equipment measures the concentration of ambient air pollutant levels compared to the NAAQS.

Table 3-10  
Local Ambient Air Quality – Northern Virginia Area

Pollutant and Averaging Time	Monitored Data	Primary Standard	Secondary Standard	Monitoring Site Location
CO 1-hour Maximum <sup>1</sup> 8-hour Maximum <sup>1</sup>	9.7 4.1	35 9	35 9	McLean
Pb Quarterly Maximum <sup>2</sup>	0.01	1.5	1.5	Mount Vernon
NO <sub>x</sub> Annual Arithmetic Mean <sup>1</sup>	0.023	0.053	0.053	Falls Church
O <sub>3</sub> 1-hour Maximum <sup>1</sup>	0.129	0.12	0.12	Upper Cub Run Sewage Treatment
PM <sub>10</sub> Annual Arithmetic Mean <sup>2</sup> 24-hour Maximum <sup>2</sup>	20 47	50 150	50 150	Mount Vernon
SO <sub>2</sub> Annual Arithmetic Mean <sup>1</sup> 24-hour Maximum <sup>1</sup> 3-hour Maximum <sup>1</sup>	0.009 0.028 0.048	0.03 0.140 -	- - 0.500	McLean
TSP Annual Geometric Mean <sup>2</sup> 24-hour <sup>2</sup>	40 93	75 260	60 150	Springfield

<sup>1</sup>in parts per million (ppm)    <sup>2</sup>in grams/meter<sup>3</sup> (g/m<sup>3</sup>)

Source: Virginia Ambient Air Monitoring 1998 and 1999 Data Reports, VDEQ

Fairfax County is included in the “Northern Virginia area” that is categorized as a serious nonattainment area for O<sub>3</sub>. There have been as many as five O<sub>3</sub> monitoring stations in operation in Fairfax County since 1995 (Table 3-11). The measured ambient air concentrations were well below the corresponding NAAQS, except for O<sub>3</sub>. O<sub>3</sub> exceedences are expected in Fort Belvoir area since the closest monitoring site located at Mount Vernon has been designated an O<sub>3</sub> nonattainment area for the 1995-2000 period.

Table 3-11  
Highest 1-hour Ozone (O<sub>3</sub>) Monitoring Data for Fairfax County (1995-2000<sup>1</sup>)

Station	1995	1996	1997	1998	1999	2000
Chantilly	<b>0.138</b>	0.108	0.109	<b>0.129</b>	0.118	0.098
Mt. Vernon <sup>2</sup>	<b>0.131</b>	<b>0.125</b>	<b>0.124</b>	<b>0.127</b>	<b>0.130</b>	<b>0.125</b>
Lee Park	ND <sup>3</sup>	ND	ND	0.118	0.128	0.093
Arlington	<b>0.120</b>	0.105	<b>0.131</b>	<b>0.127</b>	<b>0.134</b>	0.111
Lewinsville	<b>0.146</b>	0.108	0.115	<b>0.123</b>	<b>0.125</b>	0.112

<sup>1</sup>in parts per million (ppm)    <sup>2</sup>closest to Fort Belvoir    <sup>3</sup>ND = No Data

Bold denotes O<sub>3</sub> values exceeding NAAQS standard of 0.12 ppm.

### 3.4.3 Air Pollution Sources

The predicted maximum peak hour CO impacts are presented in Table 3-12 and 3-13. The worst-case CO conditions occur during the PM peak period at the intersection of US 1/Backlick Road/Pohick Road, and during the AM peak period at the intersection of Kingman Road/Fairfax County Parkway. The modeling results indicate no existing violations of NAAQS standard: 35 ppm for one-hour CO level and 9 ppm for eight-hour CO level.

Table 3-12  
Weekday Existing Carbon Monoxide (CO) Levels

Intersection Receptor Location	1-Hour Concentration <sup>1</sup>	8-Hour Concentration <sup>1</sup>
US 1 / Backlick Road and Pohick Road - PM peak	9.6	5.5
Kingman Road / Fairfax County Parkway - AM peak	8.1	4.5

<sup>1</sup>in parts per million (ppm). Includes background concentrations of 6 ppm (1-hour) and 3 ppm (8-hour).

Table 3-13  
Worst Case CO Concentration Analysis along US 1

Location	1-hour <sup>1</sup>		8-hour <sup>1</sup>	
	Build	No-build	Build	No-build
Lorton Road				
Base 1998	7.3	N/A	4.1	N/A
2004	6.8	7.0	3.6	3.8
2022	7.1	9.5	3.9	5.7
Summer Crossing				
Base 1998	7.5	N/A	4.2	N/A
2004	N/A	7.4	N/A	4.1
2022	N/A	10.3	N/A	6.4
Pohick Cemetery				
Base 1998	8.0	N/A	4.6	N/A
2004	4.4	7.8	3.5	6.6
2022	6.9	11.6	3.7	7.4

<sup>1</sup>in parts per million (ppm). Includes background concentrations of 6 ppm (1-hour) and 3 ppm (8-hour).

Source: VDOT, 1998a.

Stationary sources at Fort Belvoir include 37 boilers, 31 generators, 2 incinerators, 9 regulated underground storage tanks (USTs), a Firefighting Training Facility, and over 225 insignificant

sources of air emissions. The insignificant stationary sources include closed sanitary landfills, above ground storage tanks (ASTs), spray painting operations, welding operations, asphalt paving activities, degreasers, oil-water separators, woodworking activities, printing operations, pesticide application activities, residential and other smaller #2 fuel oil and natural gas boilers and emergency generators (Werner, 2001).

Impacts of CO, the predominant pollutant emitted from gasoline-powered motor vehicles, peak 1-hour and average 8-hour CO concentrations were determined for the closest worst-case roadside sites (Table 3-13). The estimated CO concentrations shown are well below the NAAQS Standard: 35 ppm for one-hour CO level and 9 ppm for eight-hour CO level.

### 3.5 Noise

Noise levels depend on many factors, including: the quality of sound; magnitude of the change; time of day at which the changes take place; whether the noise is continuous or intermittent; and ability to perceive the changes. Noise levels are typically expressed in terms of decibels (dB), which are a logarithmic expression of sound energy. Frequency weightings such as A-weighted decibels, or dBA, are the weighting network most often applied to traffic noise evaluations. Human ability to perceive changes in noise levels varies widely with the individual, as does response to the perceived changes. The average ability for an individual to perceive noise level changes is well documented (Table 3-14). These thresholds permit estimation of an individual's probable perception of changes in noise levels.

Table 3-14  
Average Ability to Perceive Changes in Noise Levels

Change in dBA	Human Perception of Sound
2-3	Barely perceptible
5	Readily noticeable
10	A doubling or halving of the loudness of sound
20	A 'dramatic change'
40	Difference between a faintly audible sound and a very loud sound

Source: FHWA, 1995.

The dBA scale de-emphasizes the very low and very high frequencies and emphasizes the middle frequencies, thereby closely approximating the frequency response of the human ear. This places the noise levels in a context to which people can more easily relate. Table 3-15 provides examples of common outdoor noise levels and their respective noise level in decibels.

The extent to which individuals are affected by noise sources is controlled by several factors:

- ?? duration and frequency of sound
- ?? distance between sound source and receptor
- ?? intervening natural or man-made barriers or structures
- ?? ambient environment

Generally, the level of highway traffic noise increases with: heavier traffic volume; higher traffic speeds; and greater number of trucks in the flow of traffic. FHWA has determined that heavy-duty trucks typically produce more noise than medium-duty trucks traveling at the same speed, which in turn generate more noise than automobiles.

Some noise is caused by activities essential to a community's "Quality of Life" for its inhabitants, such as emergency vehicle sirens, garbage collection operations, and construction and maintenance equipment. Other sources of noise, such as traffic and aircraft, arise from the movement of people and goods, activities that are essential to the viability of the community or region as a place to live and conduct business. Although these and other noise-producing activities are endemic to modern life in many locales, the noise they produce is sometimes undesirable and may detract from the quality of the environment.

Existing noise levels in the vicinity of Fort Belvoir are typical of those normally associated with nearby land uses and the overall level of development in the area, which can be classified as suburban. The primary source of noise near the site area is vehicular traffic. For a typical suburban area with associated traffic conditions, noise levels are normally about 50 dBA of background noise and about 70 dBA near sidewalks adjacent to traffic routes.

Table 3-15  
Common Outdoor Noise Levels

Noise Source	Level (dBA)
Air raid siren at 50 feet (15.25 m)	120
On platform by-passing subway; jet fly over at 1,000 feet (305 m)	100
On sidewalk by-passing heavy truck / bus; gas lawn mower at 3 feet (0.91 m); diesel truck at 50 feet (15.25 m)	90
On sidewalk by typical highway; noisy urban daytime	80
On sidewalk by-passing autos with mufflers; gas lawn mower at 100 feet (30.5 m)	70
Typical urban area background / busy office	60
Typical suburban area background; quiet urban daytime	50
Quiet urban at nighttime	40
Typical rural area at night	30

Source: Guide on Evaluation and Attenuation of Traffic Noise, AASHTO-1974 (City of New York, 1993).

The Fairfax County Comprehensive Plan contains general noise policy guidelines to allow development in noise impact areas. Fairfax County has adopted federal noise standards as a basis for the Comprehensive Plan policy guidelines (Heine, 1991). These guidelines attempt to minimize the potential for noise and land use conflict through the use of noise compatible planning strategies. Federal standards published by the Department of Housing and Urban Development (HUD) state that noise levels above 65 dBA DNL (day-night average sound level) interrupt human activity and adversely affect health, requiring mitigation. Therefore, in areas with sound levels above 65 dBA DNL, new noise sensitive development is discouraged in Fairfax County (Heine, 1991).

The Fairfax County Comprehensive Plan's noise policy minimizes the potential for noise and land use conflicts by using noise-compatible planning strategies. Although Fort Belvoir is not required to adopt these regulations, it is Fort Belvoir's policy to not take action that is incompatible with the Fairfax County noise guidelines and restrictions (Gillett, 1995).

DNL contours have been developed to model noise generated by aircraft and ground activities. The Federal Interagency Committee on Noise (FICON) has identified the 65 dBA DNL as appropriate for assessing aircraft and other noise impacts on residential land uses (FICON, 1992). At present, DNLs from average "busy day" aircraft operations do not exceed 65 dBA outside the Fort Belvoir or Davison Army Airfield boundaries (Rachami, 2000).

## VDOT Noise Study

Noise in the site area was studied previously by VDOT as part of the Route 1 Project 12906 Program Project Monitoring System (PPMS). Federal guidelines establish noise abatement criteria (NAC) for different land-uses (Subchapter 5.13), and the VDOT Noise Impact Analysis determined whether these criteria have been approached or will be exceeded due to the proposed project (Table 3-16). No noise-sensitive areas were identified near the OCR / US 1 intersection at that time (VDOT, 1998c). Commercial property in the area of Armistead Road and US 1 is not considered noise sensitive and Fort Belvoir has no noise sensitive activities adjacent to US 1. VDOT's noise analysis along US 1 reveals that for the design year 2022, traffic volume predictions would cause 53 residential properties, one recreational facility, one assisted living community and one cemetery to be impacted by project noise levels.

Table 3-16  
Noise Impact Analysis along US 1

Facility	Location	FHWA	1998 <sup>1</sup>	2022	
		NAC <sup>1</sup>		No-build <sup>1</sup>	Build <sup>1</sup>
Sunrise Community	Lorton Road	67	67	68	71
Woods of Fairfax	Ashland Lane	67	60	61	63
Woodside Apartments	Woodside Lane	67	68	68	72
Pohick Village Condos	Pohick Road	67	67	67	69
Southgate Woods Condos	Rhonnda Drive	67	65	65	68
Summer Crossing Condos	Old Pohick Way	67	62	63	68
Single-family Residence	Telegraph Road / US 1	67	62	65	66
Pohick Church Exterior	OCR / US 1	67	63	63	66
Interior	"	52	43	43	46
Cemetery	"	67	66	66	69
Fairfax Military Retirement	"	67	56	56	60

<sup>1</sup> In  $L_{eq}[h]$  or highest hourly equivalent sound level.  
Source: VDOT, 1998c

Two sound barriers to protect or eliminate the noise impacts between Pohick Road and Woodside Lane were considered in VDOT's Noise Impact Analysis (VDOT, 1998c) for this segment of US 1. These barriers would reduce the noise level from 5 to 9 dBA.

A third barrier, 190 feet (58 m) south of the pavement edge to protect the church's cemetery property, was not considered feasible. In order for a barrier to be effective it must provide a minimum of 5 dBA noise reduction. To provide this 5 dBA noise reduction barrier, the barrier would have to cross both cemetery entrances leading off US 1, plus block the US 1 entrances to

Pohick Church. In addition, sound barriers in a Historic District, such as Pohick Church, require approval from state and federal agencies.

Land uses sensitive to traffic noise would also be sensitive to construction noise. A method of controlling construction noise is to establish the maximum noise levels that construction operations can generate. In view of this, VDOT has developed specifications, which can be found in *VDOT's January 1997 Metric Road and Bridge Specifications, Section 107.14 (b.3), "Noise Pollution"*. The contractor would be required to conform to this specification to reduce the impact of construction noise on the surrounding community.

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### **3.6 Hazardous Substances**

Hazardous waste management at Fort Belvoir is conducted in compliance with the Resource Conservation and Recovery Act (RCRA). Fort Belvoir has a Hazardous Waste Management / Waste Minimization (HWMP) Plan and a Spill Prevention Control and Countermeasures (SPCC) Plan. In addition, Fort Belvoir has two RCRA Part B permits from the Virginia Department Environmental Quality (VDEQ) for storage of hazardous wastes. All current and former hazardous waste permitted facilities present potential constraints to future development, in that closure of such sites is required prior to reuse. Such closures are subject to regulatory approvals.

Fort Belvoir has completed conversion of all large central plants on-post from #6 fuel oil-fired boilers to natural gas-fired boilers with #4 fuel oil as backup (US Army Garrison, Fort Belvoir, 2001b). Fort Belvoir has about 160 USTs, of which 19 are regulated. These tanks contain substances such as heating oil, diesel fuel, gasoline, JP-8, lubricants, used oils and hazardous waste (fuel-contaminated water). Fort Belvoir has completed a program of tightness testing, removal, replacement and upgrading of the regulated tanks, such as ASTs and USTs.

A preliminary assessment/site inspection conducted in 1982 for the Installation Restoration Program (IRP) indicated that there were no sites on Fort Belvoir eligible for an IRP. In addition, there are no Comprehensive Response, Compensation, and Liability Act (CERCLA) sites on Fort Belvoir (US Army Garrison Fort Belvoir, 2000).

Various studies have identified 238 solid waste management units (SWMUs) on the installation. Since 1992, Fort Belvoir has evaluated each of them and prepared action plans for all the SWMUs on the Main Post and EPG (US Army Garrison Fort Belvoir, 2001b).

An initial on-site assessment was made by the Department of the Army in 1995 to evaluate the project corridor for the potential presence of on-site hazardous wastes, pollutants, significant site debris and evidence of USTs. In 1998, preliminary design plans were used to re-evaluate sites along the project corridor and no environmental concerns were evident.

## **3.7 Infrastructure and Utilities**

### **3.7.1 Water Supply**

The Fairfax County Water Authority (FCWA) supplies potable water to Fort Belvoir. The installation owns, operates and maintains the entire on-post distribution system. This includes about 78 miles (126 km) of more-than-6 inch (15-cm) diameter water main pipes, two pumping stations, five storage tanks (four elevated, free-standing aboveground tanks and one at ground level) which provide about 2.6 million gallons (9.8 million liters) of storage capacity and a chlorination unit. A total of 2.2 million gallons per day (MGD) (8.3 million liters per day [MLD]) are provided through two FCWA points of entry, such as metered vaults and pump stations, that are located on Pole Road and Telegraph Road. Fort Belvoir also has five groundwater wells, used for irrigation only (US Army Garrison Fort Belvoir, 2001b). Fort Belvoir's water system will be fully privatized in the near term with the distribution system being reduced to two pumping stations and four storage tanks (three elevated and one ground-level). At completion, this system will have the capacity of about 2.3 million gallons (8.7 million liters) of storage.

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### **3.7.2 Sanitary Sewer**

Fort Belvoir owns and maintains the on-post sanitary sewer system, which includes 37 sewage pumping/lift stations and two main pumping stations. As of 2000, the installation discharged about 7.8 MGD (29.5 MLD) of wastewater to the system, which ultimately discharges to the Norman J. Cole, Jr. Pollution Control Plant on OCR. The plant discharges into the Pohick Creek approximately 0.75 miles (1.2 km) south of the OCR / US 1 intersection and has been associated with water quality problems in the past. This is the only point source discharge of wastewater on Fort Belvoir. (US Army Garrison Fort Belvoir, 2001b).

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### **3.7.3 Natural Gas**

Fort Belvoir's natural gas system is owned and operated by Washington Gas. As of 2000, gas was distributed to the post through 25 miles (40 km) of main gas line and 11 miles (18 km) of service lines mostly servicing the family housing areas. Fort Belvoir has been upgrading its natural gas supply system since 1993 and will continue to do so over the next few years. Improvements include the conversion of facilities from #2 and #6 fuel oil to natural gas; replacement of old piping; and placement of new lines and meters (US Army Garrison Fort Belvoir, 2001b).

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### **3.7.4 Electricity**

Electrical power at Fort Belvoir is provided by Dominion Virginia Power (DVP) from a substation near the Humphreys Engineer Center (HEC). Fort Belvoir owns the entire on-post

electrical system and its appurtenances. Power is transferred from the DVP substation to a Fort Belvoir-owned switching station and distributed to the post at 34.5 kilovolts (kV) through about 78 miles (126 km) of overhead lines and 83 miles (134 km) of underground lines. A previous electrical study provided the basis for a planned upgrade of the electrical distribution system. The planned upgrade consists of a series of projects that provide and extend the 34.5 KV distribution feeders (US Army Garrison Fort Belvoir, 1998a).

The installation owns and maintains the distribution feeder system. As of 2000, 10 substations were located throughout the installation to transform power to lower voltage. Fort Belvoir also uses one combination substation and switching station and three switching stations. Auxiliary generators are used as back-up for critical functions. Fort Belvoir's electrical system is undergoing privatization to upgrade their power system, which was initiated in 1998 (US Army Garrison Fort Belvoir, 1998a).

Several subareas of the installation are served independently by DVP. The DCEETA and SAM-T Satellite Earth Terminal Complex each purchase power separately. The Southwest Area has a small, separate service through the Davison Army Airfield area (US Army Garrison Fort Belvoir, 1998a).

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### **3.7.5 Steam**

The DeWitt Hospital, Davison Army Airfield and the larger buildings on Fort Belvoir use steam to provide heat and hot water. Recently built facilities, such as the McNamara HQC and smaller buildings, such as residential units, use individual boilers. Fort Belvoir has four high-pressure and six low-pressure steam plants. As of 1997, steam was distributed to the post through 13 miles (21 km) of steam and condensate lines. Most of the piping associated with each central boiler runs underground. Fort Belvoir owns and maintains the entire system (US Army Garrison Fort Belvoir, 1998a).

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### **3.7.6 Communications**

Telecommunication and information services on Fort Belvoir are supported by systems that transport, route, and process electronic voice data and images in telecommunications switches, campus cabling, manholes, and ductworks, building wiring for administrative telecommunications, and specialized Information Missions Area facilities, such as computer rooms and video teleconferences rooms (US Army Garrison Fort Belvoir, 1998a).

Chesapeake and Potomac Telephone serves the installation as a contractor for commercial telephone service. Commercial telephone service is provided to the government system main switch and to the housing areas. The network backbone consisting of a copper and fiber-optic data-distribution Asynchronous Transfer Mode (ATM) and the telephone switch are Integrated Services Digital Network (ISDN) capable.

The telephone system is maintained and operated by Defense Telecommunications Service. The main telephone switch provides over 18,000 lines, with the capacity to upgrade to 44,900 lines (US Army Garrison Fort Belvoir, 1998a).

The installation owns the entire system, including copper and fiber-optic cables, utility poles, and computerized switchboard systems. Most distribution cable is carried overhead on utility poles, while most fiber-optic cable is carried through an underground ductbank, along with some conventional cable. However, there are some direct-buried copper cables and fiber-optic cables in various locations (US Army Garrison Fort Belvoir, 1998a).

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### **3.7.7 Solid Waste**

Fort Belvoir generates about 10,460 tons (9,490 metric tons) of solid waste per year that are disposed of off-installation by a contract hauler and about 3,135 tons (2,843 metric tons) that are recycled (US Army Garrison Fort Belvoir, 2001a).

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## **3.8 Socioeconomics**

Several meetings between VDOT, Fairfax County Office of Transportation, and Pohick Church representatives have been held, and the church representatives appear to be satisfied with the proposed US 1 and OCR roadway design. Through these meetings and contacts with various state and local agencies, VDOT has stated that this project should not affect the quality of the human environment.

Due to the diverse nature of US 1 corridor, there are both limitations to, and opportunities for, economic development. Generally, the entire corridor has undergone an orientation shift from primarily a north/south transportation route for the entire east coast to one of a local residential/commuter route. The prior orientation serving the long distance traveler has resulted in obsolete development patterns and overall poor physical appearance. The limited east-west access to US 1 is another major constraint to economic development along the corridor.

Development across OCR and US 1 from the site area includes the Pohick Church and adjacent cemetery; apartments and condominiums; a single-family residence on Telegraph Road; and retirement facilities, such as the Sunrise Independent and Assisted Living Community and the Fairfax Military Retirement Facility.

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### **3.8.1 Demographics**

Fairfax County is a densely populated area with a high rate of population growth. In 2000, the county population had an increase of 18.5 percent from 1990 (Table 3-17). According to the Fairfax County Comprehensive Plan, the population of the county's Lower Potomac Planning District in which Fort Belvoir is located increased from 16,300 in 1980 to 24,371 in 1990, a

nearly 50 percent increase. Between 1990 and 1995, this population increased to 25,830, a 6 percent increase. The installation's land supports 2,000 family housing units, 4,000 installation dependents and a working population of approximately 17,700 military and civilian employees. Fort Belvoir supports over 200,000 military personnel, dependents, and retirees in the region (Senires-Dubyak, 2000).

Table 3-17  
Demographic Overview 1990-2000

County Jurisdiction	Population			Households 1990	Housing Units 1990
	1990	2000	Percent Change		
Fairfax, VA	818,584	969,749	18.5	292,943	307,966
Montgomery, MD	757,027	873,341	15.4	282,903	295,723
Prince George's, MD	729,268	801,515	9.9	257,689	270,090
Washington, DC	606,900	572,059	-5.7	249,034	278,489
Prince William, VA	215,686	280,813	30.2	70,253	74,759
Arlington, VA	170,936	189,453	10.8	78,745	84,847
Loudoun, VA	86,129	169,599	96.9	30,623	32,932
City of Alexandria, VA	111,183	128,283	15.4	53,280	58,252
Charles, MD	101,154	120,546	19.2	32,934	34,487
Stafford, VA	61,236	92,446	51.0	19,443	20,529
Fauquier, VA	48,741	55,139	13.1	16,484	17,716
King George, VA	13,527	16,803	24.2	4,795	5,280
REGIONAL TOTALS	3,720,371	4,269,746	14.7	1,391,116	1,483,060
<b>Fort Belvoir</b>	<b>8,590</b>	<b>7,176</b>	<b>-16.5</b>	<b>1,758</b>	<b>2,106</b>

Sources: National Association of Counties Website, 2001; US Census Bureau Website, 2001.

### 3.8.2 Employment and Income

Table 3-18 shows the ethnic make-up of Fort Belvoir, the City of Alexandria, and Fairfax County. All three areas have proportionally larger minority populations – whether non-whites or Hispanics - than the Commonwealth of Virginia as a whole. Fort Belvoir stands out as having a much higher proportion of under-18 residents than Fairfax County, Alexandria, or Virginia as a whole. By contrast, the population of Alexandria is older overall than that of the Commonwealth (Table 3-19).

Table 3-18  
Race and Ethnicity for 2000 (in percent)

Jurisdiction	White	Black <sup>1</sup>	Other Non-White	Two or More Races	Total Non-White Population	Hispanic <sup>2</sup>
Fort Belvoir	55.7	31.8	8.2	4.3	44.3	10.5
Fairfax County	69.9	8.6	17.9	3.7	30.1	11
City of Alexandria	59.8	22.5	13.5	4.3	40.2	14.7
Commonwealth of Virginia	72.3	19.6	6.1	2	27.7	4.7

<sup>1</sup>having origins in any of the black racial groups of Africa.  
Source: US Census Bureau Website, 2001.

<sup>2</sup>Hispanic origin, may be of any race.

Table 3-19  
Under-18 Population for 2000 (in percent)

Jurisdiction	Population under 18
Fort Belvoir	44.4
Fairfax County	25.4
City of Alexandria	16.8
Commonwealth of Virginia	24.5

Source: US Census Bureau Website, 2001

The most recent comparable income data for the four relevant areas are provided by the 1990 census (Table 3-20), which shows that while both the City of Alexandria and Fairfax County were wealthier than Virginia as a whole, the opposite was true of the Fort Belvoir.

Table 3-20  
Income for 1989 (in Dollars)

Jurisdiction	Per Capita Income	Median Household Income	Median Family Income
Fort Belvoir	1,780	29,200	28,900
Fairfax County	24,833	59,280	65,200
City of Alexandria	25,500	41,470	50,800
Commonwealth of Virginia	15,700	33,330	38,210

Source: US Census Bureau Website, 2001

More recent data for the City of Alexandria and Fairfax County indicate that these jurisdictions have remained more prosperous overall than the state as a whole. In 1997, the estimated median

household income was \$72,000 for Fairfax County (Fairfax County Website, 2001), compared with \$40,209 for Virginia. With only 3.3 percent of all people living in poverty in 1997, Fairfax County is a particularly rich community (Table 3-21). In Alexandria in 2000, the estimated median household income was \$67,312. In 1997 an estimated 10.2 percent of all people there lived in poverty. Equivalent figures for Virginia as a whole are \$45,753 and 11.6 percent, respectively.

Table 3-21  
Fairfax County Income Distribution for 1997 (in percent)

Income Class		
	Households	Families
Under \$25,000	8.7	6.5
\$25,000 to \$49,999	19.7	15.1
\$50,000 to \$74,999	23.2	20.5
\$75,000 to \$99,999	16.6	18.4
\$100,000 to \$149,999	21.1	26.0
\$150,000 or more	10.7	13.4

Source: Fairfax County Website, 2001

According to the Fairfax County website (Fairfax County Website, 2001), the Virginia Employment Commission reported employment in Fairfax County at 487,113 in 1999, up 31.0 percent from 371,716 in 1990 and up 4.8 percent since 1998. The most recent data from the US Department of Labor, Bureau of Labor Statistics (USBLS) reports unemployment for Fairfax County at 1.1 percent for February 2001, with 6,481 unemployed and 570,842 employed (USBLS Website, 2001).

The county reports that the average travel time to work in 1998 was 29.9 minutes and that 51 percent of the county's resident workforce were employed in Fairfax County; the others worked in Washington, D.C. (18.7 percent), elsewhere in Virginia (21 percent), Maryland (5 percent) and other places (4.3 percent) (Fairfax County, 1998).

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### 3.8.3 Environmental Justice

Under Executive Order (EO) 12898, federal agencies must accomplish environmental justice as part of their overall mission by identifying and addressing as appropriate, disproportionately high and adverse human health or environmental impacts of their activities on minority or low income populations, to the greatest extent practicable. Based on a review by the VDOT's Right-of-Way staff, there are no predominantly minority or low-income populations in vicinity of the site area. The community of Accotink Village, located 1.3 miles (2 km) east of the east terminus of the site

area at northeast corner of the Pohick Road / US 1 intersection, is considered a low-income community and is eligible for consideration under EO 12898.

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### **3.8.4 Tax Revenues and Expenditures**

Fairfax County's adopted general fund revenue budget for fiscal year (FY) 2001 is \$2.14 billion. Real estate taxes account for 50.7 percent and personal property taxes account for another 19.6 percent (Fairfax County Website, April 2001). This adopted budget for FY 2001 represents a 7.7 percent increase over the revised budget plan for FY 2000. School expenditures account for 50.3 percent of general fund disbursements, followed by health and welfare (12.5 percent) and public safety (11.7 percent).

Fairfax County's Office of Management and Budget estimates that the "typical" household paid \$3,434.10 in taxes in FY 2001 (Fairfax County Website, April 2001). The breakdown by principal tax categories is: \$2,530.76 for real property; \$353.52 for personal property; \$396.67 for sales; and \$153.15 for utilities.

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## **3.9 Community Facilities and Services**

### **3.9.1 Services**

Safety and security issues at Fort Belvoir are handled by the Army's Military Police (MP) and Fire and Emergency Medical Services (EMS). The MP headquarters are on South Post at Pohick Road and 12<sup>th</sup> Street. Five fire companies with a total staff of 66 firefighters serve the installation. The fire station at Davison Army Airfield (No. 66) services the site area. At least 21 firefighters are on duty 24 hours a day. The fire department fields three engines and one ladder truck (Sullivan, 2000).

The Fairfax County Police Department provides public safety services throughout the county, with the exception of Fort Belvoir, Dulles International Airport and several municipalities, such as Herndon, Alexandria and Vienna. The Fairfax County Police Department has responsibility to patrol the US 1 and OCR segments.

The Fairfax County Fire and Rescue Department is a combined career and volunteer organization providing fire suppression, rescue, and EMS, among other functions. It employs 1,155 uniformed staff and 89 civilian staff, and includes 352 operational volunteers and 426 administrative volunteers. Services are provided from 34 county stations. In 2000, the department responded to approximately 113,200 fire emergencies and 93,300 EMS emergencies. Those stations closest to Fort Belvoir are Woodlawn, Lorton, Gunston and Kingstowne (Fairfax County Website, 2001).

The Fairfax County Department of Health provides a wide range of public health programs, including 11 health care centers located throughout the county and three primary health care centers for low-income uninsured county residents. A map generated by the Fairfax County Geographic Information System (GIS) and Mapping Service shows 16 hospital urgent-care facilities in the county and five others in nearby Arlington and Alexandria. Besides De Witt Army Community Hospital at Fort Belvoir, the nearest hospital is the 232-bed Mount Vernon Hospital, located 6.4 miles (11 km) northeast of the site area (Fairfax County Website, 2001).

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### **3.9.2 Recreational Facilities**

Fort Belvoir offers 1,006 acres (407 ha) of recreational facilities that are convenient to the population they serve. These facilities include two golf courses, officers and non-commissioned officers clubs, tennis courts, swimming pools, softball and soccer fields, etc. In addition, the Dogue Creek Marina rents boats and slips and dry-storage facilities. When completed, the Tompkins Basin Recreation Area would be the site of many new recreational facilities, including basketball and tennis courts, baseball and soccer fields, a swimming pool, tent and recreational vehicle camp sites, rental cabins, a lodge and a 150-room hotel with conference center (US Army Garrison Fort Belvoir, 2000b).

Some of Fort Belvoir's undeveloped areas are open to recreational use: two wildlife refuges; fishing at Mulligan Pond and along Gunston Cove, Accotink Creek, Dogue Creek, and Pohick Creek; bow hunting in designated areas; and bird watching, hiking, nature photography, and environmental education along the 10 miles (16 km) of trails.

The Fairfax County Park Authority operates over 350 parks on more than 18,300 acres (7,400 ha). Facilities include a horticulture center, a working farm, an activities/equestrian center, eight indoor recreational centers, nature and visitor centers, golf courses, campgrounds, an ice-skating rink and a water park. A wide variety of activities and programs are operated at the county parks and recreational centers.

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### **3.9.3 Mass Transit**

Mass transit in the vicinity of the site area is not a feasible alternative to motorist travel on US 1. Non-motorized travel in this corridor is encouraged by multi-purpose, pedestrian/bike trails, which are an essential part of this project. The site area has no direct interface with facilities for mass transportation, such as bus or rail. The US 1 Corridor Study (VDOT, 1998) described the mass transit service along US 1 as "poor," which it defines as "large parts of the corridor lack transit service."

The nearest commuter rail service, the Virginia Express Line (VRE) that parallels I-95 between the Fairfax and Prince William County on the Alexandria-Fredericksburg tracks. The Lorton

VRE station is approximately 1.2 miles (1.93 km) west of the site area on Potomac Bend Boulevard, an extension of Armistead Road. The nearest Metrorail line (Blue Line) ends at Franconia Mall in Springfield, 3.9 miles (6.4 km) north of the site area.

Bus service in the vicinity of the site area is provided by the “Fairfax Connector” and the Metrobus. However, there is no bus service along US 1 from Fort Belvoir to the Lorton VRE station or points south, causing transit to and from Fort Belvoir to be difficult. A Metrobus bus line connects the McNamara HQC with the Lorton VRE and with the Huntington Metrorail Station (Yellow Line) located just south of I-95 in Alexandria. Between Lorton and the McNamara HQC, the Metrobus route operates primarily via Lorton Station Road, US 1, Fairfax County Parkway and Kingman Road.

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## **3.10 Transportation and Traffic**

### **3.10.1 Highway and Street Network**

Four principal roadways define the Northern Virginia highway system in the vicinity of the site area:

- Interstate 95 (I-95).
- Fairfax County Parkway (Route 7100).
- Richmond (Jefferson Davis) Highway (US 1).
- Telegraph Road (Route 611).
- Old Colchester Road (OCR)

I-95 located two miles (3 km) northwest of Fort Belvoir, runs in a general north-south direction through Northern Virginia. Direct access to Fort Belvoir from I-95 is primarily via Route 7100 (Exit 166). Alternate access points via I-95 interchanges are at US 1 (Exit 161) and Lorton Road (Exit 163). Exit 161 is 2.2 miles (3.55 km) south of the OCR / US 1 Intersection and Exit 163 is 1.8 miles (2.9 km) southwest of the OCR / US 1 intersection.

Fairfax County Parkway, classified as a principal arterial, links Fort Belvoir and US 1 with I-95 and northern and western Fairfax County, including City of Fairfax, Reston, Dulles Airport and ultimately Leesburg Pike (Route 7). The Parkway is a divided four-lane limited access highway that was constructed during 1996 to 2001. A section from Rolling Road to Backlick Road has not been completed. The Parkway terminates at US 1 approximately 1.14-miles (1.83 km) east of the eastern terminus of the site area.

US 1 is classified as a principal north-south transportation arterial in Northern Virginia. US 1 links neighborhoods with commercial areas and serves regionally as an alternate corridor to I-95. Within Fort Belvoir, US 1 is a four-lane undivided highway that has an east-west orientation with traffic lights at five major intersections in the Main Post area of Fort Belvoir. VDOT’s proposed project length is 1.121 miles (1.804 km) with a design speed of 55 mph (90 km/hr).

Both Telegraph Road and OCR are classified as minor arterial roads. Telegraph Road is a continuous four-lane highway that traverses the north and northwest boundary of Fort Belvoir from Beulah Street southwest to US 1. OCR is a two-lane rural road, which extends approximately 4.2 miles (6.8 km) south from US 1 to the Occoquan River. OCR is a winding road that has several limited vision curves, a single-lane bridge at Pohick Creek, and a one-lane street in the Town of Colchester.

As a result of the terrorist attacks on September 11, 2001 Force Protection requirements implemented by Department of Defense, public access on and off Fort Belvoir has been severely restricted. These requirements have closed public access to South Post of Fort Belvoir except through three locations: Pohick Road (Tulley Gate), Belvoir Road (Pence Gate) and Mount Vernon Road (Walker Gate). Unmanned and locked gates in the vicinity of the site area are:

- ?? Stewart Road Gate - 210 feet (64 m) south of the site area; and
- ?? An unnamed gravel road - 898 feet (274 m) east of the Belvoir Woods Parkway.

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### **3.10.2 Existing Traffic Conditions**

The purpose of the VDOT project is to increase capacity along a segment of US 1. As a result of the improvements, traffic congestion would be reduced, and safety would be increased, thus lowering the potential for accidents. Current traffic congestion in the vicinity of the site area is a result of commercial and residential growth in the region without a correlative increase of road capability. As US 1 continues to be burdened beyond its capabilities, increased delays would occur at the primary intersections, such as the Pohick Road and the Telegraph Road / OCR intersections. The existing highway would not be capable of accommodating the predicted future traffic volumes without improvements. This problem is compounded by the misalignment of the northbound OCR with the northbound lane of Telegraph Road, which is a safety hazard.

Completion of this project would improve safety by providing additional lanes to increase capacity for through vehicles, as well as providing additional space for necessary weaving by traffic on or leaving US 1. The majority of accidents along this segment of US 1 have been rear-end and angle collisions on dry pavement during daylight. Same direction sideswipes were the third most frequent accident type. Twice as many accidents occur in evenings as morning, illustrating a need for an additional west bound lane along this segment. (VDOT, EA). To conform to American Association of State Highway and Transportation Officials (AASHTO) design standards, a tapering of US 1 from four through lanes east of Telegraph Road to seven through lanes at Telegraph Road and OCR intersections is required.

#### **3.10.2.1 Volume**

Daily Service Volume (DSV) computed by VDOT for the US 1 segment is: 35,000 vehicles in 1995; 42,000 vehicles in 1999; and a forecasted 79,000 vehicles in 2022. Traffic volumes on Telegraph Road ranged from approximately 12,000 to 18,000 vehicles per day in the vicinity of

Fort Belvoir in 1999. Manual turning movement traffic counts for AM and PM peak periods were supplemented by counts for the *US 1 Location Study* during the summer and fall of 2000. In addition, manual counts were taken in early 2001 at the Belvoir Road and Pohick Road intersections along US 1 (TransCore, 2002).

As a means of evaluating past trends in traffic volume for OCR, TransCore compared the Average Daily Traffic (ADT) from the VDOT Secondary Traffic Section Tabulation Report, Fairfax County, for the years 1991, 1995 and 2000 (Tables 3-22). The ADT for OCR between 1991 and 2000 has declined by 43%.

Table 3-22  
Average Daily Traffic (ADT) at OCR / US 1 Intersection

Year	ADT	% change from 1991
1991	3340	-
1995	2860	- 14.4 %
2000	1900	- 43.1%

Source: TransCore, 2002

### Levels of Service (LOS)

A qualitative assessment of intersection operation is based on the average delay per vehicle (Table 3-23). LOS is qualitative assessment of traffic conditions that describes the quality of traffic flow as perceived by motorists. The Fairfax County goal is a rating of LOS D or better.

Table 3-23  
Level of Service (LOS)

LOS	Conditions for Un-signalized Intersections Criteria	Average Delay <sup>1</sup>
<b>A</b> Best	Free flow conditions. Each vehicle is virtually unaffected by other vehicles in traffic stream and delays are minimal.	< 5 to 10
<b>B</b>	Normal traffic flow conditions of traffic flow with some delays.	10 - 15
<b>C</b>	Normal traffic flow conditions with some delays caused by presence of other vehicles.	15 - 25
<b>D</b>	Traffic flow remains stable, however ability to maneuver is severely restricted by high density of traffic flow.	25 - 35
<b>E</b>	Traffic demand is at or near capacity.	35 - 50
<b>F</b> Worst	Traffic approaching a given point exceeds amount that can pass the point without slowing down of traffic.	> 50 to 60

<sup>1</sup>in seconds Source: Transportation Research Board, 1997.

A qualitative assessment of intersection operation is based on the average delay per vehicle, as shown in Table 3-23. LOS is qualitative assessment of traffic conditions that describes the quality of traffic flow as perceived by motorists. The peak hour LOS for intersections along US 1 (Telegraph Road / OCR, Pohick Road and Lorton Road) are currently C and F. If no improvements are made to the existing US 1, the peak hour LOS at all three intersections will be elevated to F. Thus, the existing roadway could not accommodate predicted future traffic volumes without improvements (US Army Garrison Fort Belvoir, 1998a).

### 3.10.2.2 Traffic Operational Analysis – General

Traffic operations are a function of traffic volume and available roadway capacity. The ratio between the volume and capacity is termed the volume-to-capacity (V/C) ratio (Table 3-24 and Table 3-25). The standard industry procedure for determining the V/C ratio of a roadway facility is the 1997 *Highway Capacity Manual* (Transportation Research Board, 1997). This manual contains planning-level procedures for assessing the adequacy of signalized intersections, two-way stop-controlled intersections, and four-way (or all-way) stop-controlled intersections. The procedures consider number of vehicles turning or proceeding straight through the intersection; number of lanes provided for each turning movement; and turning vehicle conflicts.

Table 3-24  
Signalized Intersection Level of Service (LOS) - Criteria

V/C Ratio	Assessment	Description
<0.85	Under Capacity	Stable flow, slight delays
0.85-0.95	Near Capacity	Approaching unstable flow, acceptable delays
0.95-1.00	At Capacity	Unstable flow, congested, unacceptable delays
>1.00	Over Capacity	Forced flow, over saturation

Source: Transportation Research Board, 1997.

Table 3-25  
Signalized Intersection Levels of Service (LOS) - Existing Conditions

Signalized Intersections	AM		PM	
	V/C Ratio	Capacity Status	V/C Ratio	Capacity Status
Fairfax County Parkway / Kingman Road	0.38	Under Capacity	0.77	Under Capacity
US 1 / Fairfax County Parkway	0.94	Near Capacity	0.93	Near Capacity
US 1 / Pohick Road	0.82	Under Capacity	1.05	Over Capacity
US 1 / Belvoir Road	0.80	Under Capacity	0.65	Under Capacity
US 1 / Woodlawn Road	0.66	Under Capacity	0.82	Under Capacity

Source: TransCore, 2001.

For signalized intersections, the conflicts are summarized into a numerical value termed “critical lane volume.” The critical lane volume is divided by the intersection capacity to obtain a V/C ratio. A traffic operational analysis was conducted for several signalized intersections in the vicinity of the site area. The only intersection that is over capacity is US 1 and Pohick Road in the afternoon peak hour. For un-signalized intersections, the typical distance between vehicles arriving at the intersection is calculated based on peak-hour traffic volumes to determine the likelihood of available gaps in major street traffic allowing turns to and from the minor street. The number of vehicles waiting on the minor street approaches and left turn lanes of the major street are calculated using empirically based formulas. The data in Table 3-25 represent existing conditions prior to September 11<sup>th</sup>, 2001. As a result of Force Protection requirements, accessibility onto Fort Belvoir has been dramatically altered. Consequently, these numbers may have changed significantly.

### 3.10.2.3 Traffic Operational Analysis – Site Specific

A site-specific traffic operational analysis was performed on the Telegraph Road / OCR intersection on US 1. The traffic analysis included several studies (Table 3-26) based on the proposed realignment of US 1 and other growth factors (TransCore, 2002). All studies agree that, with the natural growth rate of Fairfax County and the planned growth of Fort Belvoir, the LOS provided by the existing already stressed traffic network would continue to deteriorate.

Fairfax County’s expected growth rate is between 1.5 to 2.5 percent annually, and the realignment of the civilian-employee workforce at Fort Belvoir represents a similar growth (MTMC, 1988, Fairfax, 1996). Estimated growth rates for specific highways based on the Metropolitan Washington Council of Governments (MWCOC) Model projections (TransCore, 2002) for the five-year period of 2002 through 2007 are:



- ?? One lane, shared northbound left turn, through, and right turn movements.
- ?? Two lanes, shared left turn and through, and exclusive right turn movements.
- ?? Three lanes, exclusive left turn, through, and right turn movements.

Table 3-27  
Peak-hour Vehicle Traffic Flow at Telegraph / OCR Intersection on US 1.

<b>Telegraph Road / US 1 Intersection</b>								
	<b>AM Peak Hour - Southbound</b>				<b>PM Peak Hour - Southbound</b>			
<b>Year</b>	<b>1990<sup>1</sup></b>	<b>1998<sup>2</sup></b>	<b>2002<sup>2</sup></b>	<b>2025</b>	<b>1990<sup>1</sup></b>	<b>1998<sup>2</sup></b>	<b>2002<sup>2</sup></b>	<b>2025</b>
Left turn onto eastbound US 1	20	32	61	125	20	32	54	115
Through lane onto OCR	5	11	8	15	110	127	154	200
Right turn onto westbound US 1	190	117	159	295	625	743	933	1,350
<b>OCR / US 1 Intersection</b>								
	<b>AM Peak Hour - Northbound</b>				<b>PM Peak Hour - Northbound</b>			
<b>Year</b>	<b>1990<sup>1</sup></b>	<b>1998<sup>2</sup></b>	<b>2002<sup>2</sup></b>	<b>2025</b>	<b>1990<sup>1</sup></b>	<b>1998<sup>2</sup></b>	<b>2002<sup>2</sup></b>	<b>2025</b>
Left turn onto westbound US 1	5	5	10	15	10	11	8	10
Through lane onto Telegraph	135	95	117	155	35	21	21	30
<b>Right turn onto eastbound US 1</b>	<b>250</b>	<b>170</b>	<b>150</b>	<b>200</b>	30	21	20	25

Source: <sup>1</sup>JHK, 1990; <sup>2</sup>TransCore, 2002

Table 3-30 summarizes the projected queuing lengths on OCR; the intersection LOS; and intersection delay. A similar analysis was made using forecasting 2025 volumes.

The following summary is the site-specific Operational Analysis performed by TranCore:

- ?? Data from 1991 to 2000 indicate that the daily traffic on OCR has decreased by 43% during the 10-year period (Table 3-22).
- ?? MWCOG Version I Regional Model forecasted an increase in daily traffic on OCR of 32% from 2001 to 2025 (Table 3-26).
- ?? Comparing the traffic volume in Table 3-27, TransCore data shows that capacity to handle peak-hour traffic volumes for the OCR / US 1 intersection would deteriorate significantly over the next 20 years during the AM Peak period, even with the widening of US 1. Adding one additional lane (an exclusive right turn lane) on the OCR approach to intersection would improve the operation significantly.

?? Based on the Operational Analysis (Table 3-30), upgrading the OCR northbound approach to three lanes (left, through, right turn lanes) would not significantly improve the operation of the intersection over the two northbound lanes approach. However, a dedicated northbound right-turn lane would significantly improve the operation of the intersection compared to a single northbound lane.

Table 3-28  
Signal Cycle for Telegraph Road / OCR Intersection on US 1

	All turns northbound on OCR	All turns southbound on Telegraph	Left turn onto OCR off westbound US 1	Through traffic for westbound US 1	Through traffic on eastbound US 1	Left turn onto Telegraph off US 1
AM <sup>1</sup>	36	10	7	47	127	87
PM <sup>1</sup>	12	22	17	125	129	21

<sup>1</sup> signal duration in seconds.

Source: TransCore, 2002

Table 3-29  
OCR Intersection on US 1

	AM Peak	PM Peak
Signal Delay	56.4 seconds	28.7 seconds
Capacity Utilization	108.6 %	114.1%
LOS	E	C
Dedicated Signal Light Duration (OCR for all turns)	36 seconds	12 seconds
Percent of Cycle Length	20 %	6.7%

Source: TransCore, 2002

Table 3-30  
Peak-hour Traffic Volumes on Northbound OCR

Peak	Source	QL <sup>1</sup>	LOS	Delay <sup>2</sup>
2002 - AM	1 lane	561	E	57.9
	2 lanes	226	D	54.9
	3 lanes	223	D	54.9
2002 - PM	1 lane	107	C	28.8
	2 lanes	80	C	28.6
	3 lanes	61	C	28.6
2025 - AM	1 lane	825	F	124.7
	2 lanes	411	E	79.2
	3 lanes	362	E	78.6
2025 - PM	1 lane	171	C	23.3
	2 lanes	101	C	23.0
	3 lanes	39	C	23.0

<sup>1</sup>QL = Queuing Length in feet. 1 QL = 1 car length of 20 feet (9.1 m) <sup>2</sup>in seconds  
Source: TransCore, 2002