DEPARTMENT OF THE NAVY

MARINE CORPS HERITAGE CENTER

DRAFT ENVIRONMENTAL IMPACT STATEMENT

MARINE CORPS BASE
QUANTICO, VA

REPORT DOCUMENTATION PAGE

1. REPORT DATE (DD-MM-YYYY) 01-07-2000	**2. REPORT TYPE**	**3. DATES COVERED (FROM - TO)** xx-xx-2000 to xx-xx-2000
4. TITLE AND SUBTITLE Draft Environmental Impact Statement (DEIS) Unclassified		**5a. CONTRACT NUMBER**
		5b. GRANT NUMBER
		5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)		**5d. PROJECT NUMBER**
		5e. TASK NUMBER
		5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME AND ADDRESS United States Marine Corps Marine Corps Heritage Center Quantico , VA 00000		**8. PERFORMING ORGANIZATION REPORT NUMBER**
9. SPONSORING/MONITORING AGENCY NAME AND ADDRESS ,		**10. SPONSOR/MONITOR'S ACRONYM(S)**
		11. SPONSOR/MONITOR'S REPORT NUMBER(S)
12. DISTRIBUTION/AVAILABILITY STATEMENT A PUBLIC RELEASE ,		

13. SUPPLEMENTARY NOTES

14. ABSTRACT
This Environmental Impact Statement evaluates the potential effects of developing up to 460,000 square feet (42,735 square meters) of display, storage, administration, and other support facilities and outdoor display and activity area. The purpose and need for the proposed action, alternatives considered, affected environment, and environmental consequences are presented in the DEIS. Five alternative sites situated along the Interstate 95/US Route 1 corridor in the vicinity of Marine Corps Base Quantico are evaluated in this DEIS.

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
					Fenster, Lynn lfenster@dtic.mil
a. REPORT Unclassified	b. ABSTRACT Unclassified	c. THIS PAGE Unclassified	Public Release	356	19b. TELEPHONE NUMBER International Area Code Area Code Telephone Number 703 767-9007 DSN 427-9007

Cover Sheet

Responsible Agency:

Department of the Navy, United States Marine Corps

Proposed Action:

The proposed action is to construct and operate a Marine Corps Heritage Center complex on or near Marine Corps Base Quantico, Virginia. Development of the 100-acre complex would include approximately 20 buildings, outdoor exhibits and memorials, ceremonial and demonstration areas, access roads, and parking areas in a campus-like setting. The new facilities would consolidate existing museum components currently located at the Washington Navy Yard and Marine Corps Base Quantico, and enhance the curation, exhibit, and accessibility of Marine Corps historical collections and archives.

Designation:

Draft Environmental Impact Statement (DEIS)

Abstract:

This Environmental Impact Statement evaluates the potential effects of developing up to 460,000 square feet (42,735 square meters) of display, storage, administration, and other support facilities and outdoor display and activity area. The purpose and need for the proposed action, alternatives considered, affected environment, and environmental consequences are presented in the DEIS. Five alternative sites situated along the Interstate 95/US Route 1 corridor in the vicinity of Marine Corps Base Quantico are evaluated in this DEIS.

Availability:

July 2000

The public review period ends 45 days following the date of the Federal Register notice for this Draft Environmental Impact Statement.

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EXECUTIVE SUMMARY

1. General

This Draft Environmental Impact Statement (DEIS) has been prepared to address the effects of construction and operation of a Marine Corps Heritage Center (MCHC) complex at Marine Corps Base (MCB) Quantico, Virginia. The DEIS has been prepared in accordance with Section 102(2)(c) of the National Environmental Policy Act (NEPA) of 1969, the Council on Environmental Quality "Regulations for Implementing the Procedural Provisions of NEPA," 40 Code of Federal Regulations, Part 1500, and the Marine Corps Environmental Compliance and Protection Manual (Marine Corps Order {MCO} 5090.2A). This administrative DEIS has been distributed to individuals, agencies, and organizations listed in Section 9 for review and comment.

2. Background

There are four major components of the Marine Corps History and Museums Division (MCHMD). The Historical Branch, the Support Branch, and the Field Operations Branch occupy buildings 58 and 154 at the Washington Navy Yard (WNY) in the District of Columbia. The fourth component, the Museum Branch, is located at MCB Quantico. Exhibits at both the WNY and MCB Quantico are open to the public.

The MCHMD now occupies 11 different structures scattered throughout these two bases. These facilities provide minimal protection for curation of museum collections and lack sufficient space for storage or exhibit of historical material. Workshops and office space are also inadequate to support the growing collections and other programs. These deficiencies limit the capabilities of the MCHMD to protect historical material under its control, to provide ready access to historical information, or to operate efficiently. Minor renovations have been undertaken to enhance the existing facilities, but additional improvements to these structures are constrained by various site conditions and would not be economically practical. Replacement of individual buildings at their present scattered locations would not improve museum operations or services.

3. Description of the Proposed Action

The Marine Corps is proposing to construct and operate a Marine Corps Heritage Center (MCHC) complex, on or adjacent to MCB Quantico. The proposed MCHC is envisioned to be the National Museum of the Marine Corps. The new facilities are intended to consolidate and collocate existing interpretive, curatorial, and support functions of the MCHMD; enhance protection of Marine Corps historical collections; improve accessibility to historical information and the collection for students (particularly those enrolled in educational programs at MCB Quantico), educators, and professional historians; and foster public education and appreciation through exhibits, displays, and hosting outdoor ceremonies, events, and demonstrations.

The MCHC complex would encompass approximately 100 acres (40 hectares) and consist of buildings, outside exhibits, a parade field, demonstration areas, access roads, parking areas, and walkways. The proposed park-like design of the complex would intersperse approximately 20 buildings throughout large areas of maintained lawns. The proposed facilities would provide approximately 460,000 square feet (42,735 square meters) of indoor space for museums, exhibits, restoration workshops, curation facilities, administrative offices, a library, an armory, an auditorium, a conference center, and a big screen theater. Development of the MCHC complex would occur in phases, with the first phase planned for opening in 2004. The grounds of the MCHC would be used for outdoor exhibits, memorials, ceremonies, and operational demonstrations. Ceremonies would typically include performances by military bands and cannon salutes. Operational demonstrations may occur 12 times per year and include small tactical exercises using military vehicles or aircraft.

4. Alternatives

Alternatives for the MCHC were developed in consideration of the following criteria: a) adjacency to MCB Quantico to facilitate use by base education programs and to obtain support from base services; b) close access to I-95; and c) suitable size and setting appropriate for development of the MCHC complex, including noise and visual buffers. Siting of the MCHC at MCB Quantico facilitates use by students in educational programs on base and codependency of these activities. The following alternatives for the MCHC are evaluated in this DEIS (see Figure ES-1).

Alternative 1: Russell Road Site involves development of the MCHC within the approximately 500 acres (202 hectares) of Marine Corps property located to the west of I-95 in northern Stafford County.

Alternative 2: Mainside South Site involves development of the MCHC on approximately 159 acres (64 hectares) of Marine Corps property located east of US-1 and north of VA-637 in northern Stafford County.

Alternative 3: Mainside North Site involves development of the MCHC within 140 acres (57 hectares) of Marine Corps property located southeast of the intersection of US-1 and VA-619, near Triangle, in southern Prince William County.

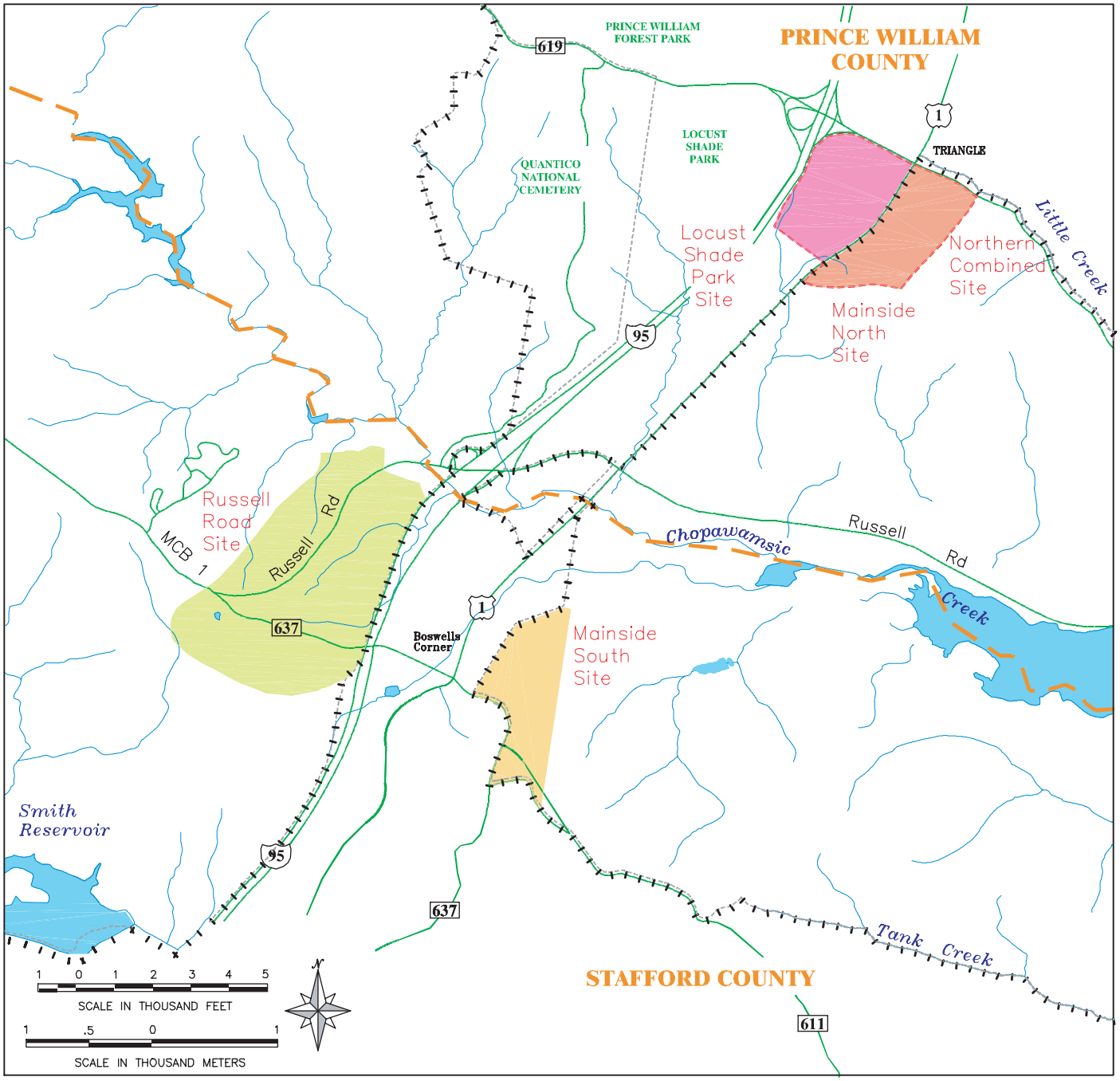
Alternative 4: Locust Shade Park Site involves development of the MCHC within approximately 110 acres (45 hectares) between I-95 and US-1, just south of VA-619. The site is in the northeast corner of Locust Shade Park, which is owned by Prince William County. The Locust Shade Park Site is the Preferred Alternative of the Marine Corps.

Alternative 5: Northern Combined Site involves use of both the Locust Shade Park Site and the Mainside North Site for the development of the MCHC complex. A portion of each of these sites would be used for the project, with the majority of the components sited on the Locust Shade Park Site.

No-Action Alternative: Under the No-Action Alternative, the MCHMD would continue to operate out of existing facilities at the WNY and MCB Quantico. This would significantly affect the ability of the MCHMD to perform its mission by restricting development of enhanced museum facilities to protect and exhibit historical material, by limiting its ability to attract visitors and donations, or by improving its operational efficiency and capabilities.

5. Summary of Potential Environmental Impacts

Table ES-1 summarizes the effects of each alternative in relation to the pertinent environmental issues.



Legend

- Russell Road Site - 500 Acres (202 hectares)
- Mainside South Site - 159 Acres (64 hectares)
- Mainside North Site - 140 Acres (57 hectares)
- Locust Shade Park Site - 110 Acres (45 hectares)
- Northern Combined Site - 250 Acres (101 hectares)
- Property Line
- Road
- Stream
- County Boundary
- MCB Quantico Boundary

Marine Corps Heritage Center
MCB Quantico, VA
Environmental Impact Statement

ES - 1
Alternative Sites Being Considered

Parsons Harland Bartholomew & Associates, Inc., Richmond VA, 2000.

Table ES-1: Summary of Impacts and Alternatives

Environmental Issue	Alternative 1 Russell Road Site	Alternative 2 Mainside South Site	Alternative 3 Mainside North Site	Alternative 4 Locust Shade Park Site	Alternative 5 Northern Combined Site	No Action Alternative
Topography, Geology, and Soils	Grading required to provide suitible building sites. Site preparation would change existing soils through excavation, mixing, compaction, and augmentation.					No change from existing situation.
	Site conditions are expected to necessitate a large amount of grading and/or slope stabilization. Extensive earthwork would increase the likelihood of encountering bedrock, exposes larger/steeper areas to erosion, and increases site preparation costs.					
Water Quality	The use of erosion and sediment controls during construction and the incorporation of stormwater management in the completed project would mitigate potential impacts.					No change from existing situation.
Aquatic and Terrestrial Environment	Approximately 100 acres (40 hectares) of forest cover would be removed from the selected site and replaced with buildings, roads, parking areas, turf, and landscape vegetation. A small number of resident wildlife would be eliminated through site preparation. Incidental impacts to wetlands within intermittent stream beds are expected to occur through installation of utility lines and access road crossings to the selected site. Buildings would not be sited in wetland areas.					No change from existing situation.
	The MCHC complex would not be sited within the buffer area for small whorled pogonia at the Russell Road site.	No listed threatened or endangered species occupy habitat on these sites.				
Air Quality	Project related emissions (construction and operation) were determined to be well below threshold levels, identified by EPA in the conformity regulation, to have the potential to impact regional efforts to attain clean air standards.					No change from existing situation.
Noise and Explosion Safety	A slight increase in the daytime noise levels is expected to result from construction related activities, increased traffic levels along roadways within and adjacent to the MCHC, and ceremonial events and operational demonstrations.					No change from existing situation.
	The site is located near the base Ammunition Supply Point, but beyond the associated Explosive Safety Quantitiy Distance safety zone. Accordingly, from an explosive safety viewpoint, personnel and facilities exposures would be permitted within the site. However, substantially diminished air overpressure impacts (if any) and remote fragmentation possibilities from an accidental explosion should be considered if this site is selected.			Noise from high speed traffic on I-95 is particularly evident at this site.	Noise from high speed traffic on I-95 is particularly evident in the western half of this site.	
Cultural Resources	Protection, exhibition, and access to Marine Corps historical collections material would be enhanced. NRHP listed or eligible archaeological sites or historic resources would not be affected.					The ability of MCHMD to protect, exhibit, or provide public access to Marine Corps historical collection material would be limited.
	Remains at three small cemeteries may be relocated.			Components of the MCHC would not be sited within the cemetery located in the northeast corner of the site.	Components of the MCHC would not be sited within the cemetery located in the north central portion of this site.	
Land Use, Zoning, and Aesthetics	The proposed development would be compatible with the base land use management plan. Current use would be converted from a combination of passive recreation, timber production, and administration facilities to a museum complex.	The proposed development would be compatible with the base land use management plan. Current use would be converted from passive recreation to a museum complex. The utility line, towers, and right-of-way clearing at the eastern edge of the site may affect visual aspects of the site and present a safety concern for aircraft demonstrations.	The proposed develoment would be compatible with the base land use management plan. Current use would be converted from a combination of passive recreation and family housing to a museum complex. Family housing units within the site would be demolished.	Prince William County identified the Locust Shade Park site for development of the proposed MCHC complex. Proposed land use would be similar to existing recreational use. A real estate transaction would transfer ownership and/or control of the property to the Marine Corps and use would be changed from passive recreation to a museum complex.	Prince William County identified the portion of the site west of US-1 for development of the proposed MCHC complex. Proposed land use would be similar to existing recreational use. A real estate transaction would transfer ownership and/or control of the site area west of US-1 to the Marine Corps and use would be changed from passive recreation to a museum complex.	No change from existing situation.

Table ES-1: Summary of Impacts and Alternatives Continued

Environmental Issue	Alternative 1 Russell Road Site	Alternative 2 Mainside South Site	Alternative 3 Mainside North Site	Alternative 4 Locust Shade Park Site	Alternative 5 Northern Combined Site	No Action Alternative
Traffic	It is anticipated that by 2015 the following three intersections would be operating at unacceptable levels of service (LOS): Russell Road/I-95 southbound on/off ramp, Russell Road/I-95 northbound off ramp, and US-1/VA-610.					
	Locating the MCHC at this site would create additional delays at the Russell Road/I-95 southbound on/off ramp, and the Russell Road/I-95 northbound on ramp would degrade to an unacceptable LOS.	Use of this site would create additional delays at Russell Rd/I-95 southbound on/off ramp and Russell Rd/I-95 northbound off ramp. LOS for the Russell Rd/I-95 northbound on ramp and the USI/VA-637 intersection would degrade, but not to unacceptable levels				
Infrastructure and Utilities	Adequate sources of utilities are available for development of the MCHC at any of the alternative locations. To connect the utilities, various pumps, storage tanks, valves, and connection vaults would be required.					No change from existing situation.
	Russell Road Site is the farthest of the alternative sites from main utility distribution lines. Services lines to this site are expected to involve longer runs and would likely cross the I-95 corridor.					
Socioeconomics Environmental Justice	Development of the MCHC within the Quantico area is expected to increase local commerce and generate revenue. The small number of staff and personnel relocating to the area is not anticipated to significantly impact housing or public services. The proposed construction and operation of the museum complex is not expected to have disproportionally high or adverse human health or environmental effects on local communities.					No change from existing situation.
Community Facilities	Development of the MCHC at any of the alternative sites is not expected to significantly increase demands for local community services.					No change from existing situation.
Solid Waste, Hazardous Waste, and Environmental Contamination	The proposed development and operation are not intended to use or generate hazardous material or generate large amounts of solid waste or environmental contamination.					No change from existing situation.
	Site contains four areas of known or suspected hazardous materials contamination. Testing and required remediation could delay construction of the facility and significantly increase project costs. Development prior to testing and remediation could adversely affect the use and operation of MCHC facilities.					

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Acronyms and Abbreviations

°C	Degrees Celsius
°F	Degrees Fahrenheit
ASP	Ammunition Supply Point
CAA	Clean Air Act
CAAA	Clean Air Act Amendments
CFR	Code of Federal Regulations
CO	Carbon Monoxide
COE	US Army Corps of Engineers
dB(A)	Decibels A-weighted Scale
DCR	Department of Conservation & Recreation
DEIS	Draft Environmental Impact Statement
DoD	Department of Defense
DRMO	Defense Reutilization and Marketing Office
EIFS	Economic Information Forecasting System
EIS	Environmental Impact Statement
EO	Executive Order
EPA	US Environmental Protection Agency
ESQD	Explosive Safety Quantity Distance
FEIS	Final Environmental Impact Statement
GIS	Geographic Information System
GO	Growth Opportunity
IBD	Inhabited Building Distance
INRMP	Integrated Natural Resources Management Plan
IR	Installation Restoration
I-95	Interstate 95
kV	Thousand Volts
LOS	Level of Service
MCB	Marine Corps Base
MCCDC	Marine Corps Combat Development Center
MCHC	Marine Corps Heritage Center
MCHMD	Marine Corps History and Museum Division

MCO	Marine Corps Order
MCU	Marine Corps University
MLUMP	Multiple Land Use Management Plan
MOA	Memorandum of Agreement
NAAQS	National Ambient Air Quality Standards
n.d.	Not Dated
NEPA	National Environmental Policy Act of 1969
NHPA	National Historic Preservation Act
NO_x	Nitrous Oxide
NPDES	National Pollutant Discharge Elimination System
NREAB	Natural Resources and Environmental Affairs Branch
NRHP	National Register of Historic Places
NWI	National Wetland Inventory
OCS	Officer Candidate School
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
RONA	Record of Non-Applicability
ROW	Right-of-Way
SF	Square Feet
SIP	State Implementation Plan
SHPO	State Historic Preservation Office
spp.	Species
STORET	Storage and Retrieval Program
STPs	Shovel Test Pits
THREATCON	Threat Condition
tpy	Tons per Year
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Service
US-1	United States Highway 1
VA-	Virginia State Route
VAC	Virginia Administrative Code
VDEQ	Virginia Department of Environmental Quality
VDHR	Virginia Department of Historic Resources
VDOT	Virginia Department of Transportation

VOCs	Volatile Organic Compounds
WMCAR	William and Mary Center for Archaeological Research
WNY	Washington Navy Yard

SECTION 1: Introduction

1.1 General

This Draft Environmental Impact Statement (DEIS) has been prepared to address the effects of construction and operation of a Marine Corps Heritage Center (MCHC) complex at Marine Corps Base (MCB) Quantico, Virginia. The DEIS has been prepared in accordance with Section 102(2)(c) of the National Environmental Policy Act (NEPA) of 1969, the Council on Environmental Quality "Regulations for Implementing the Procedural Provisions of NEPA," 40 Code of Federal Regulations, Part 1500, and the Marine Corps Environmental Compliance and Protection Manual (Marine Corps Order {MCO} 5090.2A).

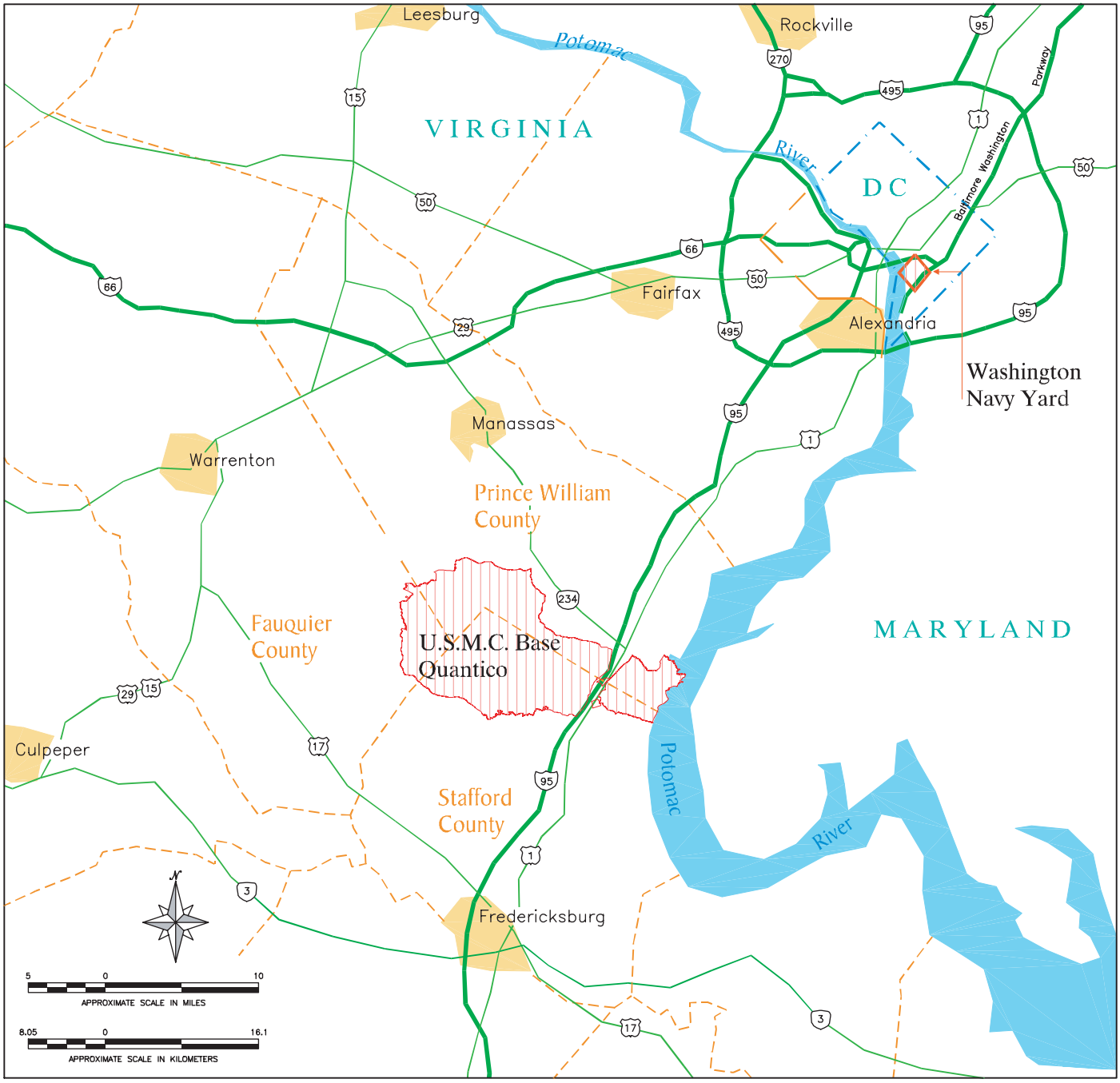
1.2 Purpose and Need

The Marine Corps History and Museums Division (MCHMD) is responsible for the collection, preservation, and presentation of information and material used in the study and development of military doctrine, tactics, weapons, and equipment. The collections contain a wide range of historical material and information on Marine Corps personnel, weapons, equipment, and events. The material and collections held by the MCHMD are a valuable source of information for historical research and are used extensively by teachers and students of various educational and training programs. This information is particularly valuable to students at the Marine Corps University (MCU) at MCB Quantico, who benefit from easy access to the information and materials contained within the museum collections. The location at MCB Quantico also

facilitates sharing of MCU and Marine Corps Reserve Center archiving capabilities. MCB Quantico is a major training and education center for the Marine Corps, as well as for other federal agencies. In addition to the MCU, the base is the site of the Marine Corps Officer Candidate School (OCS), the Marine Corps Combat Development Center (MCCDC), and a variety of other educational and training programs. These institutions regularly use the archives and the displays at the Air-Ground Museum to support instruction and research on combat doctrine, tactics, and technology. The Air-Ground Museum also loans items to other Department of Defense (DoD) museums and to the Smithsonian Institution and other civilian museums.

There are four major components of the MCHMD. The Historical Branch, the Support Branch, and the Field Operations Branch occupy buildings 58 and 154 at the Washington Navy Yard (WNY) in the District of Columbia (see Figure 1-1). These activities maintain and archive Marine Corps historical records and documents, provide administrative services to all MCHMD components, and acquire historical information and artifacts. The fourth component, the Museum Branch at MCB Quantico, curates, restores, and exhibits a variety of large and small military items. These items include weapons, uniforms, personal equipment, vehicles, artillery, and artwork. The Museum Branch occupies all or part of several buildings and outdoor surface areas located throughout the eastern portion of MCB Quantico. These facilities are used for storage, restoration workshops, exhibit space, and administrative offices. The Air-Ground Museum is the main Museum Branch structure, and is primarily used to display and exhibit collection material. Exhibits at both the WNY and MCB Quantico are open to the public.

Information and material are continually added to the museum collections. In response, the MCHMD has acquired any available space at MCB Quantico and the WNY to meet its immediate needs. As a result, the MCHMD now occupies 11 different structures scattered throughout these two bases. Facilities at MCB Quantico include a variety of buildings and open storage areas. The Air-Ground Museum is a complex of three small aircraft hangars built in the 1920s, adjacent to the OCS on the south side of Chopawamsic Creek. The buildings house permanent and changing displays of weapons, personal equipment, tanks, trucks, and small aircraft, and are open to the public from April 1 to November 15. Just north of the Air-Ground Museum are two support buildings which are used for museum storage and workshop facilities. A short distance to the southwest are a Quonset hut and an open field which are used to store aircraft, tanks, and other equipment awaiting preservation. On a hill to the west of the hut are two additional storage facilities - a one-acre fenced yard containing an airplane and numerous aircraft engines in



Legend

- Marine Corps/Navy Installations
- Interstate Highways
- Major Highways
- County Boundaries
- Incorporated Cities
- Potomac River

Marine Corps Heritage Center
MCB Quantico, VA
Environmental Impact Statement

Figure 1-1

Location Map

Parsons Harland Bartholomew & Associates, Inc., Richmond VA, 2000.

individual storage containers and the hilltop Radar Site Complex. The Radar Site Complex is a fenced area of approximately one acre (0.4 hectare) which includes a former radar dome and three buildings. The yard and the buildings are used for open and covered storage of military vehicles and other items. The western half of the Larson Gym building, which lies to the east of the Air Ground Museum, is occupied by artifact restoration and exhibit construction workshops. One-fourth of the third floor of Building 2121, near the Marine Corps Air Facility, is a secure armory where the small arms collection is stored. Finally, Building 2014, near Butler Stadium, houses the Museums Branch administration offices, archival storage, and research facilities.

These facilities provide minimal protection for curation of museum collections, and lack sufficient space for storage or exhibit of historical material. Workshops and office space are also inadequate to support the growing collections and other programs. These deficiencies limit the capabilities of the MCHMD to protect historical material under its control, to provide ready access to historical information, or adequately display its collections. Minor renovations have been undertaken to enhance the existing facilities, but additional improvements to these structures are constrained by various site conditions and would not be economically practical. Consolidation of MCHMD activities and material is necessary to improve operations and services. Replacement of individual buildings at their present scattered locations would not satisfy this requirement.

1.3 Proposed Action

The proposed action includes the construction and operation of a consolidated MCHC complex on, or adjacent to, MCB Quantico to replace existing MCHMD facilities at MCB Quantico and the WNY. The proposed MCHC is envisioned to include the National Museum of the Marine Corps, which would showcase the Corps' many accomplishments over the years. The new facilities are intended to enhance protection of Marine Corps historical collections, improve access to collection material, and foster public education and appreciation through exhibits, displays, and hosting outdoor ceremonies, events, and demonstrations. The MCHC complex would encompass approximately 100 acres (40 hectares) and consist of buildings, outside exhibits, a parade field, demonstration areas, access roads, parking areas, and walkways. The proposed park-like design of the complex would intersperse approximately 20 buildings throughout large areas of maintained lawns (see figures 1-2 and 1-3). The proposed facilities would provide approximately 460,000 square feet (42,735 square meters) of indoor space for museums, exhibits, restoration workshops, curation facilities, administrative offices, a library, an

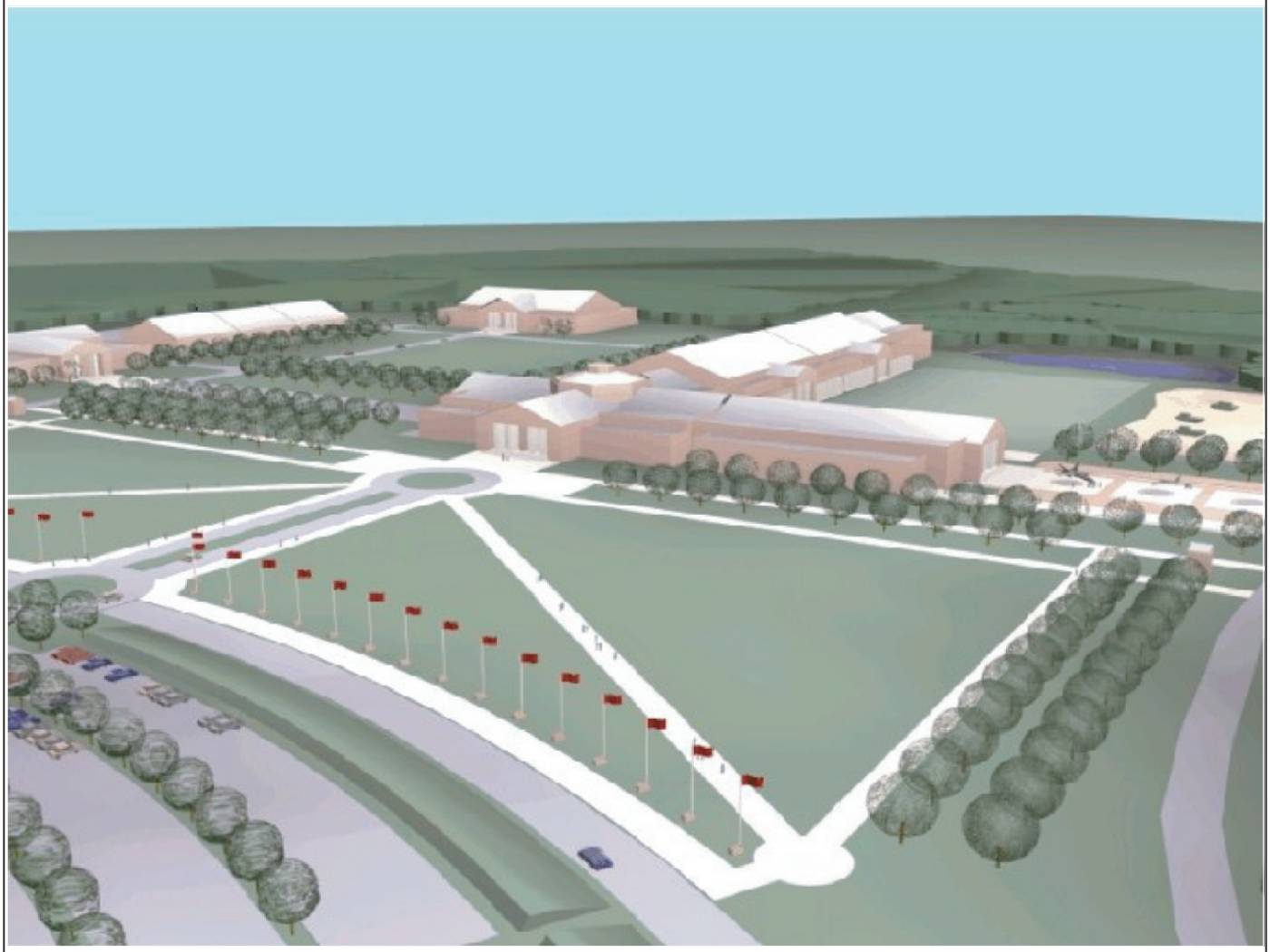
armory, an auditorium, a conference center, and a big screen theater. Primary activities at the MCHC would focus on operation of the museum, conference center, and support facilities. Other activities would include ceremonial events with performances by military bands and cannon salutes. Operational demonstrations would also be conducted at a rate of about once per month and/or on special occasions. The military equipment to be used in these demonstrations would include a variety of rotary wing and warfighting vehicles. These demonstrations would range from static displays to simultaneously landing of up to three V-22 aircraft.

Development of the MCHC complex would occur in phases, with the first phase planned for opening in 2004. The initial phase of development would include installation of utility lines to the site, minor improvements to servicing roadways, preliminary site preparation, and construction of several basic museum facilities. Utility lines would be routed from main trunk lines to the project site along existing roads, easements, and rights-of-way. Roadwork would include modification to existing roadways and intersections to improve routing of traffic in the immediate vicinity of the development. Initial site preparation would include clearing, grading, erosion control and stormwater management structures, access roads, and parking. The first buildings to be constructed at the site would include several basic museum components, such as a welcome center, restaurant, armory, gift shop, and exhibit hall.

Subsequent phases of development would be dependent upon the availability of funds; the funds would be derived primarily from private contributions and revenue generated by operation of the MCHC museum. Table 1-1 outlines the various types of proposed facilities and the phases anticipated for construction of the full MCHC. The MCHC is expected to take 15 to 20 years to be fully completed. When completed, it is expected to attract up to 417,000 visitors annually. The MCHC complex would be open year-round, except for certain holidays. MCHC collections and personnel would be moved into the MCHC in stages as new facilities were completed.

1.4 Scoping and Public Involvement

The National Environmental Policy Act (NEPA) process is designed to involved the public in federal decision-making. Public involvement and intergovernmental coordination and consultation are recognized as essential elements in the development of an EIS. Formal notification and opportunities for public participation, as well as informal coordination with government agencies and planners, have and will continue to occur throughout the EIS process.



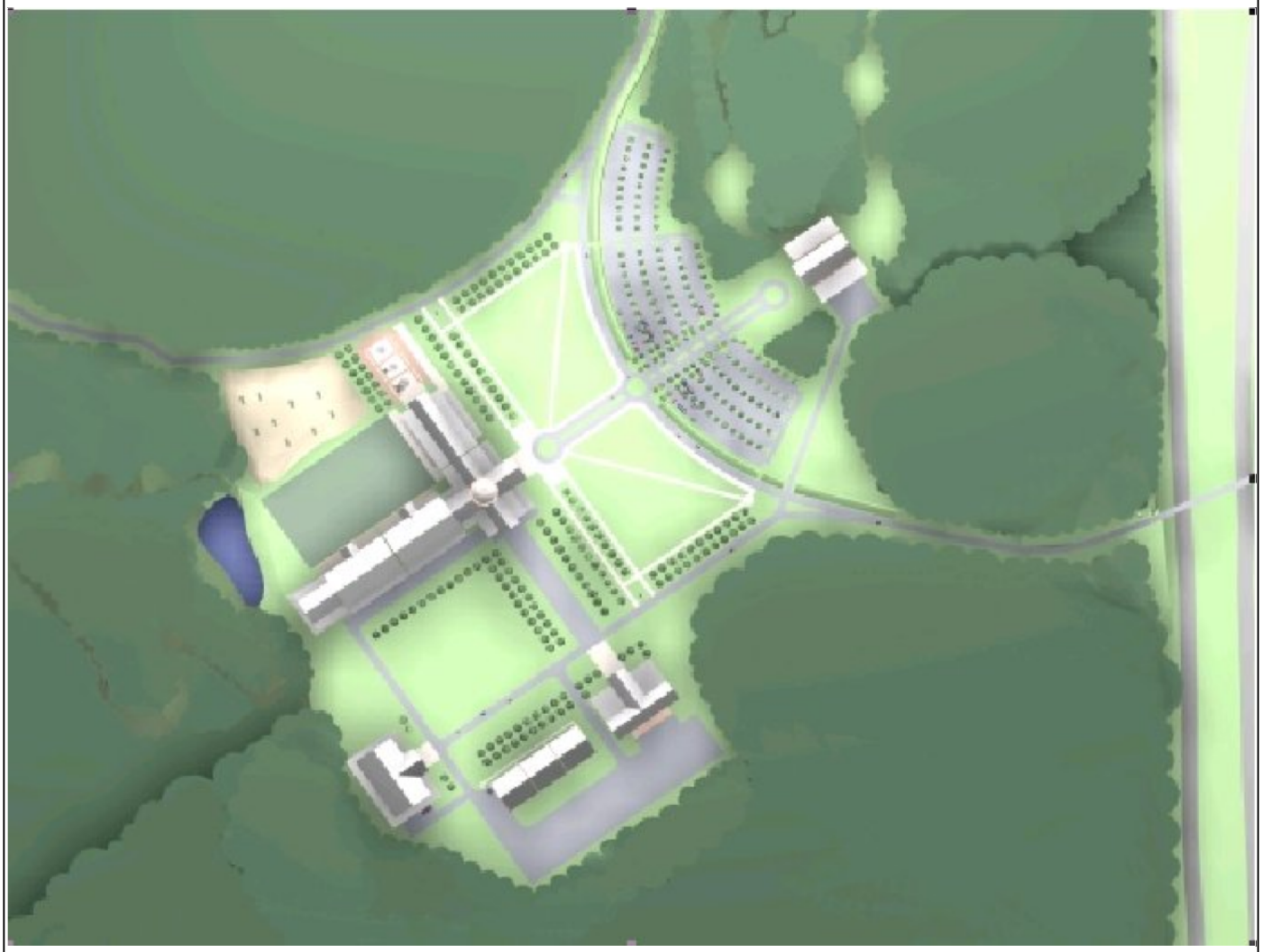
This figure represents the general nature of the proposed MCHC complex and is intended only to illustrate the overall organization and character of the proposed action.

Marine Corps Heritage Center
MCB Quantico, VA
Environmental Impact Statement

Figure 1-2

Concept Design

Parsons Harland Bartholomew & Associates, Inc., Richmond VA, 2000.



This figure represents the general nature of the proposed MCHC complex and is intended only to illustrate the overall organization and character of the proposed action.

Marine Corps Heritage Center
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Figure 1-3

Concept Plan

Parsons Harland Bartholomew & Associates, Inc., Richmond VA, 2000.

A Notice of Intent to Prepare an EIS was published in the *Federal Register* on August 26, 1998. A public scoping meeting was held on September 17, 1998, at the Ramada Inn in Triangle, VA, which is near MCB Quantico in Prince William County. Legal notices with details about the public scoping meeting were placed twice (August 27 and 30, 1998) in each of two local newspapers, *The Free Lance-Star* and the *Potomac News*. An announcement was also published in the MCB Quantico newspaper, *The Sentry*. In addition, a scoping notification letter was mailed to key local and regional elected representatives, organizations, and agencies. The letter provided general information on the proposed action and alternatives, and invited the recipients to participate in the scoping process. Responses received from the public and federal and Virginia state agencies during the scoping process are included in Appendix A. Relevant issues identified through scoping are addressed in this DEIS.

Table 1-1: Heritage Center Building Program	Indoor	Outdoor
Phase 1		
Buildings		
Foundation Office Space	7,500 SF	
Exhibit Space	60,000 SF	
Restaurant	5,000 SF	
Bookstore and Gift Shop	5,000 SF	
Welcome Center	5,000 SF	
Classrooms	1,700 SF	
Busload Rally Point	800 SF	
USMC (HD) Space	23,000 SF	
Miscellaneous Space	12,000 SF	
Outdoor Facilities		
Parade Deck		3 acres
Demonstration Area		7 acres
Roads and Parking		12 acres
Phase 1 Total	**120,000 SF**	**22 acres**

Table 1-1: Heritage Center Building Program (continued)	Indoor	Outdoor
Phase II		
Buildings		
Museum and Exhibit Space	40,900 SF	
Material History Unit	34,000 SF	
Heritage Center Offices	1,400 SF	
Exhibit and Restored Art Storage	18,300 SF	
Restoration and Exhibit Units	63,700 SF	
Historical Branch	9,500 SF	
Archival Storage	15,000 SF	
Support Branch	3,000 SF	
Library	10,600 SF	
Field Operations Unit	6,300 SF	
Auditorium (1500 seats)	18,000 SF	
Outdoor Facilities		
Memorial Park		2 acres
Exhibit Storage		2 acres
Roads and Parking		3 acres
Phase II Total	**220,700 SF**	**7 acres**
Phase III		
Buildings		
Museum and Exhibit Space	40,900 SF	
Conference Center	50,000 SF	
Exhibit and Restored Art Storage	18,300 SF	
Public Toilets	1,300 SF	
Big Screen Theater	12,000 SF	
Outdoor Facilities		
Exhibits		2 acres
Roads and Parking		2 acres
Phase III Total	**122,500 SF**	**4 acres**
Heritage Center Total	**463,200 SF**	**33 acres**

Source: Marine Corps Heritage Center Concept Development
Note: The information provided in this table is an approximation of the size and timing of development. Build out may not occur in three distinct phases, nor are space allocations likely to be exactly as shown. Construction would be accomplished as funds become available.

Throughout the preparation of the DEIS, an effort was made to locate, inform, and seek input from interested individuals and organized groups. All individuals or organizations identified on the EIS distribution list will receive copies of the DEIS, public hearing notices, and the Final EIS. Individuals or organizations wishing to be added to the distribution list or requesting to review support EIS documentation, should contact the Marine Corps representative listed on the cover sheet of this document.

SECTION 2: Alternatives

2.1 General

The proposed MCHC must be located on, or adjacent to, MCB Quantico in order to support professional military educational programs and special Marine Corps programs and activities, as well as to accommodate all MCHMD activities. MCB Quantico is located 35 miles (56 kilometers) south of Washington, DC, and 20 miles (32 kilometers) north of Fredericksburg, VA, on the west side of the Potomac River (see Figure 1-1). The base includes approximately 60,200 acres (24,363 hectares) in Prince William County (40 percent), Stafford County (55 percent), and Fauquier County (5 percent). Prince William Forest Park, a unit of the National Park Service, and Quantico National Cemetery abut MCB Quantico on its northern boundary. MCB Quantico serves as a major training and education center for the United States Marine Corps, as well as for other federal agencies.

2.2 Siting Criteria

Alternative sites for the MCHC were identified within the Quantico area in consideration of ongoing military mission requirements, installation land use management plans, and specific siting criteria for the project. The siting criteria includes a) Adjacency to MCB Quantico to facilitate the relationship with on-base educational programs and support functions; b) Ready accessibility to I-95; and c) Suitable size (approximately 100 acres {40 hectares}) and setting appropriate for development of the MCHC complex, including noise and visual buffers.

2.3 Viable Alternatives

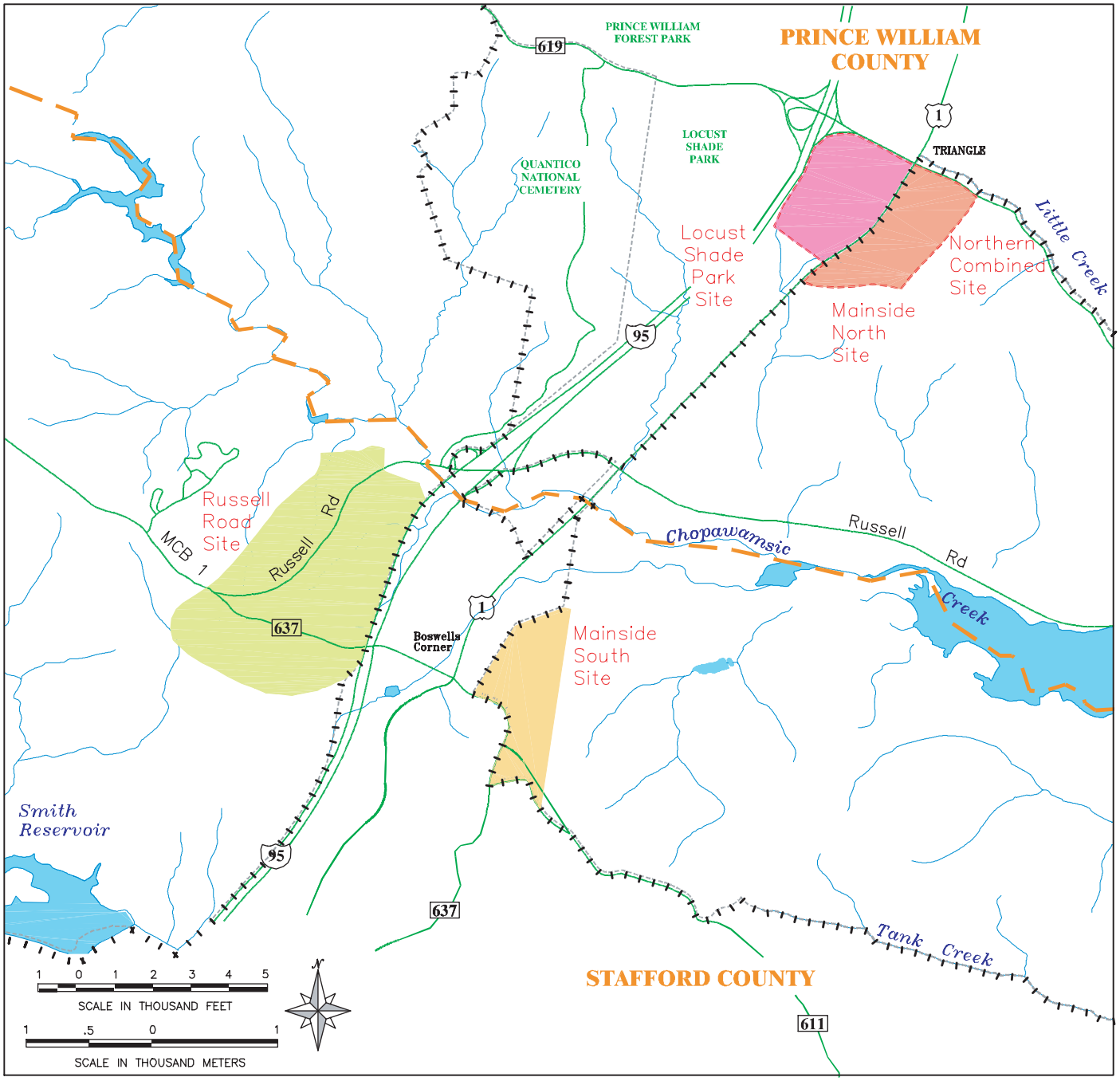
With consideration of these factors, the Marine Corps identified three alternative sites at MCB Quantico - the Russell Road site, the Mainside South site, and the Mainside North site. Two additional sites were identified through public scoping for the EIS. They are the Cherry Hill site and the Locust Shade Park site. A preliminary evaluation of these two additional sites revealed that the Cherry Hill site did not meet the siting criteria for adjacency to MCB Quantico or convenient access to I-95. As a result the Cherry Hill site was eliminated from further consideration as a viable alternative location for the MCHC. The Locust Shade Park site does meet the criteria established for the proposed action and has been evaluated in this EIS. A fifth alternative was identified as viable and consists of a combination of the Locust Shade Park Site and one of the on-base sites. All five alternative site locations are adjacent to MCB Quantico, have easy access to I-95, and have suitable space to accommodate the proposed MCHC complex (see Figure 2-1).

2.4 Alternative 1: Russell Road Site

Alternative 1 involves development of the MCHC within the Russell Road site (see Figure 2-2). This site includes an area of approximately 500 acres (202 hectares) of Marine Corps property located to the west of I-95 in northern Stafford County. This is the largest of the alternative locations, and the MCHC complex would only occupy about one-fifth of the site area. Development at this location would avoid the buffer area for the small whorled pogonia and the large wetlands in the southwest portion of the alternative site. Existing structures within this site would be demolished.

2.5 Alternative 2: Mainside South Site

This site is located approximately one-quarter mile (0.4 kilometer) east of the US-1/VA-637 intersection near Boswells Corner in northern Stafford County (see Figure 2-3). It contains approximately 159 acres (64 hectares) of Marine Corps property.



Legend

- Russell Road Site - 500 Acres (202 hectares)
- Mainside South Site - 159 Acres (64 hectares)
- Mainside North Site - 140 Acres (57 hectares)
- Locust Shade Park Site - 110 Acres (45 hectares)
- Northern Combined Site - 250 Acres (101 hectares)
- Property Line
- Road
- Stream
- County Boundary
- MCB Quantico Boundary

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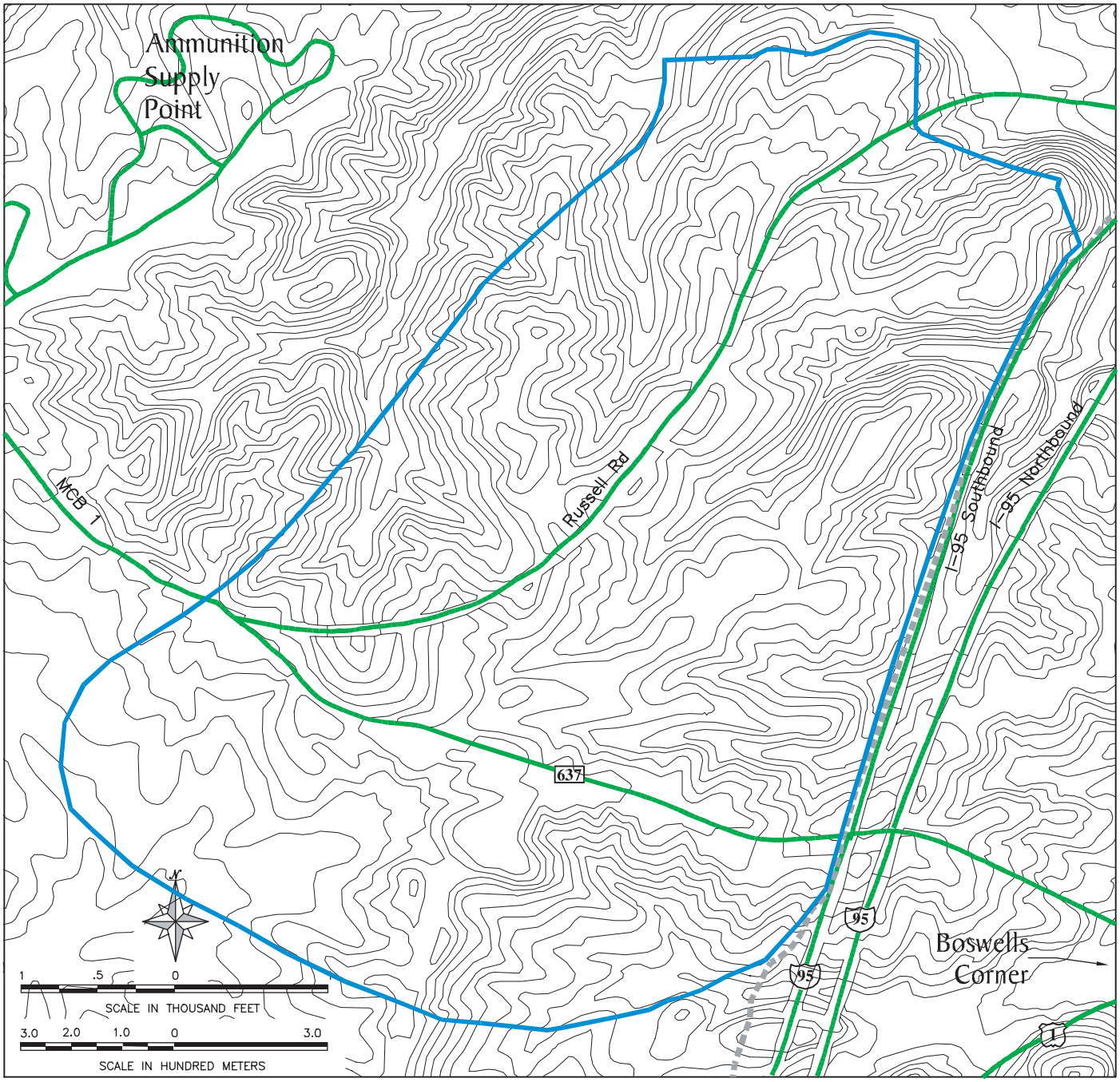
Environmental Impact Statement

Figure 2-1

Alternative Sites Being Considered

Parsons Harland Bartholomew & Associates, Inc., Richmond VA, 2000.



Legend

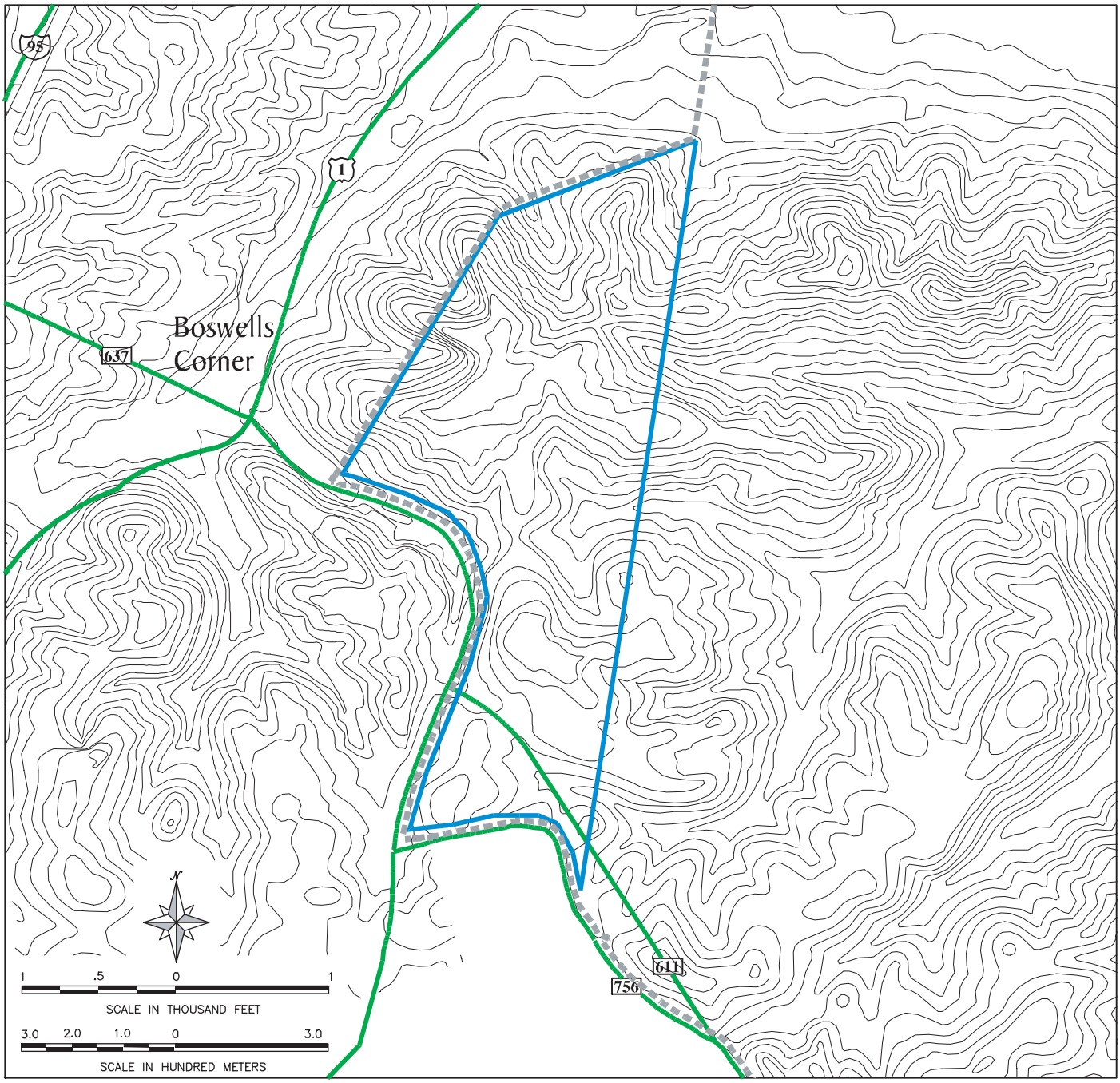
- MCB Quantico Boundary
- Russel Road Site Boundary
- Roads
- 10' Contour Lines

Marine Corps Heritage Center
MCB Quantico, VA
Environmental Impact Statement

Figure 2-2

Russell Road Site

Parsons Harland Bartholomew & Associates, Inc., Richmond VA, 2000.



Legend

- MCB Quantico Boundary
- Mainside South Site Boundary
- Roads
- 10' Contour Lines

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Figure 2-3
Mainside South Site

Parsons Harland Bartholomew & Associates, Inc., Richmond VA, 2000.

2.6 Alternative 3: Mainside North Site

This site consists of approximately 140 acres (57 hectares) of Marine Corps property located southeast of the intersection of US-1 and VA-619, near Triangle, in southern Prince William County (see Figure 2-4). Existing structures within this site would be demolished.

2.7 Alternative 4: Locust Shade Park Site (Preferred Alternative)

This 110 acre (45 hectare) site is located between I-95 and US-1, just south of VA-619 (see Figure 2-5). It is situated in the northeast corner of Locust Shade Park, which is owned by Prince William County. Implementation of the proposed action at this alternative site would involve a real estate transaction between Prince William County and the Marine Corps.

2.8 Alternative 5: Northern Combined Site

This alternative would use portions of both the Locust Shade Park site and the Mainside North site for development of the Marine Corps Heritage Center Complex (see Figure 2-6). The majority of complex components would be located on the Locust Shade Park site and primarily consist of museum and visitor related facilities. Components to be located on the Mainside North site would consist of administrative facilities.

2.9 No-Action Alternative

Under the No-Action Alternative, the MCHMD would continue to operate out of existing facilities at the WNY and MCB Quantico. These facilities are seriously overcrowded, afford minimal protection for collection material, and provide only limited space for presentation of exhibits and access to archival information. Implementation of the No-Action Alternative would significantly affect the ability of the MCHMD to perform its mission by restricting development of enhanced museum facilities to protect and exhibit historical material, and by limiting its ability to better serve patrons, or improve its operational efficiency and capabilities.

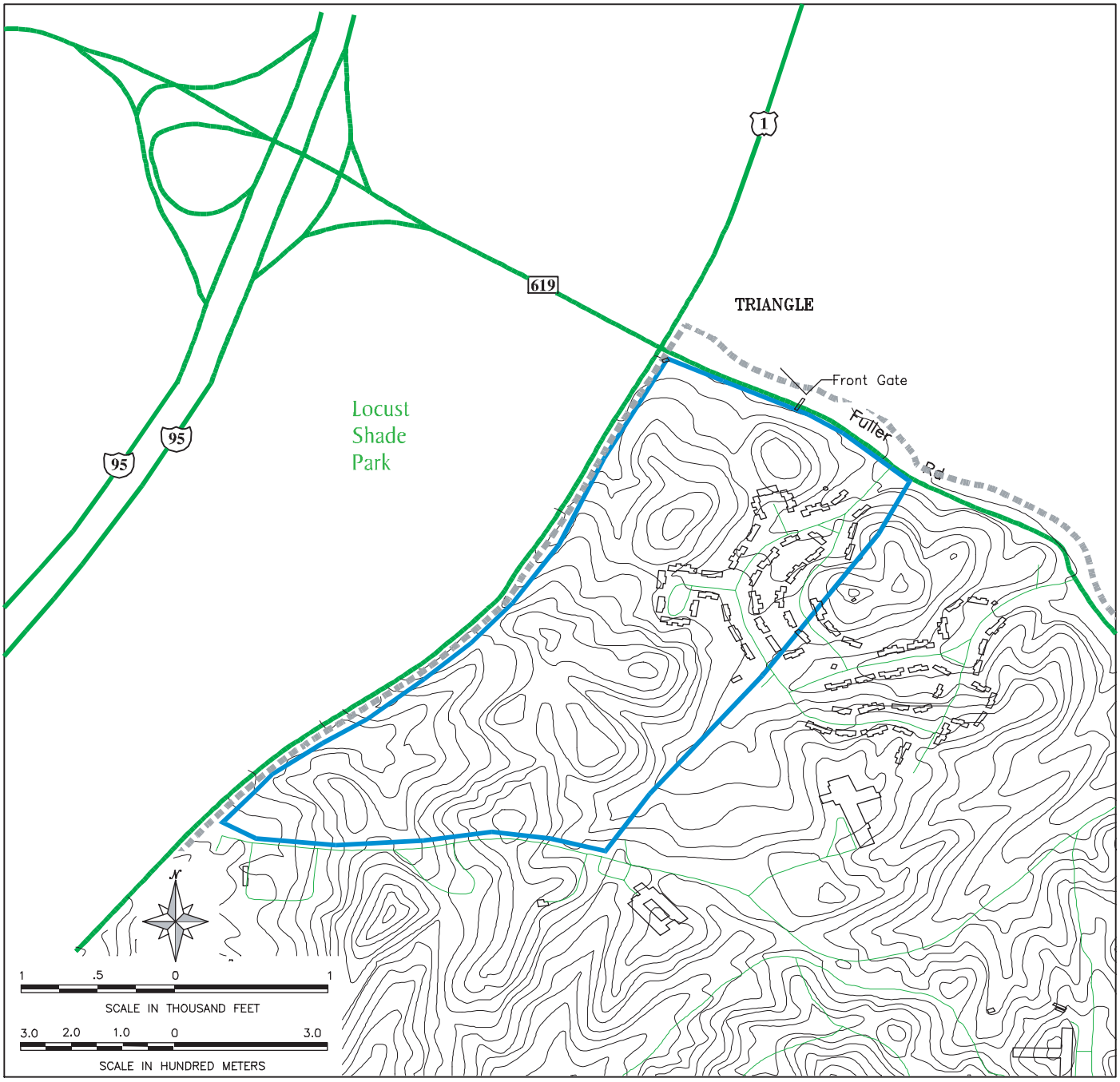
The following photographs show some of the facilities at MCB Quantico.

Air-Ground Museum

Radar Site Storage Complex

Building 2014 - Administration and Storage

Restoration and Exhibit Workshops



Legend

- MCB Quantico Boundary
- Mainside North Boundary
- Roads
- 10' Contour Lines
- Buildings

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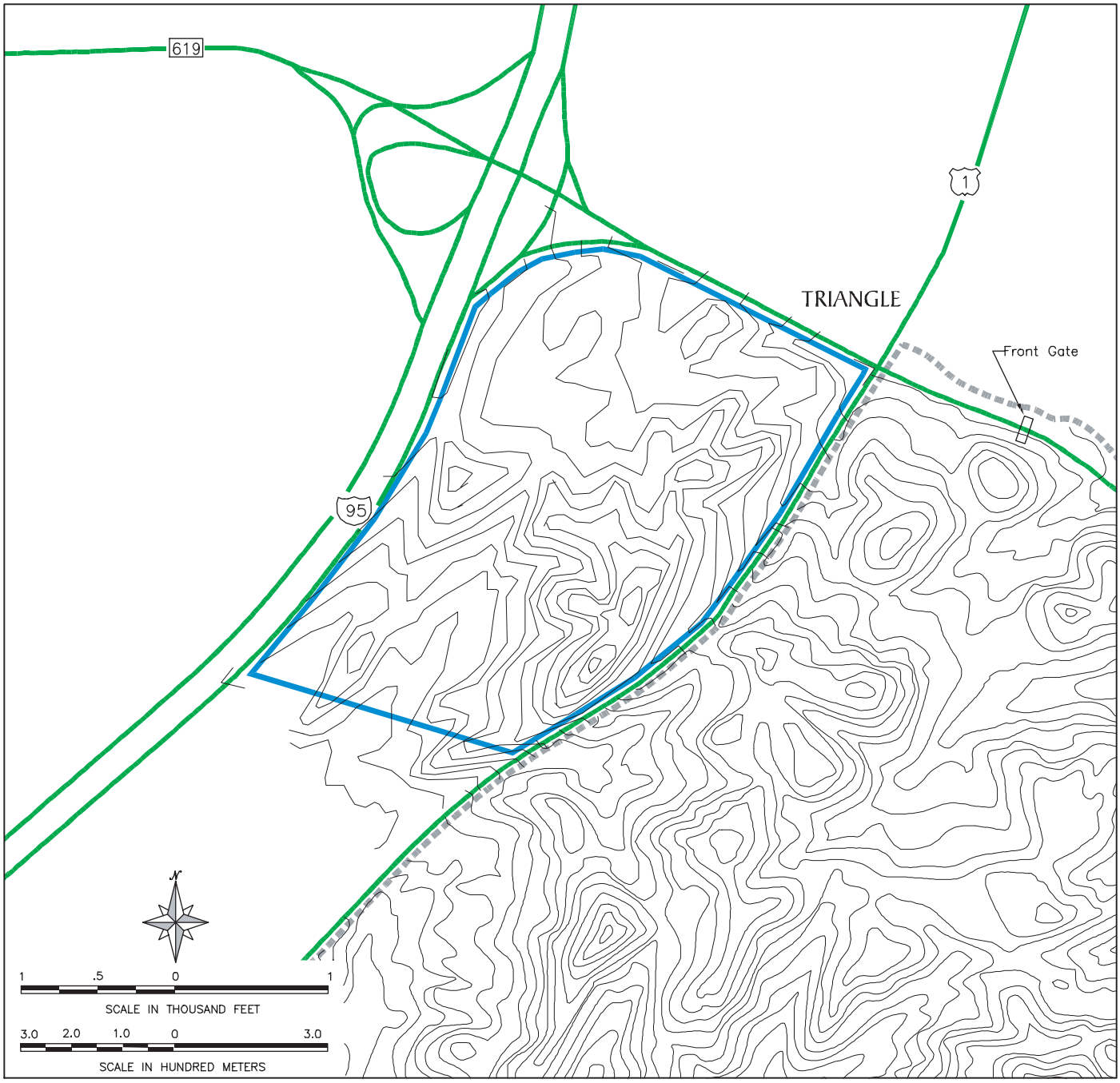
Environmental Impact Statement

Figure 2-4
Mainside North Site

Parsons Harland Bartholomew & Associates, Inc., Richmond VA, 2000.



Legend

- MCB Quantico Boundary
- Locust Shade Park Site
- Roads
- 10' Contour Lines

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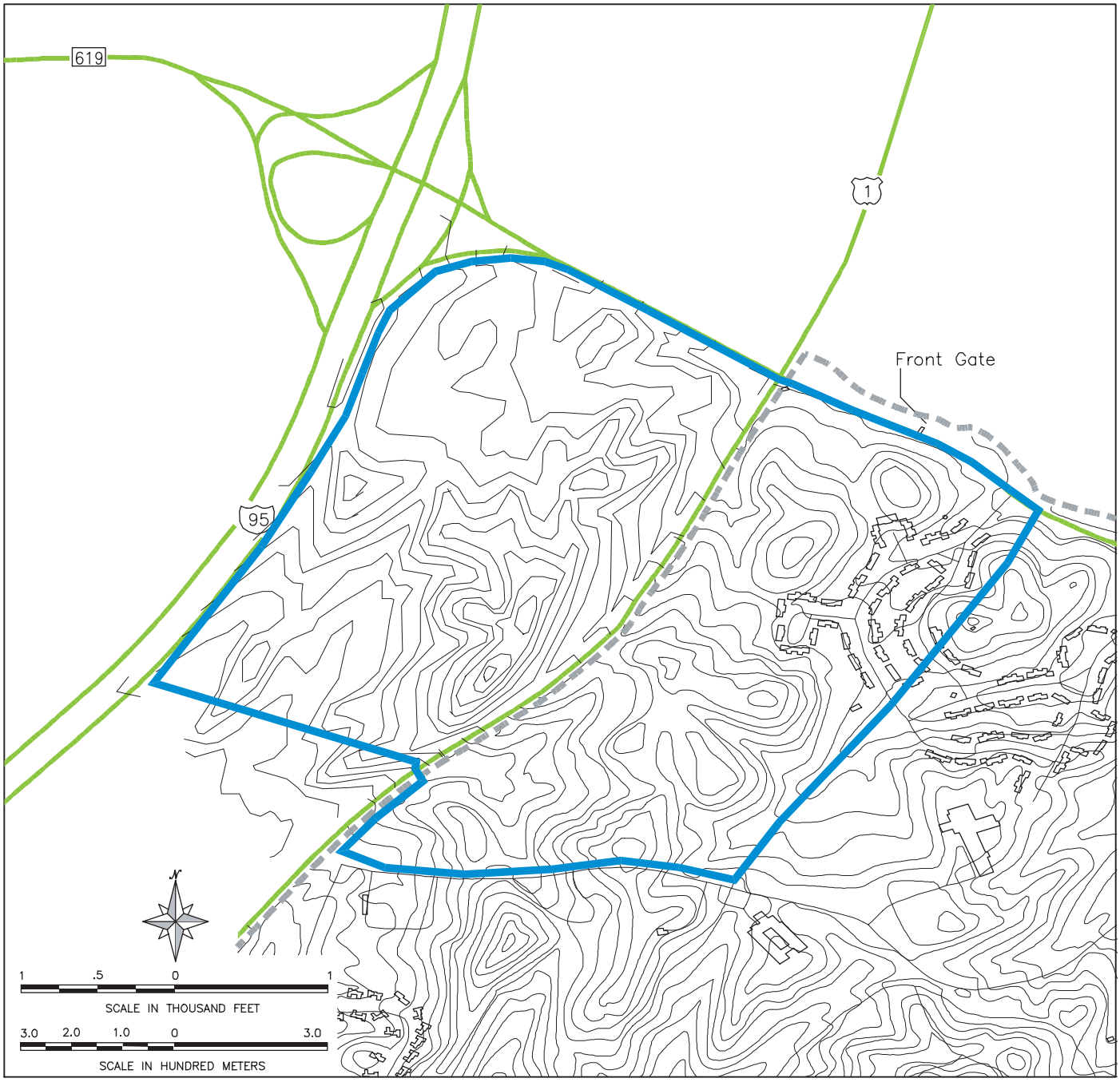
Environmental Impact Statement

Figure 2-5
Locust Shade Park Site

Parsons Harland Bartholomew & Associates, Inc., Richmond VA, 2000.



Legend

- MCB Quantico Boundary
- Locust Shade Park Site Boundary
- Roads
- 10' Contour Lines
- Buildings

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Figure 2-6
Northern Combined Site

Parsons Harland Bartholomew & Associates, Inc., Richmond VA, 2000.

SECTION 3: Description of the Existing Environment

3.1 Topography, Geology, and Soils

The easternmost 7,000 acres (2,833 hectares) of MCB Quantico are in the Atlantic Coastal Plain geologic province. The balance, 53,200 acres (21,449 hectares), lies to the west in the Piedmont geologic province. The boundary between the two geologic provinces generally parallels I-95. Piedmont geology consists of highly deformed and metamorphosed sedimentary, volcanic, and plutonic rocks of Ordovician, Cambrian, and Late Proterozoic ages (over 300 million years ago). The Atlantic Coastal Plain geology is more recent, dating from the Eocene and Cretaceous ages (50 to 100 million years ago), and consists of sediments that are a mixture of alluvial (river borne), marine, eolian (wind borne), and slack water deposits that have been reworked many times and have developed into mixed strata with pockets of medium to fine sands and variegated clays (MCB Quantico, 1996. *Land Management Plan*).

Differences of underlying geological structure have resulted in variations in the characteristics of the soils developed on the surface. The soils of the Piedmont uplands are the products of the weathering of the bedrock upon which they rest. These soils occur in varying depths depending on their exposure to the sun and rain and tend to be fine-grained but moderately able to infiltrate precipitation. The soils of the Coastal Plain have primarily developed from layers of sediments deposited by rivers that carried eroded materials from the Piedmont region when it was more

mountainous. These soils have no underlying bedrock, tend to be very fine-grained, and are slow to infiltrate precipitation. The most widespread soils in the vicinity of the alternative sites belong to the Caroline-Lunt-Sandy and Gravelly Sediments association. On the steeper slopes that overlook Chopawamsic Creek, near where it is crossed by I-95 and US-1, the soils belong to the Rumford-Watt association (MCB Quantico, 1996. *Land Management Plan*).

The dense forest cover that occurs naturally in the region is a result of the overall stability of the topography. However, erosion can occur rapidly on sloping areas when the forest cover is removed. As urbanization has developed in the region, roads and buildings have been located on the flatter terrain, particularly on broad ridges and along the banks of rivers and streams. This pattern has left the more rugged hillsides in woodland. The terrain of the Coastal Plain is characterized by low, rounded hills and long, rolling northeast to southwest ridges (MCB Quantico, 1996. *Land Management Plan*). In the Piedmont, the terrain is somewhat more rugged and rocky. In places, bedrock may be visible at the surface and some north-facing slopes consist of exposed bedrock with no soil cover.

3.1.1 Russell Road Site Because the Russell Road site is west of I-95, it lies within the Piedmont physiographic province. However the southern half of the site contains areas where Coastal Plain features have been deposited on top of the older Piedmont structure. The underlying bedrock tends to be massive, hard, and highly fractured. On slopes that face east, south, and west the rock has generally weathered to form soils that can be up to 10 feet (3 meters) thick (US Dept. of Agriculture, February 1974). On north-facing slopes the soil cover would be thinner.

The soils found in the Russell Road site belong to both the Rumford-Watt association and the Caroline-Lunt-Sandy and Gravelly Sediments association. On the northern end of the site and the eastern edge overlooking I-95, the Rumford-Watt association dominates. This association consists of soils that are shallow to deep, well-drained, steeply sloping, and underlain by graphitic schist bedrock. Although these soils present severe limitations for land development due to steep terrain and erodibility, modern construction techniques can be used to overcome these limitations. The balance of the Russell Road site, away from the steep terrain, belongs to the Caroline-Lunt-Sandy and Gravelly Sedimeints association. The soils of this association are shallow to deep, well-drained, gently sloping and underlain by stratified sandy, gravelly and clayey materials. In this location, these stratified soils are margins of Coastal Plan soil types that have been deposited on top of lower areas of Piedmont bedrock formations. The soils in this

association, in general, have some limitations for development, such as high shrink-swell ratio and areas of perched water table. They may also be difficult to work with when wet. But, these aspects are relatively manageable with normal construction and building techniques. Figure 3-1 shows areas of the Russell Road site which may present soils constraints for the construction of buildings, paving, and utilities. The areas that are the most constrained are generally located along the stream beds and adjacent steep slopes. Some areas where perched water table condition may be present are also included in the area of soils limitations. The soils which do not present unusual problems for development are generally located adjacent to the existing road network and on ridges between drainage gullies.

The terrain of the Russell Road site consists of broad, flat ridges separated by steep (greater than 15 percent) side slopes. The largest contiguous gradually sloped portion of the site is approximately 100 acres (40 hectares). This area lies south of VA-637. A second gradually sloped area of approximately 80 acres (32 hectares) lies north of VA-637. Several smaller gently sloped areas are scattered in the west, north, and southeast portions of the site. Those areas of the site that have slopes of 15 percent or steeper are shown in Figure 3-1. The areas where both the soil limitations and the steep slopes occur are highlighted as having severe limitations for building.

3.1.2 Mainside South Site The Mainside South site lies to the east of I-95 and is within the Atlantic Coastal Plain. The geology of the Coastal Plain consists primarily of deep layers of sediment that has accumulated over time from the erosion of the mountains that rested on the neighboring Piedmont. The layering of the sediments in the Coastal Plain tends to be complex and altered in some places by regional uplift and subsequent erosion of newly elevated layers, which forms gently rolling hills and some steep slopes. Hard layers of bedrock do not occur in the Coastal Plain, but layers of packed sand and partially consolidated sandstone do occur. Any such hard layers lie at a considerable depth below the surface in the Coastal Plain, so it is unlikely that rock-like strata would be encountered during construction undertaken on the Mainside South site.

The soils found in the Mainside South site also belong to both the Caroline-Lunt-Sandy and Gravelly Sediments and the Rumford-Watt associations. On the western edge of the site, the Rumford-Watt association dominates. These soils are shallow to deep, well-drained and steeply sloping, and are underlain by graphitic schist bedrock. Although these soils present severe limitations for land development due to steep terrain and erodability, modern construction techniques can be used to overcome these limitations. The balance of the soils on the Mainside

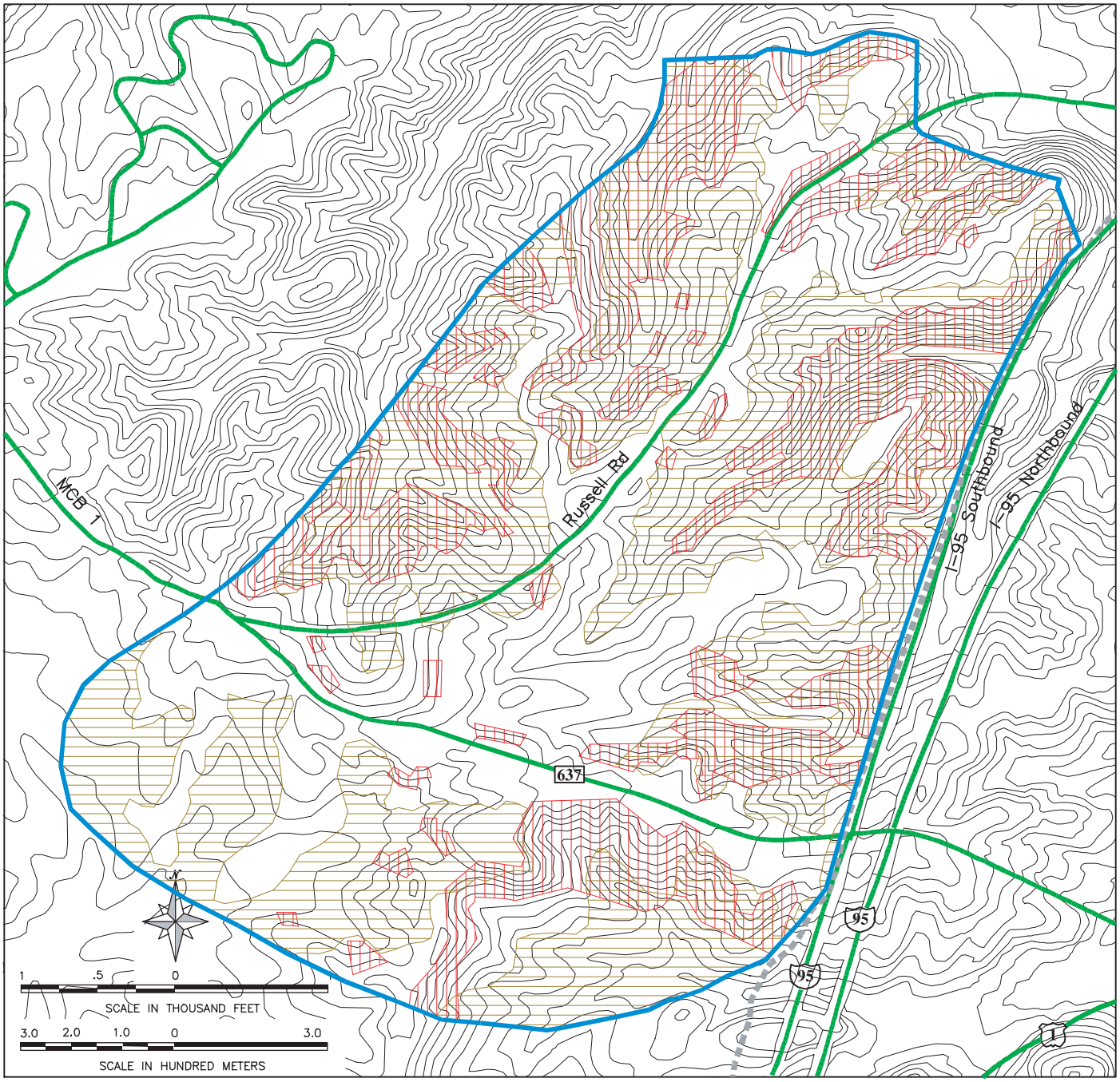
South site, including the steep terrain at the northern end, belong to the Caroline-Lunt-Sandy and Gravelly Sediments association. The soils of this association are shallow to deep, well drained, and prone to erosion when on steep topography. Where the terrain is gently sloping, the soils in this association are relatively manageable using normal construction and building techniques. Figure 3-2 shows areas of the Mainside South site which may present soils constraints for the construction of buildings, paving and utilities.

The terrain of the Mainside South site consists of narrow ridges separated by steep (greater than 15 percent) slopes. The areas where both the soil limitations and the steep slopes occur are highlighted as having severe limitations for building in Figure 3-2. The largest contiguous gradually sloped portion of the site is approximately 95 acres (38 hectares) and lies in the center and the southern end of the site. The northern and western portions are dominated by steep terrain.

3.1.3 Mainside North Site The Mainside North site lies farthest to the east of all three sites and is within the Atlantic Coastal Plain. The geological conditions that underlie the site are typical of the Coastal Plain as described above. Consolidated sand layers lie at a considerable depth below the surface, so it is unlikely that rock-like strata would be encountered during construction undertaken on the Mainside North site.

The soils within the Mainside North site are classified as Caroline-Lunt-Sandy and Gravely Sediments associations. These soils are shallow to deep, well drained, and prone to erosion only when on steep topography. The terrain consists of broad, flat hilltops connected by wide flat ridges. Small areas within the site have been identified where soil limitations are a consideration (Figure 3-3). These limitations can typically be overcome through modern construction techniques. Steep topography occurs only in small scattered areas throughout the Mainside North site and no portion of the site is dominated by severely limited soils conditions. Figure 3-3 shows the few areas of the Mainside North site which might present limited soils constraints for the construction of buildings, paving, and utilities.

The terrain of the Mainside North site consists of broad, flat hilltops connected by wide flat ridges. Two small areas steeper than 15 percent occur; one near the center of the site and one in the northern end, but virtually all of the site is accessible without crossing slopes steeper than 15 percent. The areas where both the soil limitations and the steep slopes occur are highlighted as having severe limitations for building in Figure 3-3.



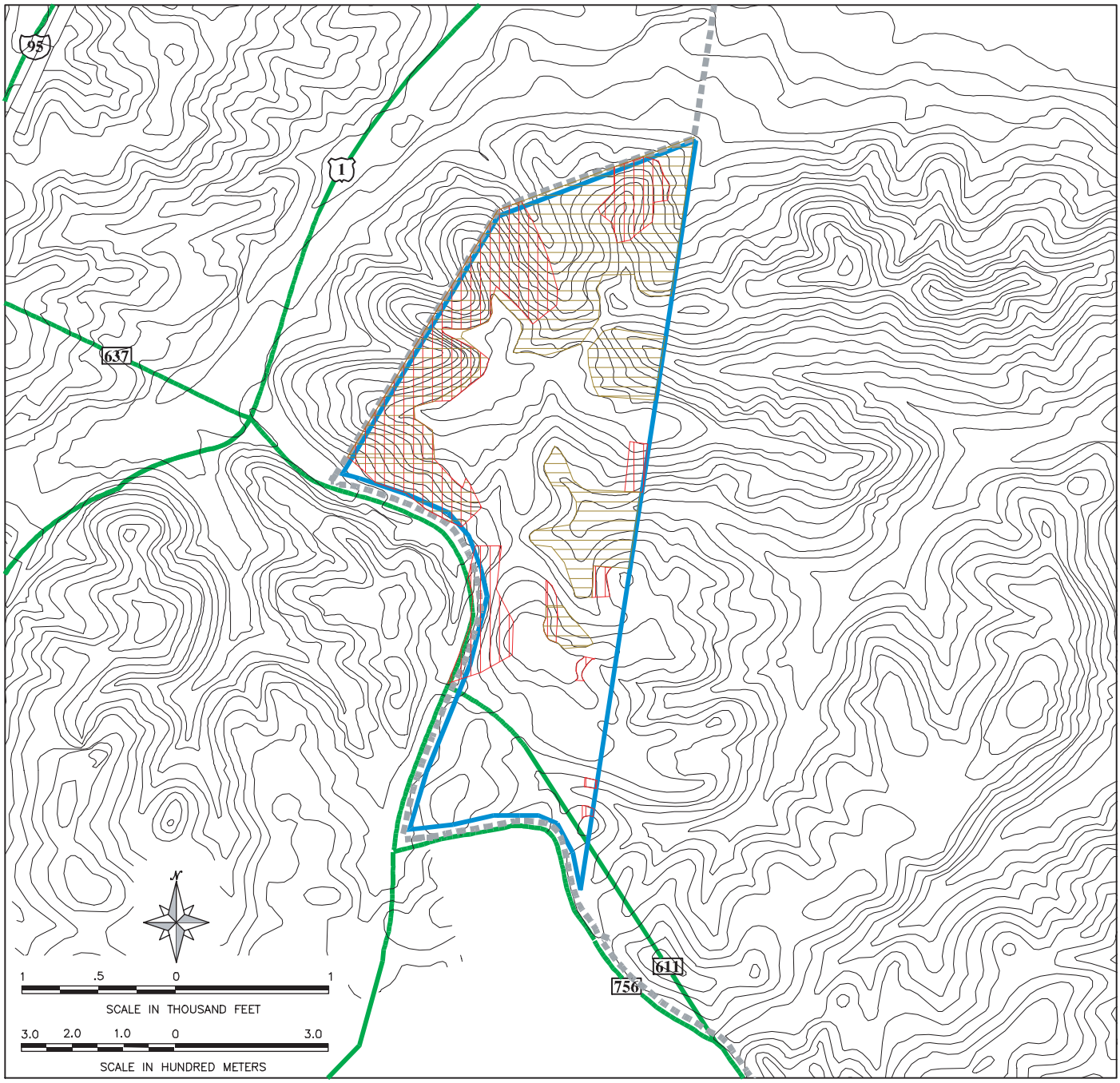
Legend

- MCB Quantico Boundary
- Russel Road Site Boundary
- Areas with Soil Limitations for Construction
- Areas with Slopes Steeper Than 15%
- Areas with Severe Building Limitations
- Roads
- 10' Contour Lines

Marine Corps Heritage Center
MCB Quantico, VA
Environmental Impact Statement

Figure 3-1
Soil & Slope Conditions
Russell Road Site

Parsons Harland Bartholomew & Associates, Inc., Richmond VA, 2000.



Legend

- MCB Quantico Boundary
- Mainside South Site Boundary
- Areas with Soil Limitations for Construction
- Areas with Slopes Steeper Than 15%
- Areas with Severe Building Limitations
- Roads
- 10' Contour Lines

Marine Corps Heritage Center
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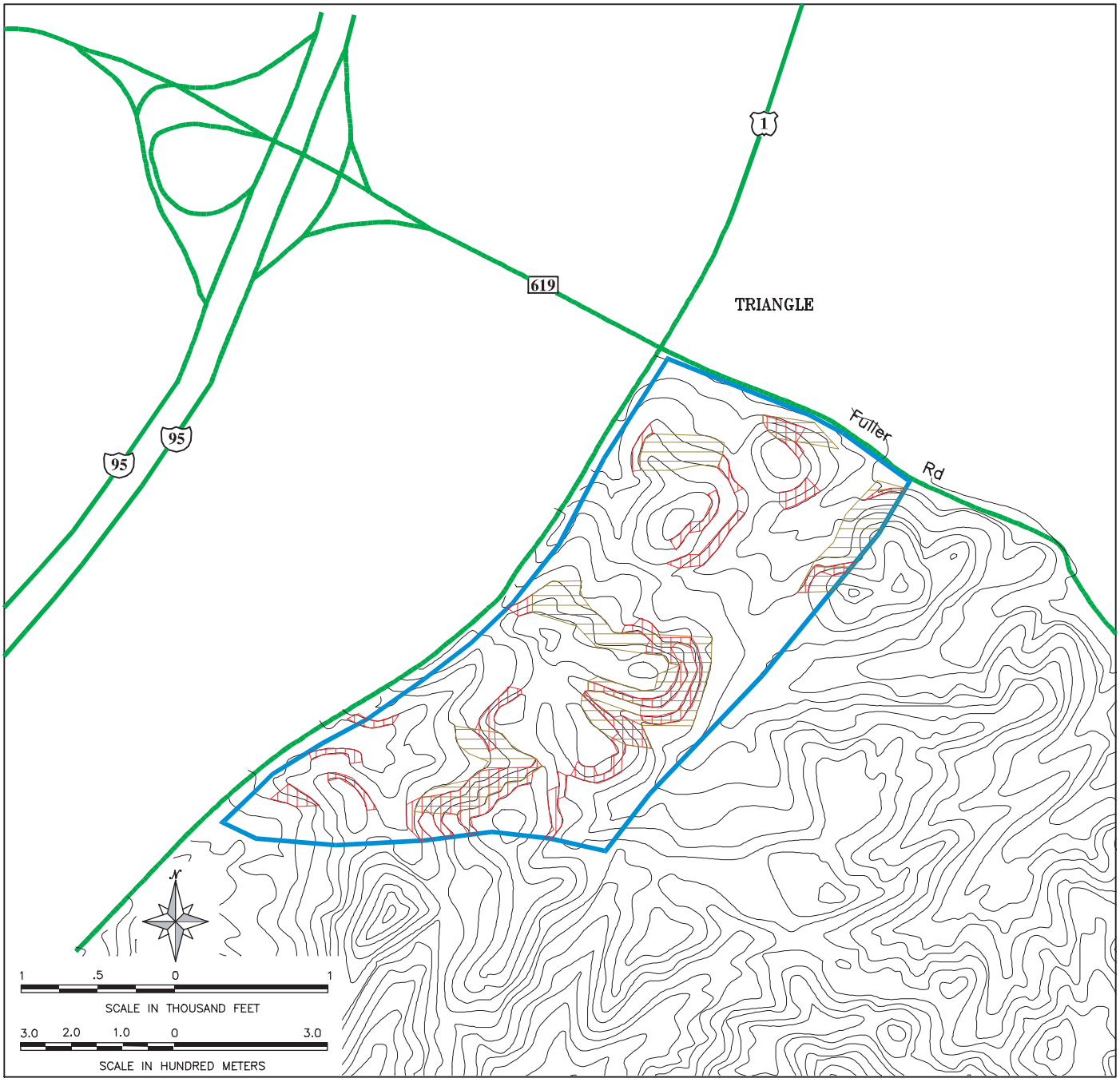
Figure 3-2
Soil & Slope Conditions
Mainside South Site

Parsons Harland Bartholomew & Associates, Inc., Richmond VA, 2000.



Legend

- MCB Quantico Boundary
- Mainside North Boundary
- Areas with Soil Limitations for Construction
- Areas with Slopes Steeper Than 15%
- Areas with Severe Building Limitations
- Roads
- 10' Contour Lines
- Buildings

Marine Corps Heritage Center
MCB Quantico, VA
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Figure 3-3
Soil & Slope Conditions
Mainside North Site

Parsons Harland Bartholomew & Associates, Inc., Richmond VA, 2000.

3.1.4 Locust Shade Park Site The Locust Shade Park site lies within the Atlantic Coastal Plain and possesses geological and soils similarities with both the Mainside North and South sites. The Locust Shade Park site is topographically similar to the Mainside South site and the Russell Road site in that it has some areas of steep slopes and considerable changes in elevation between the ridge tops and the lower areas.

The soils found in the Locust Shade Park site belong to the Caroline-Lunt-Sandy and Gravelly Sediments association. These soils are shallow to deep, well drained, and prone to erosion when on steep topography. Where the terrain is gently sloping, the soils in this association are relatively manageable using normal construction and building techniques. The steep east-facing slopes adjacent to US-1 are relatively stable deposits of sand and gravel. The sloping areas within the site are comprised of Caroline Fine Sandy Loam (USDA, 1967). Figure 3-4 shows the areas of the Locust Shade Park site which might present limited soils constraints for the construction of buildings, paving, and utilities.

The terrain of the Locust Shade Park site consists of a narrow ridge that runs north to south parallel to US-1. While very steep (30 percent) on the east face toward the highway the ridge slopes more gradually (12 percent) to the west, toward the middle of the site. The interior of the site is gently rolling (10 percent slopes) to flat, except for one area near the middle where a ridge extends across the site to the western edge. A steep stream cut through the east-west ridge appears to have been made more abrupt by early- or mid-twentieth century grading for a road that extends through the ridge. The areas where both the soil limitations and the steep slopes occur are highlighted on Figure 3-4 as having severe limitations for building.

3.1.5 Northern Combined Site The Northern Combined site is within the Atlantic Coastal Plain and possesses the topographic, geologic, and soils characteristics described above for the Mainside North and Locust Shade Park sites (see Figure 3-5).

3.2 Water Quality and Hydrology

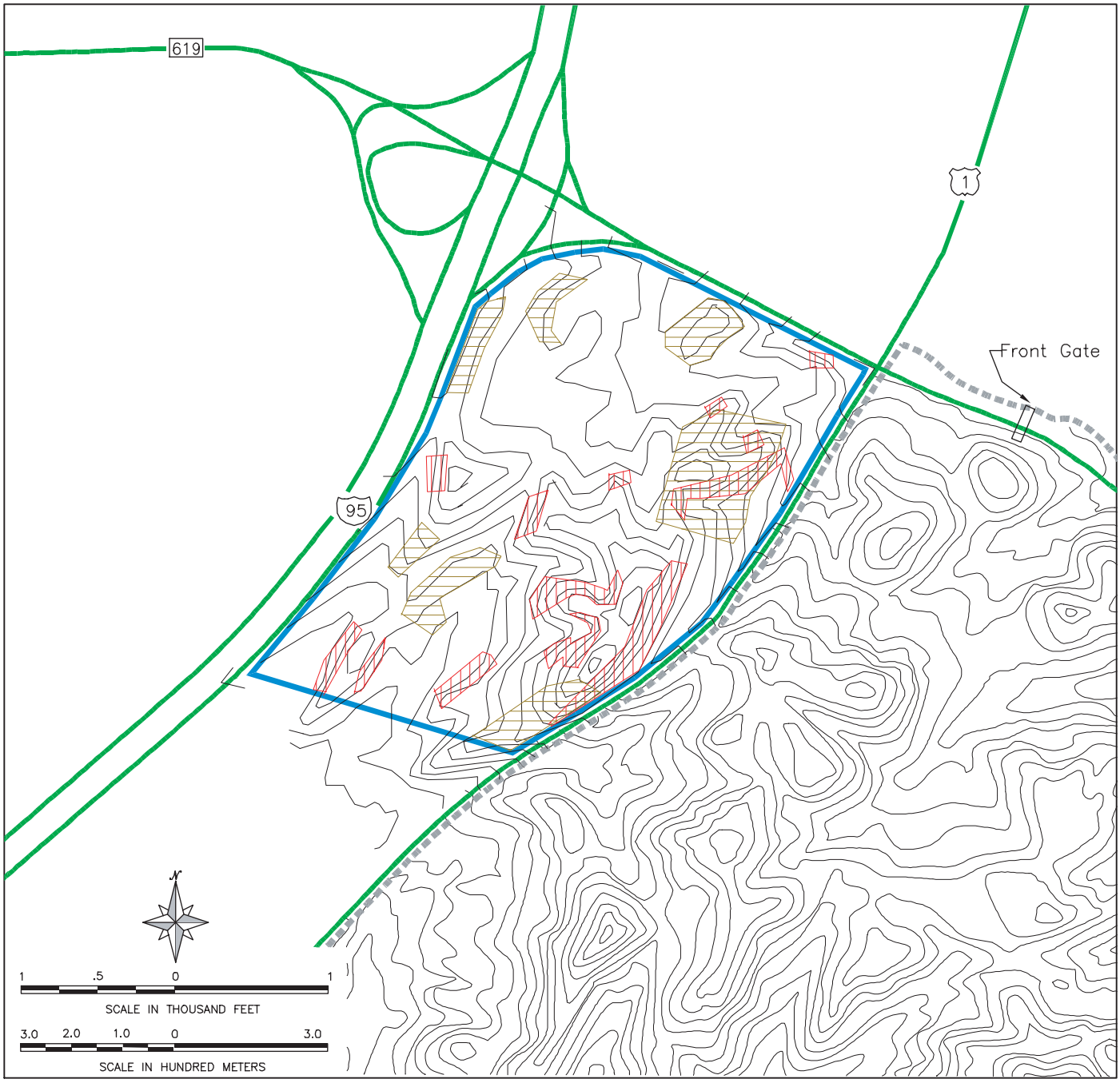
Surface drainage from the eastern portion of the base, which includes the five alternative sites, ultimately flows into the Potomac River. The tributaries that drain the alternative sites are Chopawamsic Creek, Little Creek, and an unnamed stream that flows into Smith Reservoir (see Figure 3-6). Water quality data has been collected at two locations along Chopawamsic Creek. The US Geological Survey (USGS) analyzed samples taken twice per month from a point near I-95, between January 1997 and May 1998. Virginia monitoring of water quality, under the US

Environmental Protection Agency (EPA) Storage and Retrieval (STORET) program was also conducted on Chopawamsic Creek, at the US-1 bridge, between January, 1997 and December, 1998. Based on the collected data, the water quality in Chopawamsic Creek is generally good, with the following exceptions: a) it is somewhat acidic, b) it exceeds Virginia standards for swimming due to fecal coliform, and c) in some cases, the presence of metals in the water and sediments are higher than some federal and Virginia standards (see Appendix B).

A band along the western edge of the Atlantic Coastal Plain has been identified by the US Geological Survey as the groundwater recharge area for underground aquifers that extend eastward under the Chesapeake Bay. MCB Quantico lies within that band which extends from Baltimore, MD, to Richmond, VA. The aquifers are layers of sand that convey the water downward and to the east. Wells in the Eastern Shore area of Maryland and Virginia are drilled to the aquifer layers, which lie at considerable depth at that point. The deep wells are favored in the Eastern Shore because they provide adequate water for municipal, agricultural, and industrial use and do not cause the intrusion of salt water that occurs when large volumes of water are withdrawn from shallow wells.

3.2.1 Russell Road Site Runoff from the Russell Road site is carried by numerous intermittent streams which join to form tributaries that feed Chopawamsic Creek on the north and east and Smith Reservoir to the southwest. The site is mostly covered with well- established stands of mixed deciduous and pine species. Runoff leaving this site filters through vegetation and leaf litter on the forest floor before entering the streams. This vegetation and surface litter help to stabilize soils on the site, which significantly reduces soil erosion. There are two existing buildings on the site near the intersection of Russell Road and MCB-1; they are the Game Check Station and the Log Cabin. They house sections of the Natural Resources and Environmental Affairs Branch. Stormwater discharge from the Game Check Station area flows unobstructed overland to an intermittent stream that flows northwestward, entering Chopawamsic Creek about one mile (1.6 kilometers) away. The Log Cabin building area drains into nearby Ponderosa Pond, which discharges to a tributary that flows southward to Smith Reservoir approximately 1.5 miles (2.4 kilometers) away.

3.2.2 Mainside South Site Runoff from the Mainside South site is carried by several intermittent drainageways that discharge eastward and westward into two perennial streams that lead to the tidal portion of Chopawamsic Creek, about one mile (1.6 kilometers) away. The site is mostly wooded with mixed deciduous trees. Runoff to the east flows into a wetland area that



Legend

- MCB Quantico Boundary
- Locust Shade Park Site
- Areas with Soil Limitations for Construction
- Areas with Slopes Steeper Than 15%
- Areas with Severe Building Limitations
- Roads
- 10' Contour Lines

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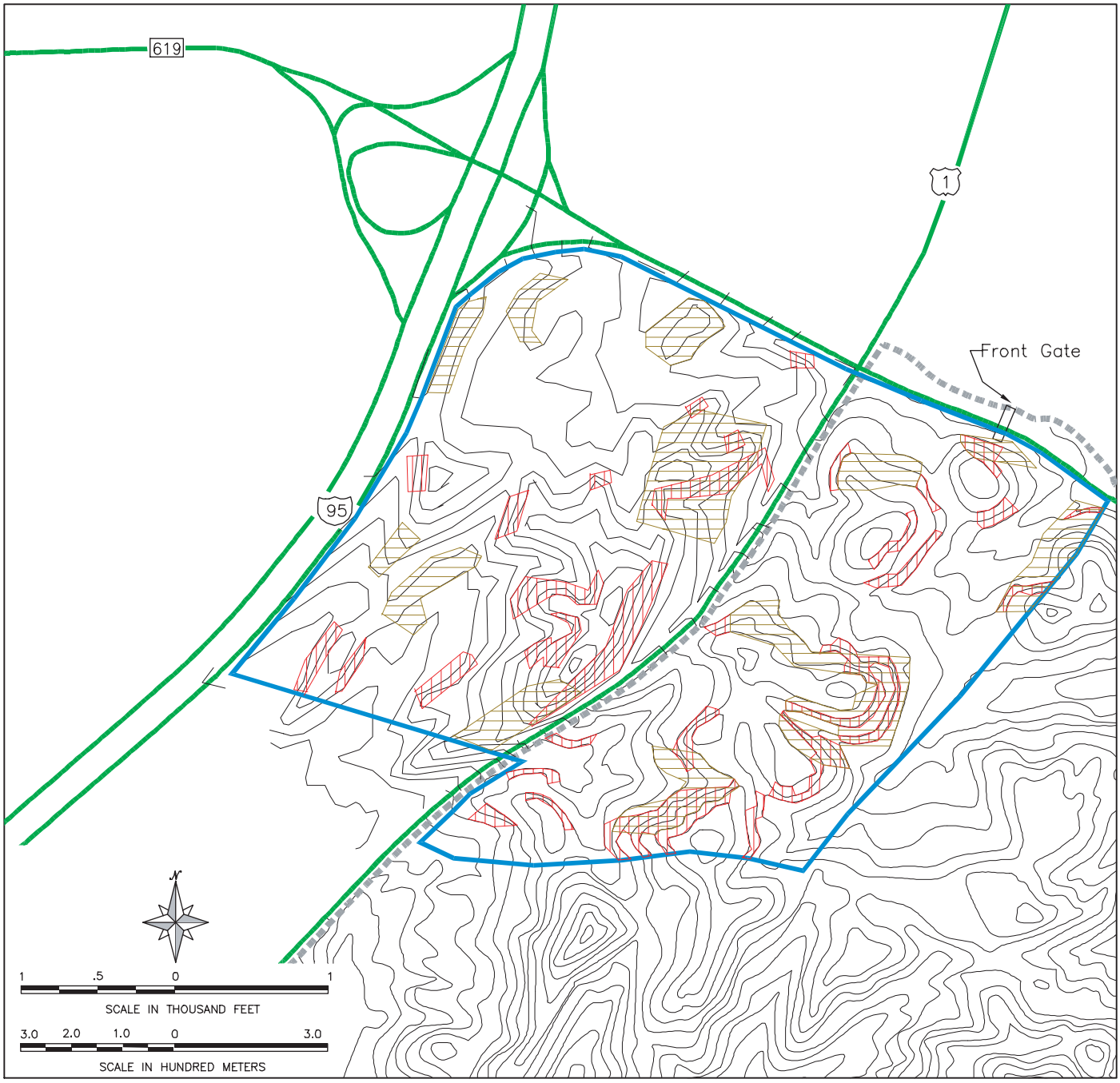
Figure 3-4
Soil & Slope Conditions
Locust Shade Park Site

Parsons Harland Bartholomew & Associates, Inc., Richmond VA, 2000.



Legend

- MCB Quantico Boundary
- Northern Combined Site
- Areas with Soil Limitations for Construction
- Areas with Slopes Steeper Than 15%
- Areas with Severe Building Limitations
- Roads
- 10' Contour Lines

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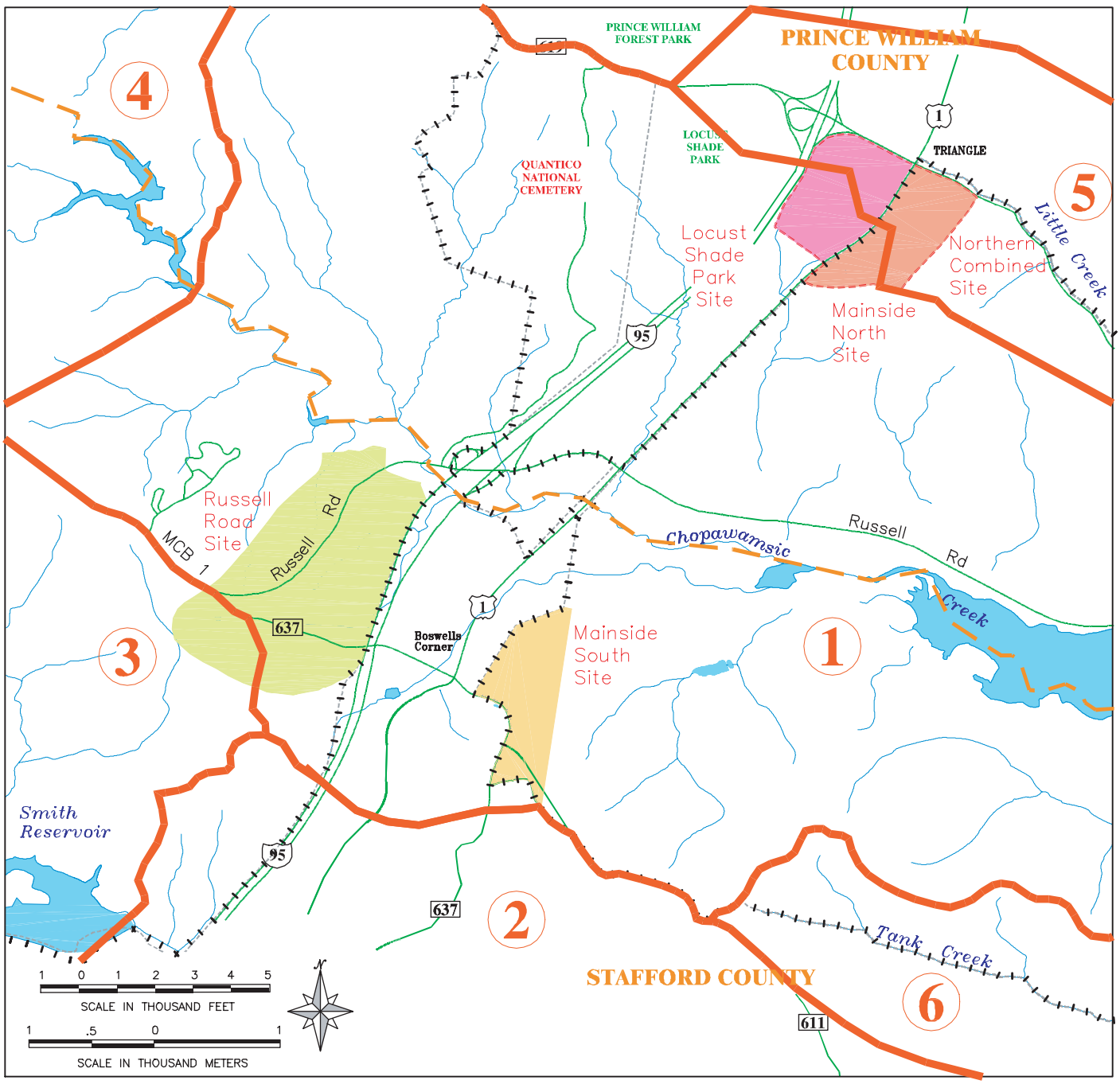
Figure 3-5
Soil & Slope Conditions Northern Combined Site

Parsons Harland Bartholomew & Associates, Inc., Richmond VA, 2000.



Legend

- (1) Chopawamsic Creek Watershed
- (2) Aquia Creek Watershed
- (3) Smith Reservoir Watershed
- (4) Breckenridge Reservoir Watershed
- (5) Little Creek Watershed
- (6) Tank Creek Watershed
- County Boundary
- Watershed Boundaries
- MCB Quantico Boundary
- Streams
- Roads

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Figure 3-6
Watersheds

Parsons Harland Bartholomew & Associates, Inc., Richmond VA, 2000.

lies near the center of the eastern edge of the site. No manmade drainage structures are located within the site other than ditches and culverts along SR-611, SR-637, and SR-756.

3.2.3 Mainside North Site Runoff from the Mainside North site is carried by small drainageways into ditches, culverts, and storm sewers that discharge runoff northward into Little Creek and southward into a stream that flows to the tidal portion of Chopawamsic Creek. The northeastern quarter of the site is occupied by a portion of Thomason Park Housing. This development occupies approximately 24 acres (10 hectares) and is about 50 percent impervious (roofs and paving) with the balance of the area covered with lawn. Stormwater runoff is collected from most of the developed area in a system of curbs and gutters along the streets and parking areas. Drain inlets convey the runoff to a piping system under the streets which lead off-site to the eastern portion of Thomason Park Housing and northward under Fuller Road. Ultimately, the piping system discharges directly into Little Creek.

3.2.4 Locust Shade Park Site The Locust Shade Park site discharges runoff to both Little Creek and Chopawamsic Creek. Intermittent drainageways from the northern half of the site carry runoff to the northeast corner and through a culvert that discharges into Little Creek on the north side of VA-619. The east-facing slopes of the ridge along the US-1 frontage of the site drain toward the highway. Runoff collects in a ditch that runs north to the US-1/VA-619 intersection, then continues through a culvert to Little Creek. The southern half of the site drains through several intermittent drainageways. The westernmost flows more than half the year and runs southward along the I-95 boundary of the site for approximately 700 feet (213 meters) before leaving the site and turning to the southeast and flowing into a pond off-site. The other drainageway flows less than half the year and also flows into the pond off-site. The stream that exits the pond ultimately flows into the tidal portion of Chopawamsic Creek. No manmade drainage structures are located on the Locust Shade Park site; however, two old roadbeds that cross the site affect the drainage patterns within small localized areas.

3.2.5 Northern Combined Site The Northern Combined site drains northward into Little Creek and southward into the tidal portion of Chopawamsic Creek and the water quality characteristics described above for the Mainside North and Locust Shade Park sites.

3.3 Aquatic and Terrestrial Environment

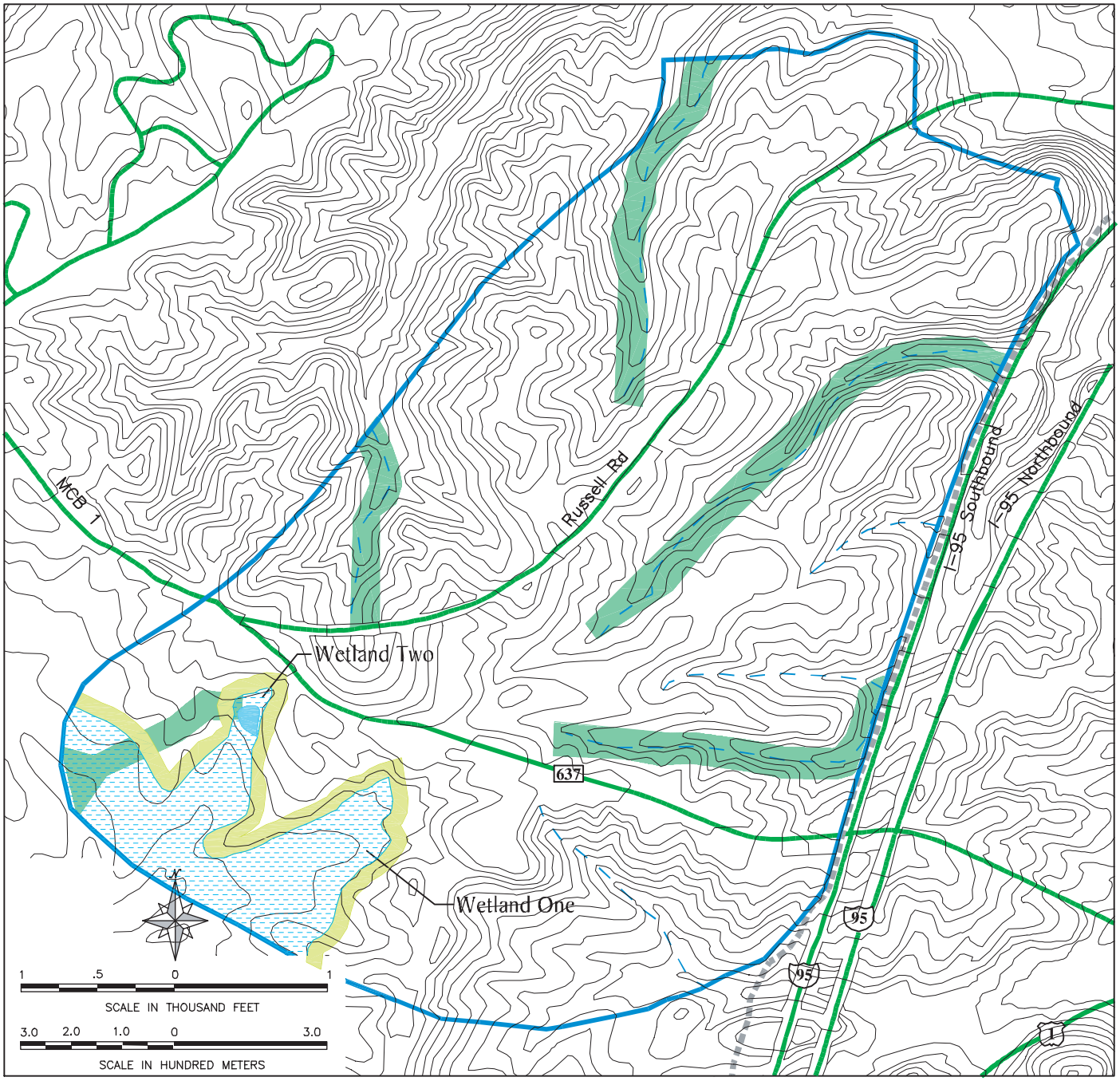
3.3.1 Wetlands The US Army Corps of Engineers, in coordination with the Virginia Marine Resources Commission, administers permits and activities in compliance with wetland regulations of the Clean Water Act of 1977 (33 U.S.C. 1251, as amended). The COE regulations concerning wetlands are found in 33 CFR, Parts 320 through 330. The Environmental Protection Agency (EPA), the US Fish and Wildlife Service (USFWS) under the Department of the Interior, and the National Marine Fisheries Service act as federal advisory agencies to the COE for issuance and conditions of 404 permits. The COE is required to solicit and consider the recommendations of these advisory agencies.

3.3.1.1 Wetlands Determination Procedures The presence of wetlands at the five alternative sites for the Heritage Center was determined by reviewing background information and conducting field investigations. Potential wetlands were first identified using several sources of background information (MCB Quantico graphic information system {GIS}, Prince William County GIS, National Wetlands Inventory {NWI} coverage {which was based on generalized interpretation from aerial photographs by the USFWS}, US Geological Survey {USGS} topographic maps, soil surveys, and MCB Quantico aerial photographs). Areas within each site were noted if they exhibited the characteristic vegetation, hydrology, and soil of wetlands.

The four sites were then fully evaluated in the field by sampling along transects for characteristic vegetation and indicators of hydrology and water saturated soils. Field investigations were conducted at the Russell Road site in September 1997 (MCB Quantico, June 1998), at the Mainside North and Mainside South sites in September 1998, and at the Locust Shade Park site in May 1999. In addition to wetlands, intermittent streams and drainages were located and mapped during the field surveys. Field data sheets for the sites found to contain wetlands are included in Appendix C.

3.3.1.2 Russell Road Site As shown in Figure 3-7, two wetland areas, designated as Wetland One and Wetland Two, exist within the boundaries of the Russell Road site. In addition, seven intermittent streambeds occur on this site, some of which may contain small linear areas with some wetlands-related characteristics.

Wetland One is located in the southwestern portion of the site and is classified as a palustrine forested broad-leaved deciduous temporarily flooded wetland (National Wetland Inventory [NWI]



Legend

- MCB Quantico Boundary
- Russell Road Site Boundary
- Approximate Wetland Boundaries
- Intermittent Stream Beds That Could Contain Small Areas of Wetland
- 100-Foot (31 meter) Intermittent Stream Buffer
- 100-Foot (31 meter) Wetland Buffer
- Roads
- 10' Contour Lines

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Figure 3-7
Wetlands and Intermittent Streams Russell Road Site

Parsons Harland Bartholomew & Associates, Inc., Richmond VA, 2000.

designation PFOIA). This wetland consists of approximately 34 acres (14 hectares), occurs in a low-lying area, and has developed as a result of drainage from adjacent uplands. Vegetation in this wetland consists of red maple (*Acer rubrum*) and sweetgum (*Liquidambar styraciflua*) in the canopy. Red maple was dominant in the subcanopy, while American beech (*Fagus grandifolia*), flowering dogwood (*Cornus florida*), and American holly (*Ilex opaca*) were present but less common. The common species comprising the herbaceous and vine layer were false nettle (*Boehmeria cylindrica*), sweetgum, honeysuckle (*Lonicera japonica*), royal fern (*Osmunda regalis*), panic grass (*Panicum virgatum*), poison ivy (*Toxicodendron radicans*) and greenbrier (*Smilax rotundifolia*). The soil series in this wetland were identified as Tetotum and Bibb. The Tetotum series soils are deep, moderately well drained, nearly level to sloping soils. The Bibb soil series are typically water saturated. Groundwater was not encountered within 12 inches of the surface while investigating soil borings. However, evidence of wetland hydrology was seen in the form of drainage patterns, water-stained leaves, and oxidized root channels.

Wetland Two is also located in the southwest portion of the Russell Road site (see Figure 3-7) and is classified as a palustrine emergent persistent seasonally flooded or saturated wetland (NWI designation PEMIE). This wetland includes approximately one acre (0.4 hectare) and consists of a man-made pond developed as part of stormwater management for development in that area. Vegetation consists of broadleaf cattail (*Typha latifolia*), soft rush (*Juncus effusus*), wool grass (*Scirpus cyperinus*), spike rush (*Eleocharis* spp.), goldenrod (*Solidago sempervirons*), and *Aster* spp. Several trees were found around the edge of the pond including black cherry (*Prunus serotina*), black willow (*Salix nigra*), and bald cypress (*Taxodium distichum*). Similar to Wetland One, the soils in Wetland Two were identified as Tetotum and Bibb.

3.3.1.3 Mainside South Site As shown in Figure 3-8, one wetland area and four intermittent streambeds were identified within the boundaries of the Mainside South site. None of the intermittent streams, other than those within the wetland area, run for more than half of the year. The wetland area is situated within the east-central portion of the project site. It consists of two distinct types of wetlands, divided into a western and eastern portion.

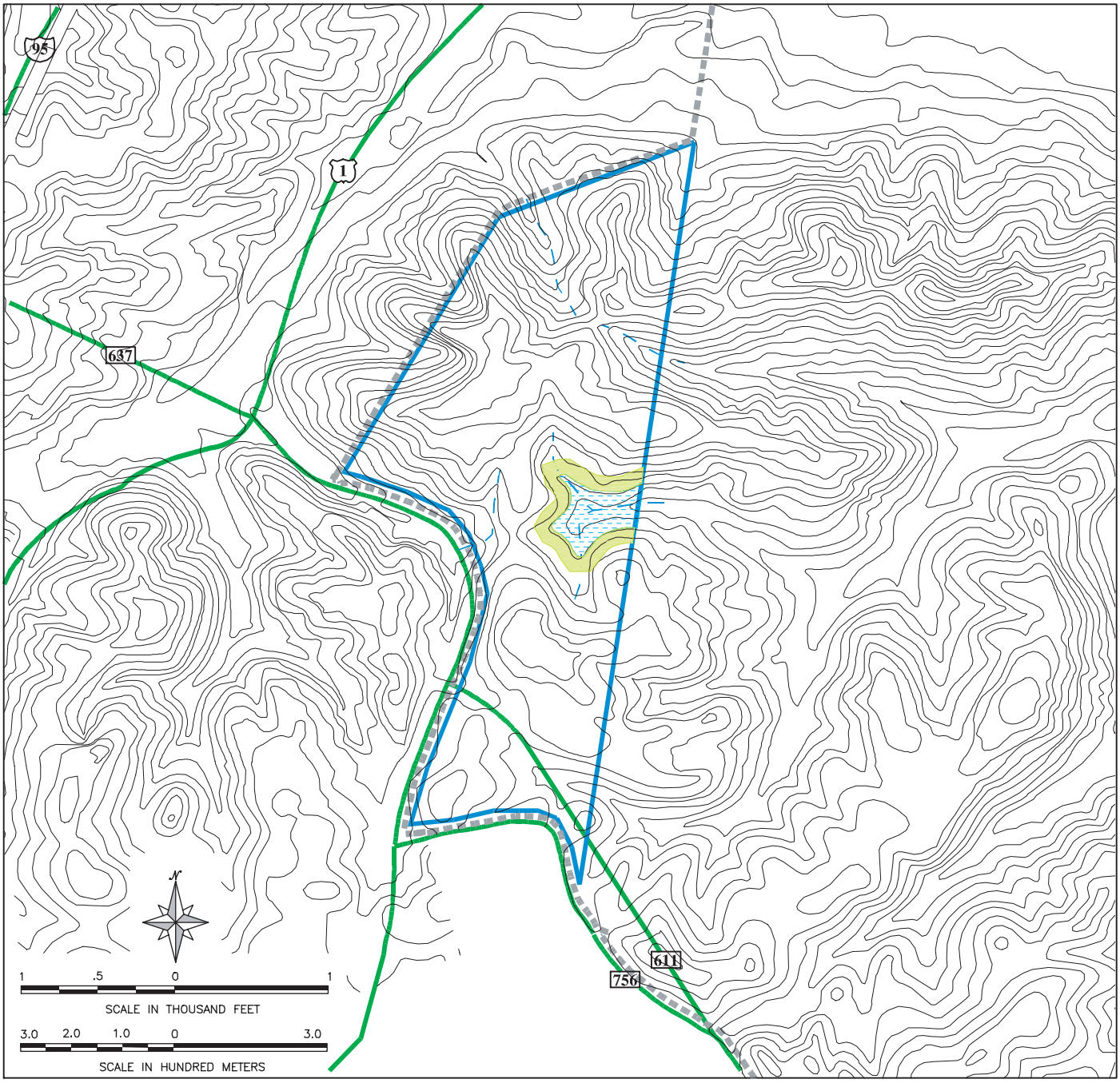
The western portion of this wetland has been classified as a palustrine forested broad-leaved deciduous seasonally flooded wetland (NWI designation PFOIC). This wetland consists of approximately five acres (2 hectares) within the site boundaries and seems to have developed

from two separate drainages of the adjacent upland areas. Characteristic vegetation of this area includes an upper canopy of sweetgum, red maple, black gum (*Nyssa sylvatica*), yellow poplar, and chestnut oak. The mid- and lower-canopies are dominated by maple-leafed viburnum (*Viburnum acerifolium*), American holly, sweet bay (*Magnolia virginiana*), and saplings of paw paw (*Asimina triloba*) and red maple. The common species comprising the herbaceous layer include New York fern (*Dryoptevis noveboracensis*), false nettle, skunk cabbage (*Symplocarpus foetidus*), paw paw seedlings, and greenbrier. Soils in this area belong to the Iuka series. Iuka soils consist of deep, moderately well drained, nearly level fine, sandy loams of the Coastal Plain. Soils within this series are strongly acidic and are low in natural fertility and organic matter content. Surface water and saturated soils were present in sporadic locations of the wetland. The area's unique wetland hydrology was also evident in drainage patterns, drift lines, sediment deposits, and water stained leaves within the wetland.

The eastern portion of the wetland extends beyond the woodline and into the adjacent cleared utility right-of- way. This area includes characteristics of a palustrine emergent persistent seasonally flooded or saturated wetland (NWI designation PEMIE) and a palustrine scrub/shrub broad-leaved deciduous seasonally flooded/saturated wetland (NWI designation PSSIE). Emergent vegetation prevalent within these communities include sphagnum moss (*Sphagnum* spp.), cinnamon fern (*Osmunda cinnamomea*), fox grape (*Vitis labrusca*), soft rush, skunk cabbage, and saplings of maple and alder (*Alnus* spp.). No standing water was observed in this part of the wetland, but ground saturation was evident.

3.3.1.4 Mainside North Site No wetlands were identified within the Mainside North site. As shown in Figure 3-9, several intermittent streambeds exist within the boundaries of the Mainside North site. However, only one intermittent stream located in the southwest corner of the site is estimated to run more than half of the year.

3.3.1.5 Locust Shade Park Site As shown in Figure 3-10, one wetland area and four intermittent streambeds were identified within the boundaries of the Locust Shade Park site (Parsons, July 1999). The only intermittent stream estimated to run more than half of the year is located along the western boundary of the site. All other streambeds were dry and contained undisturbed accumulations of last-season foliage, tree saplings and seedlings, and various levels of herbaceous growth.



Legend

- MCB Quantico Boundary
- Mainside South Site Boundary
- Approximate Wetland Boundaries
- Intermittent Stream Beds That Could Contain Small Areas of Wetland
- 100-Foot (31 meter) Wetland Buffer
- Roads
- 10' Contour Lines

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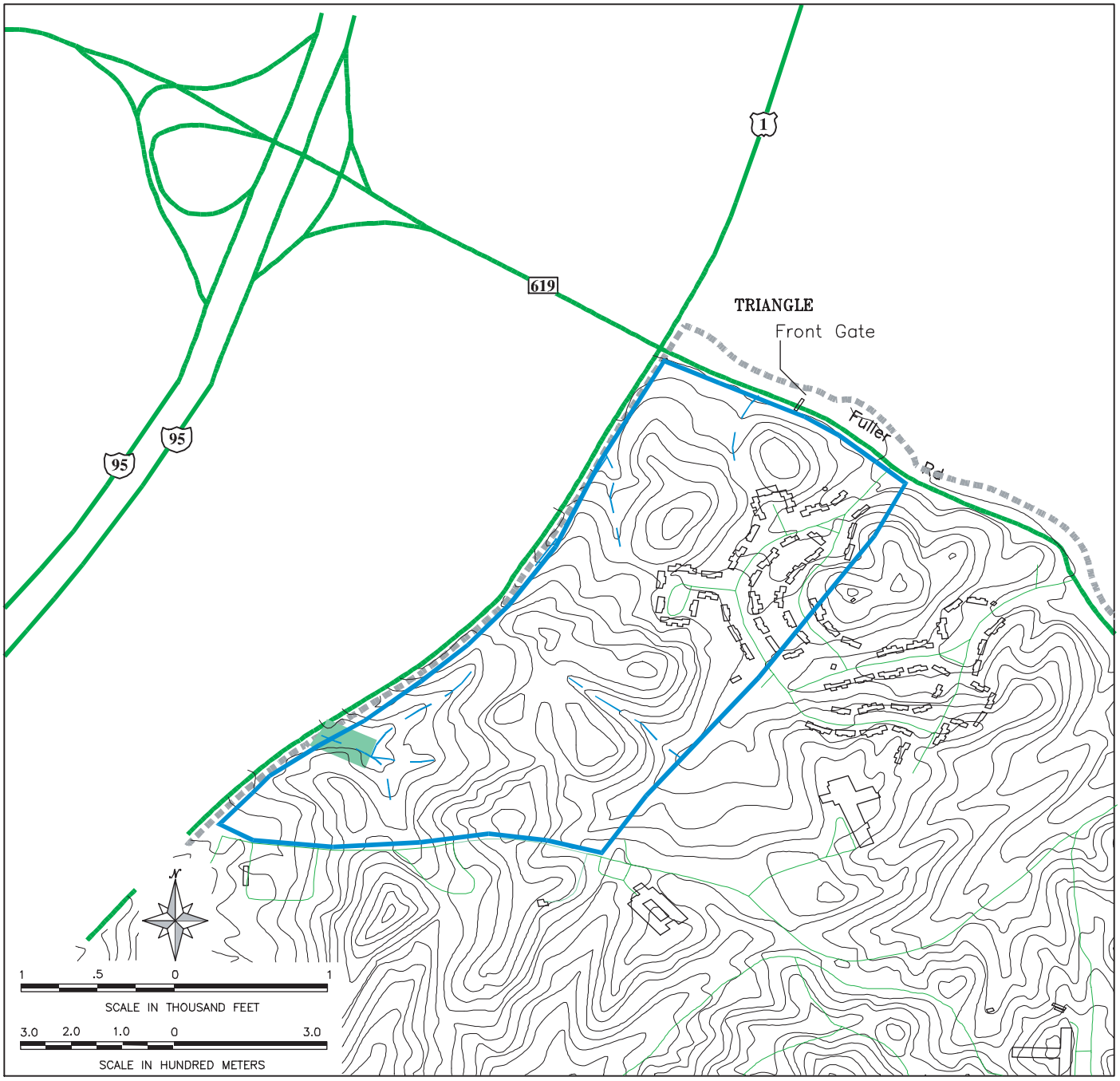
Figure 3-8
Wetlands and Intermittent Streams Mainside South Site

Parsons Harland Bartholomew & Associates, Inc., Richmond VA, 2000.



Legend

- MCB Quantico Boundary
- Mainside North Site Boundary
- Intermittent Stream Beds That Could Contain Small Areas of Wetland
- 100 Foot(31 meter) Intermittent Stream Buffer
- Roads
- 10' Contour Lines
- Buildings

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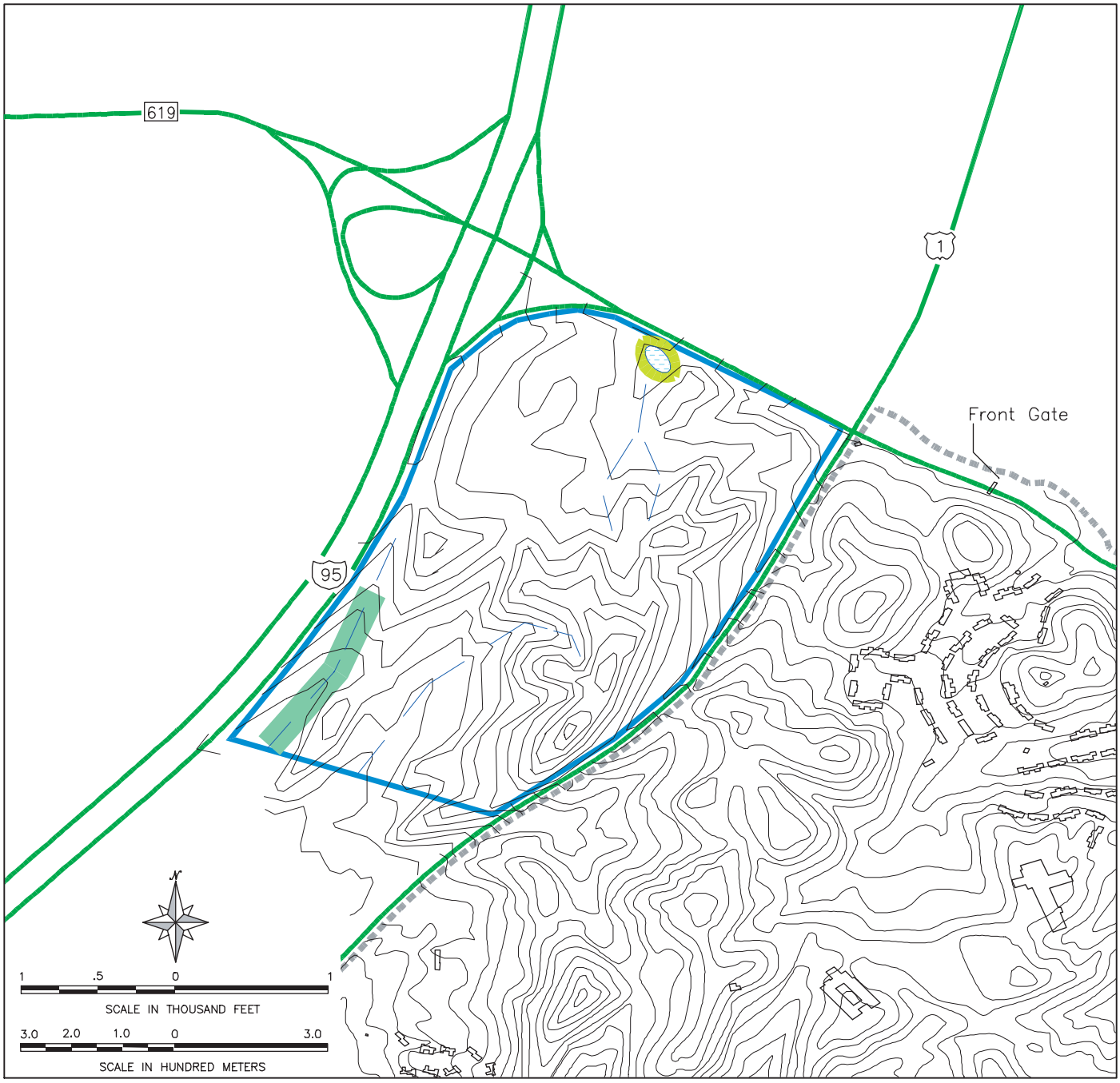
Figure 3-9
Wetlands and Intermittent Streams Mainside North Site

Parsons Harland Bartholomew & Associates, Inc., Richmond VA, 2000.



Legend

- MCB Quantico Boundary
- Locust Shade Park Site
- Approximate Wetland Boundary
- Intermittent Stream Beds That Could Contain Small Areas of Wetland
- 100 Foot(31 meter) Intermittent Stream Buffer
- 100 Foot(31 meter) Wetland Buffer
- Roads
- 10' Contour Lines
- Buildings

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Figure 3-10
Wetlands and Intermittent Streams Locust Shade Park Site

Parsons Harland Bartholomew & Associates, Inc., Richmond VA, 2000.

The wetland is located along the northern boundary of the site and consists of approximately 0.4 acres (0.15 hectares). The wetland has been classified as a palustrine forested broad-leaved deciduous seasonally flooded wetland (NWI designation PFO1C). Based on an analysis of historic aerial photography, this wetland area is likely to have developed as a result of human disturbance that occurred during construction of I-95 and associated interchanges. Field observations indicate that this disturbance is likely to have altered natural topography and drainage patterns, resulting in increased surface runoff in the area now occupied by the wetland. Characteristic vegetation within this area consists of an upper canopy of sweetgum, red maple, and Virginia pine. Common species comprising the herbaceous layer include Virginia creeper (*Parthenocissus quinquefolia*), poison ivy, and cat grape (*Vitis labrusca*). Soils in this area belong to the Hyattsville series. This soil series consists of deep, well to moderately well-drained, loamy soils of the Coastal Plain. Hyattsville soils are strongly acidic, and low in organic matter and natural fertility. Surface water and soil inundation were not present during field surveys, but wetland hydrology was evident in existing drainage patterns, drift lines, and water-stained leaves.

3.3.1.6 Northern Combined Site The Northern Combined site contains one wetland and four intermittent stream beds in the portion west of US-1 and several intermittent stream beds in the area east of US-1 (see Figure 3-11). Only one of those small stream beds in the eastern portion, the one located in the southwest corner of the site, is estimated to run more than half of the year.

3.3.2 Vegetation, Including Threatened and Endangered Species The five alternative sites consist primarily of forested uplands, containing a mixture of pine, hardwoods, and mixed pine-hardwood communities. Smaller areas of early successional shrub and grassland vegetation have minor occurrence throughout the sites.

Forest resources are plentiful at MCB Quantico, as approximately 53,100 acres (21,490 hectares) of the 60,200 acres (24,363 hectares) of total land area are forested (88 percent of the total). The diverse forest structure affords a variety of vegetative covers and habitats for understory plants and wildlife. An aggressive forest management program is directed at the improvement and maintenance of forest health and diversity through regularly scheduled silvicultural treatments.

The potential for discovery of threatened or endangered species within the alternate site locations was established through correspondence with base Natural Resource and Environmental

Affairs Branch, the US Fish and Wildlife Service and applicable Virginia state agencies. The only Federally listed threatened or endangered plant species identified for the area is the small whorled pogonia. A ground survey of the alternative sites for this federally listed threatened plant species was conducted by certified professionals and coordinated with the US Fish and Wildlife Service. The plant was only found within the Russell Road site.

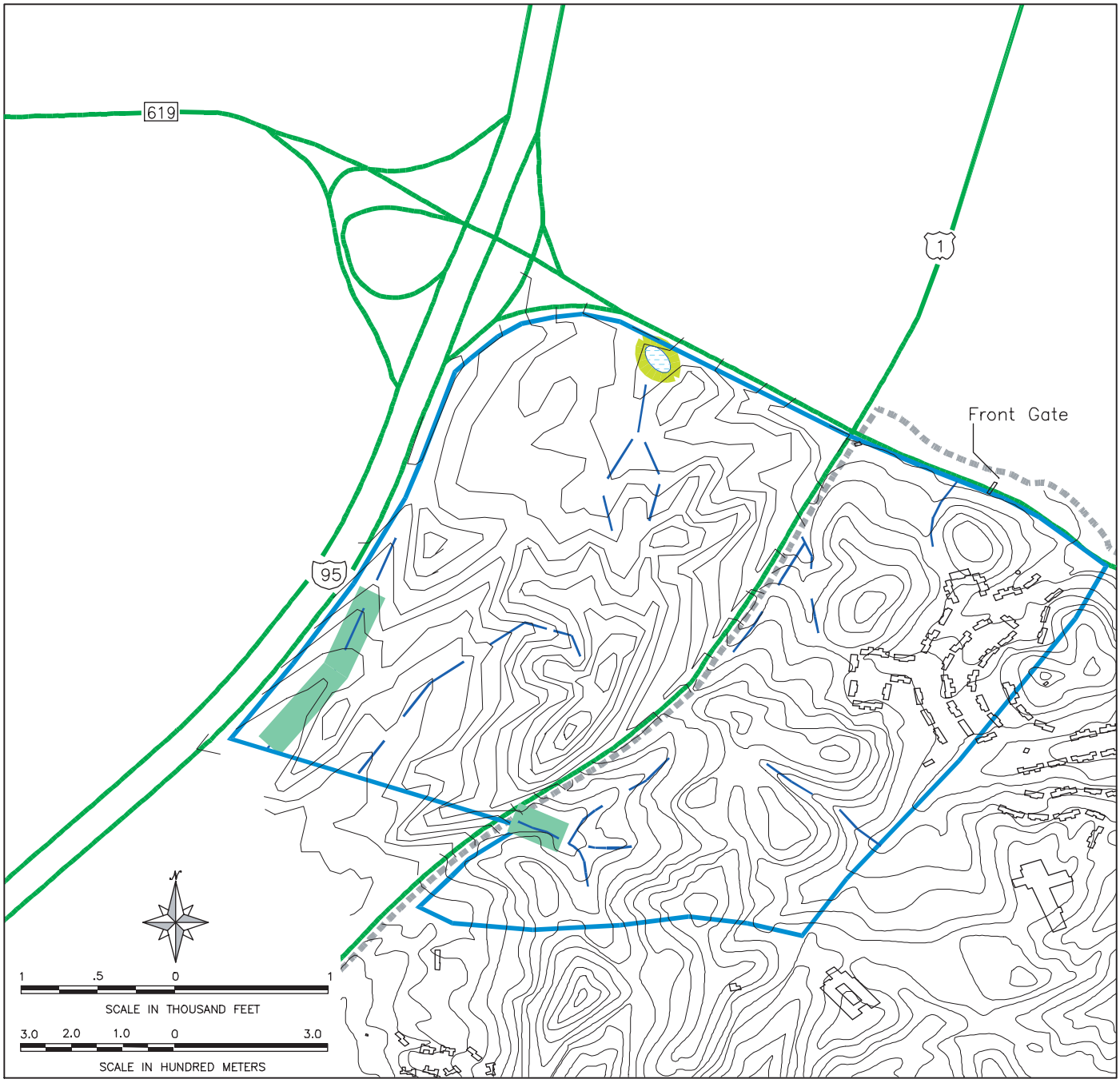
3.3.2.1 Russell Road Site Forest cover, including oak, beech, hickory, and Virginia pine, dominates vegetation within the Russell Road site. A small portion of the site has been planted with loblolly pine. Landscaped areas are maintained in the vicinity of the Natural Resources and Environmental Affairs Branch (NREAB) buildings, at the intersection of Russell Road and VA-637.

Vegetation species of unusual interest on the Russell Road site are the American chestnut tree (*Castanea dentata*) and the small whorled pogonia (*Isoteria medeoloides*). Two American chestnut trees occur on the site; one near the middle of the site on the west side of Russell Road, and the other in the southeastern part of the site south of VA-637 (see Figure 3-12). Although not listed as threatened or endangered, American chestnut trees have been severely damaged by an infection of chestnut blight fungus (*Cryphonectria parasitica, syn. Endothia parasitica*) which began in the early 1900s. As a result, the American chestnut tree now normally survives only as an understory shrub-sized tree, exhibiting continuous dieback and resprouting. The two trees on the Russell Road site are unusual in that they are over 60 feet (18 meters) tall, with trunks that are 10 inches (25 centimeters) in diameter, and show no signs of infection from the blight (MCB Quantico, June 1998).

An investigation of the Russell Road site identified four colonies of small whorled pogonia (see Figure 3-10). A buffer area surrounding the colonies was established in coordination with the US Fish and Wildlife Service, for the protection of these colonies.

3.3.2.2 Mainside South Site The northern two-thirds of the site supports hardwood forest while the southern portion is comprised of mostly mixed pine and hardwood forest.

No colonies of small whorled pogonia were discovered by a survey of the Mainside South site for this federally listed threatened plant species.



Legend

- MCB Quantico Boundary
- Northern Combined Site
- Approximate Wetland Boundary
- Intermittent Stream Beds That Could Contain Small Areas of Wetland
- 100 Foot(31 meter) Intermittent Stream Buffer
- 100 Foot(31 meter) Wetland Buffer
- Roads
- 10' Contour Lines
- Buildings

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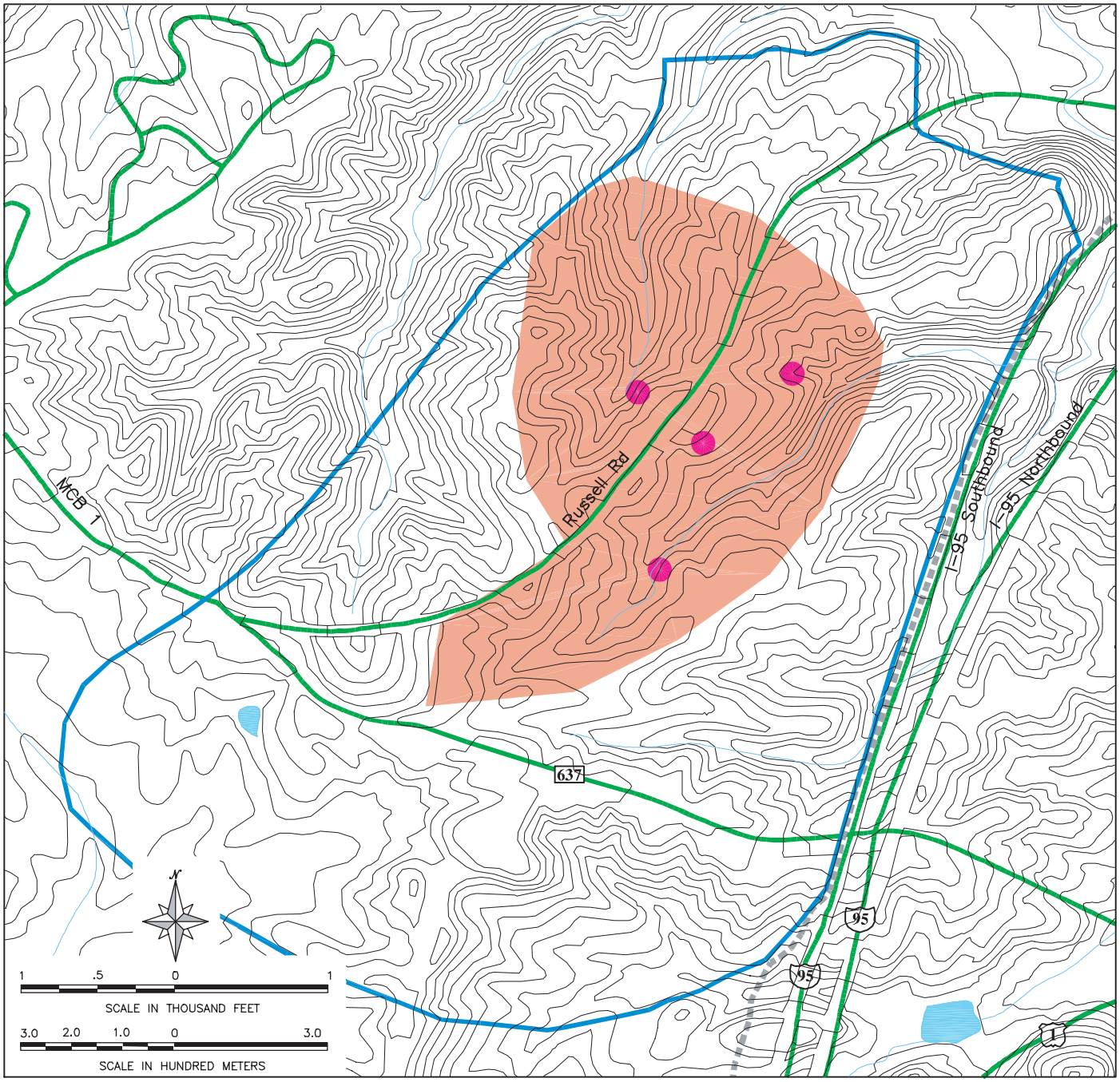
Figure 3-11
Wetlands and Intermittent Streams Northern Combined Site

Parsons Harland Bartholomew & Associates, Inc., Richmond VA, 2000.



Legend

- MCB Quantico Boundary
- Russel Road Site Boundary
- Area Requiring Consultation with US Fish and Wildlife Service If Ground Disturbing Activities Are Planned.
- Colony of small whorled pogonia (*Isotria medeoloides*)
- American chestnut tree (*Castanea dentata*)
- Roads
- Streams
- Pond

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Figure 3-12
Small Whorled Pogonia and American Chestnut Russell Road Site

Parsons Harland Bartholomew & Associates, Inc., Richmond VA, 2000.

3.3.2.3 Mainside North Site The majority of the vegetation within the Mainside North site consists of mixed hardwood trees. A small portion of the Thomason Park housing area extends into the Mainside North site. Vegetation in the housing area consists primarily of maintained lawn interspersed with ornamental trees and shrubs.

A survey of this site shows no small whorled pogonia plants are located there.

3.3.2.4 Locust Shade Park Site The Locust Shade Park site supports a hardwood forest that has some areas of pines. Recently conducted ecological community surveys have identified several upland communities within the site - white oak-northern red oak-chestnut oak forest, loblolly pine-hardwood forest, yellow poplar-white oak-northern red oak forest, Virginia pine-oak forest (Parsons, 1999).

A survey of the Locust Shade Park site for small whorled pogonia shows this federally listed threatened plant does not occur within the site boundary (Parsons, July 1999).

3.3.2.5 Northern Combined Site The vegetation of the portion of the Northern Combined site east of US-1 is that of Mainside North site described above. The vegetation on the western portion of the site is as described above for the Locust Shade Park site.

No federally listed threatened or endangered species of plants occur on the Northern Combined site.

3.3.3 Wildlife, Including Threatened and Endangered Species Wildlife found within the five sites are typical of those that inhabit or migrate through forested uplands of the Mid-Atlantic states. Based on field observations and conditions present on the sites, the wildlife listed in Table 3-1 are commonly found within the sites.

The potential for discovery of threatened or endangered wildlife species within the alternate sites was established through coordination with the base Natural Resource and Environmental Affairs Branch, the US Fish and Wildlife Service and applicable Virginia state agencies. The only Federally listed threatened or endangered wildlife species identified for the area is the bald eagle, which has been recently proposed for delisting. Although bald eagle nest sites can be found within the general vicinity, no nests were identified within the alternative sites.

Table 3-1: Wildlife Common to the Alternative Sites	
Common Name	**Scientific Name**
striped skunk	*Mephitis mephitis*
white-tailed deer	*Odocoileus virginianus*
gray squirrel	*Sciurus carolinensis*
fence lizard	*Sceloporus undulatus hyacinthinus*
eastern box turtle	*Terrapene carolina*
Canada goose	*Branta canadensis*
American goldfinch	*Cardeulis tristis*
northern cardinal	*Cardinalis cardinalis*
common yellow-shafted flicker	*Colaptes auratus*
American crow	*Corvus brachyrhynchos*
blue jay	*Cyanocitta cristata*
yellow warbler	*Dendroica petechia*
wood thrush	*Hylocichla mustelina*
black-capped chickadee	*Parus atricapillus*
tufted titmouse	*Parus bicolor*
indigo bunting	*Passerina cyanea*
rufous-sided towhee	*Pipilo erythrophthalus*
eastern bluebird	*Sialia sialis*
white-breasted nuthatch	*Sitta carolinensis*
house wren	*Troglodyte aedon*
American robin	*Turdus migratorius*
mourning dove	*Zenaida macroura*

3.4 Air Quality

The U.S. Environmental Protection Agency (EPA) defines ambient air in 40 Code of Federal Regulations (CFR) Part 50 as "that portion of the atmosphere, external to buildings, to which the general public has access." In compliance with the 1970 Clean Air Act (CAA) and the 1977 and 1990 Clean Air Act Amendments (CAAA), the EPA has promulgated ambient air quality standards and regulations. The National Ambient Air Quality Standards (NAAQS) were enacted for the protection of the public health and welfare, allowing for an adequate margin of safety. To date, the EPA has issued NAAQS for six criteria pollutants: carbon monoxide (CO), sulfur dioxide (SO_2), particles with a diameter less than or equal to a nominal 10 micrometers (PM_{10}), ozone (O_3), nitrogen dioxide (NO_2), and lead (Pb). Areas that do not meet NAAQS are called nonattainment areas. The EPA initially classified ambient air quality for the Metropolitan Washington (DC) area, which includes the counties where the alternate sites are located, as in nonattainment for the criteria pollutant ozone. Both the current location and the proposed sites

for the Marine Corps museum components are within the same nonattainment areas. Based on the levels of NAAQS exceedance, an attainment date of November 15, 1999 was set for ozone.

There are two types of quality standards - primary and secondary. Primary standards are designed to protect sensitive segments of the population from adverse health effects, with an adequate margin of safety, which may result from exposure to criteria pollutants. Secondary standards are designed to protect human health and welfare and, therefore, in some cases, are more stringent than the primary standards. Human welfare is considered to include both the natural and manmade environments. Each state and locality has the primary responsibility for air pollution prevention and control. Under the CAA and CAAA, state and local air pollution control agencies have the authority to adopt and enforce ambient air quality standards more -- Plan (SIP), which describes how the state would attain and maintain NAAQS in non-attainment areas. Virginia developed a SIP, which was approved by the EPA.

On July 18, 1997 the EPA promulgated new NAAQS for ozone and particulate matter. These new standards became effective September 16, 1997. A new eight-hour ozone standard of 0.08 parts per million (ppm) replaces the previous one-hour standard of 0.12 ppm. The new $PM_{2.5}$ standards, 15 micrograms per cubic meter (µg/m3) annual and 65 µg/m3 24-hour, supplement the existing PM_{10} standards of 50 µg/m3 and 150 µg/m3 respectively. States are to submit, for EPA approval, revisions of the SIPs that provide for attainment and maintenance of the new standards through control programs directed to sources of the pollutants involved.

To ensure that federal actions do not interfere with a state's timely attainment of the NAAQS, the CAA requires that federal agencies demonstrate that their actions in non-attainment and maintenance areas conform to the purposes of the SIP. According to the implementing regulations promulgated by the EPA, proposed federal actions must be specifically identified in the SIP, have minor emissions below threshold levels identified in the regulations, or offset any resulting increases in emissions. Since this project is not identified in the SIP, an Applicability Analysis was prepared to determine the level of project-related emissions (see Appendix E).

3.5 Noise and Explosion Safety

The existing noise environment in the vicinity of MCB Quantico is complex because there are several sources of noise. Training that occurs west of I-95 involves bombs, artillery, demolition charges, and other ordnance that can be heard and felt to different degrees over a wide area. Aircraft activity related to training occurs over MCB Quantico on a regular basis. In 1995, a

detailed study on the geographical extent and frequency of noise generated from munitions and aircraft at MCB Quantico was conducted (Wyle, 1995). All of the alternative sites are subject to noise generated by traffic along major travel routes through the area. Traffic noise is particularly evident at the Locust Shade Park site ranging between 30 and 65 dB(A).

3.5.1 Blast Noise The standard measurement unit of noise is the decibel (dB), which represents the acoustical energy present. Noise levels are measured in A-weighted decibels (dB(A)), a logarithmic scale, which approaches the sensitivity of the human ear across the frequency spectrum. A 3-dB increase is equivalent to doubling the sound pressure level, but is barely perceptible to the human ear. Noise levels vary with time and distance from the source. Exposure to prolonged noise levels of 85 dB(A) or higher is expected to cause hearing loss in humans. Research conducted at MCB Quantico indicates that noise levels at all five alternative sites are less than 65 dB(A) (Wyle, 1995).

Atmospheric shock wave vibrations generated by training blasts were also measured in the noise study. Noticeable vibration levels do not extend far enough from the firing points and impact area to have a constraining effect on land uses on the alternative sites. Groundborne vibration, or seismic energy, generated by training blasts were not directly measured in the study. However, because seismic energy is absorbed by massive bedrock such as that occurring beneath the site, the researchers predict that groundborne vibration would be unlikely to travel as far as 12 miles from the point of detonation. Because the alternative sites lie relatively near each other and within 10 miles (16 kilometers) of the impact area, and within three miles (5 kilometers) of C Demo Range, some level of groundborne vibration would likely to be felt.

3.5.2 Aircraft Noise Rotary- and fixed-wing aircraft are routinely involved in training exercises at MCB Quantico. Most aircraft maneuvers occur at the airfield adjacent to the Potomac River and within a designated restricted area (Number R-6608) which lies over most of the installation to the west of the Ammunition Supply Point (ASP), which is adjacent to and west of the Russell Road site. Noise generated by flight operations at MCB Quantico does not typically exceed 65 dB(A) at any of the alternative sites. Within the restricted area there are typically no more than 181 hours of fixed-wing operations per year.

3.5.3 Explosion Safety

The ASP at MCB Quantico is located north of MCB-1, west of the Russell Road site, about 0.9 mile (1.4 kilometers) west of I-95. The ASP includes 20 magazine storage structures, administrative and security buildings, and an interconnecting road network. Explosives facilities, such as the ASP, are separated from adjacent activities to protect non-explosives related personnel from injury should an accidental detonation occur. An Explosive Safety Quantity Distance (ESQD) is calculated for each magazine to define an explosive safety zone around the ASP. The ESQD from each of the 20 magazines are merged to define the zone's total land encumbrance (Publication NAVSEA OP-5 Volume 1). This ESQD safety zone encumbers a land area where personnel injury and/or property damage could occur from an accidental, worst case detonation of stored ammunition in any or all of the ASP magazines. This zone extends approximately 1,855 feet (590 meters) in the general direction of the five alternative sites (see Figure 3-13). Department of Defense safety regulations do not permit unrelated personnel or structures to be sited within an ESQD safety zone.

3.6 Cultural Resources

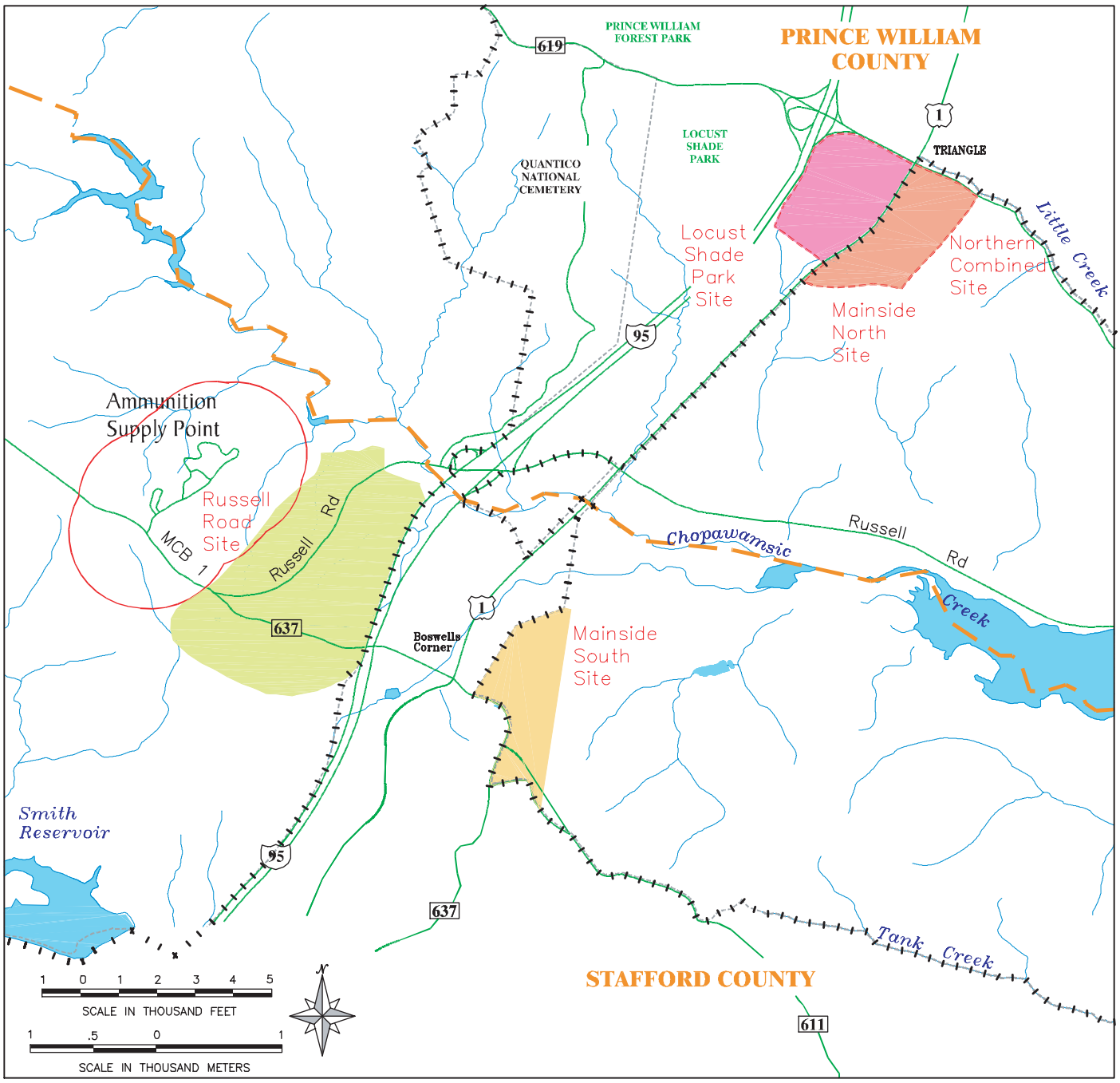
Numerous surveys of historic and archaeological resources have been conducted at MCB Quantico. The results show that no structures listed or eligible for listing on the National Register of Historic Places (NRHP) exist on any of the five alternative sites. Also, a base-wide survey for archaeological resources was completed between 1993 and 1997 which established a predictive model for determining the locations on the base that would have a high probability of containing historic and prehistoric archaeological resources. The most important criteria used in predicting prehistoric site location were distance to water, regional physiographic characteristics, and broad, level landforms. Level landforms were also an important variable for predicting the location of historical sites. In addition, proximity to water and mapped roads and trails were seen as key factors for locating seventeenth- through mid-nineteenth-century historic sites. Distance to mapped roads and trails was considered the single most important parameter for late nineteenth to early twentieth-century historic site location (Stevens, et al., 1999).

Based on this predictive model, records at the Virginia State Historic Preservation Office (SHPO) and MCB Quantico, and earlier studies conducted within the region, archaeological surveys of the alternative sites were conducted (Whitley and Pappas, 1997; Stevens et al., 1999). Of the 27 high probability areas surveyed, 23 have been assigned site numbers by the SHPO. Table 3-2 contains a listing of attributes identified for archaeological sites recognized within each of the alternative sites for the MCHC. The results of the surveys have been reviewed by the SHPO.

Due to a variety of factors, ranging from earlier disturbances at some of the sites to incomplete references for time sequencing the artifacts, the archaeological resources within the alternative sites have been found to be not eligible for listing on the NRHP.

3.6.1 Russell Road Site The Russell Road site is a 500 acre (202 hectare) parcel, located on the west side of I-95 in Stafford County. A Phase I archaeological survey of the Russell Road site was completed in September 1997 (Whitley and Pappas, 1997). The survey consisted of 11 high probability areas, which were previously identified through application of the predictive model prepared by the William and Mary Center for Archaeological Research (WMCAR, 199). Background research revealed two previously recorded archaeological sites in the Russell Road site area, and seven additional sites were recorded within one mile (1.6 kilometers). Subsurface testing, through the excavation of shovel test pits (STPs), was conducted in each of the 11 high-probability locations identified in the WMCAR model.

Seven archaeological sites were identified as a result of the Phase I survey. Two sites (44ST257A and 44ST361) contained both historic and prehistoric components (i.e., multi-component); two sites were historic (44ST362, 44ST363), and three sites were prehistoric (44ST299 44ST367, 44ST368). One of the new sites (44ST257A) was recommended for inclusion in a previously recorded site (44ST257).



Legend

- Russell Road Site - 500 Acres (202 hectares)
- Mainside South Site - 159 Acres (64 hectares)
- Mainside North Site - 140 Acres (57 hectares)
- Locust Shade Park Site - 110 Acres (45 hectares)
- Nothern Combined Site-250 Acres (101 hectares)
- MCB Quantico Boundary
- County Boundary
- Property Line
- ESQD Arc
- Roads
- Streams

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Figure 3-13
Explosion Hazard

Parsons Harland Bartholomew & Associates, Inc., Richmond VA, 2000.

Table 3-2. Summary of Site Attributes by Alternative

Alternative	Site No.	Site Type	Site Size	Artifacts	Time Period	Integrity
Russell Road	44ST257	P/H	375m x 150m	bifaces, points, ceramics, FCRglass, ceramics, brick, nails,	M & L Archaic, Woodland; late-19th/20th c.	None, Severe disturbance & erosion
Russell Road	44ST299	P	50m x 15m	Flakes, core, FCR	Unknown	None, Severe disturbance & erosion
Russell Road	44ST361	P/H	200m x 275m	flakes, core/nails bottle glass ceramics	Unknown Pre-early 19th c	None, Severe disturbance & erosion
Russell Road	44ST362	H	40m x 55m	bottle glass, brick, copper	19th c.	None, Severe disturbance & erosion
Russell Road	44ST363	H	90m x 75	bottle glass, ceramics, wire nails	early-19th c.	None, Severe disturbance & erosion
Russell Road	44ST367	P	60m x 45m	flakes	Unknown	None, Severe disturbance & erosion
Russell Road	44ST368	P	70m x 20m	flakes	Unknown	None, Severe disturbance & erosion
Mainside South	44ST375	P	20m x 50m	quartz flakes and shatter	Unknown	None, Severe disturbance & erosion
Mainside South	44ST376	P	45m x 90m	quartz flakes and shatter	Unknown	None, Severe disturbance & erosion
Mainside South	44ST374	P	30m x 70m	quartz flakes and shatter, core, FCR	Unknown	None, Severe disturbance & erosion
Mainside South	44ST377	H	80m x 80m	glass, ceramics, wire nails, wire, flagstones	early-20th c.	None, Severe disturbance & erosion
Mainside South	44ST378	P	35m x 120m	quartz flakes and shatter, point base	Archaic?	None, Severe disturbance & erosion
Mainside South	44ST379	P	60m x 80m	quartz flakes and shatter	Unknown	None, Severe disturbance & erosion
Mainside North	44PW1001	P	15m x 30m	quartz flakes and shatter, FCR	Unknown	None, Severe disturbance & erosion
Mainside North	44PW1002	P	40m x 150m	quartz flakes and shatter, FCR; point fragment	Unknown	None, Severe disturbance & erosion
Mainside North	44PW1003	P	60m x 120m	quartz flakes and shatter, FCR; point fragment	Late Archaic	None, Severe disturbance & erosion
Locust ShadePark	44PW1042	H	92m x 52m	cemetery w/ headstones&footers	early 19th/late 20th c.	yes, some vandalism
Locust ShadePark	44PW1043	H	8m x 6m	20th c, bottle dump	1st quarter 20th c.	None, Severe disturbance & erosion
Locust ShadePark	44PW1044	H	30m x 20m	brick and oyster shell	unknown	None, Severe disturbance & erosion
Locust ShadePark	44PW1045	P	82m x 54m	bifaces, flakes, shatter, and FCR	unknown	Retains some integrity
Locust ShadePark	44PW1046	P	23m x 14m	quartz flakes and shatter	unknown	Retains some integrity
Locust ShadePark	44PW1047	P	56m x 14m	quartz flakes and shatter	unknown	None, Severe disturbance & erosion
Locust ShadePark	44PW1048	P	32m x 15m	quartz flakes and shatter	unknown	None, Severe disturbance & erosion
Northern Combined Site	Contains the attributes listed for Mainside North and Locust Shade Park Sites					

P=prehistoric
H=historic

Given the lack of integrity and research potential at these sites, it was concluded that all of the above sites are considered not eligible for the National Register of Historic Places (NRHP). Widespread disturbance, due largely to past farming practices and military activity, has reduced the research potential of the sites. No further testing of the sites is recommended.

Three cemeteries are located on the Russell Road site. The cemeteries have not had new interments since prior to acquisition of the Guadalcanal Section in 1942. The cemetery on the north side of VA-637 contains one marked and possibly four unmarked graves. The cemetery south of #VA-637 has one damaged and unreadable headstone (Whitley and Papas, 1997).

3.6.2 Mainside South Site The Mainside South site is a 159 acre (64 hectare) parcel located in the Stafford County portion of MCB Quantico. The area is covered in a secondary growth forest of deciduous trees and various pines, with a relatively clear understory except in areas of modern disturbance. No previous archaeological investigations have been conducted within the Mainside South site, nor have archaeological sites have been recorded within its boundaries. However, a site file search at the VDHR indicates that 18 archaeological sites have been recorded within a one mile radius. These sites range in age from Middle Archaic (ca. 6,500 B.C.) to the early twentieth century, and primarily consist of prehistoric lithic scatters or domestic sites such as farmsteads.

Four high probability areas with a potential for historical sites were identified, but none were considered to have a high potential for prehistoric sites. The survey resulted in the identification of six archaeological sites, five prehistoric sites and one historical site. Table 3-2 summarizes selected site attributes. The five prehistoric sites (44ST374-44ST376, 44ST378, and 44ST379) consist of small, low-density lithic scatters. The lone historical site, 44ST377 (Powers site), is a late nineteenth to early twentieth century domestic site that appears on a 1925 USGS map as well as a 1957 USGS map. The site consists of a sparse scatter of domestic (glass and ceramic fragments) and architectural (wire nails, window glass) materials.

The integrity of all six sites has been severely compromised by a variety of biological agents (e.g., tree roots, burrowing animals, and uprooted trees); natural agents such as erosion; and cultural agents such as logging activities, road grading activities, twentieth century construction and/or clear cutting for utility lines. All six sites are recommended not eligible to the NRHP.

3.6.3 Mainside North Site The Mainside North site consists of a 140 acre (57 hectare) parcel located in the Prince William County portion of MCB Quantico. The area is covered in a

secondary growth forest of deciduous trees and various pines, with a relatively clear understory, except in areas of modern disturbance.

No previous archaeological investigations have been conducted within the Mainside North site, and no archaeological sites have been recorded. However, a site file search at the VDHR indicates that eight archaeological sites have been recorded within a one mile radius of the project area boundaries. These sites include seven prehistoric sites and one multi-component site (i.e., prehistoric and historic sites).

Three high probability areas were considered to have a high potential for historical sites, and two were also thought to have high potential for prehistoric sites. The three survey areas measured approximately eight acres (3 hectares) in size. The survey resulted in the identification of three prehistoric sites (44PW1001, 44PW1002, and 44PW1003).

The integrity of all three sites has been severely compromised by a variety of biological agents (e.g., tree roots, burrowing animals, and uprooted trees); natural agents such as erosion; and cultural agents such as logging activities, road grading activities, twentieth- century construction or clear cutting for utility lines. Consequently, all three sites are recommended not eligible to the NRHP.

3.6.4 Locust Shade Park The Locust Shade Park consists of a 110-acre (45 hectare) parcel located on the west side of US 1 and south of VA-619. A secondary growth forest of oak and pine dominate the vegetation.

Background research at VDHR indicated that no archaeological sites have been recorded in the project vicinity although four prehistoric sites have been recorded within one mile of the project area. Nine high probability areas were identified that exhibited a high probability for historical sites, while four of the areas also had a high potential for prehistoric sites.

The survey resulted in the identification of seven sites (four prehistoric sites and three historical sites). Two of the prehistoric sites (44PW1045 and 44PW1046) retain a moderate degree of integrity, while the two remaining sites (44PW1047 and 44PW1048) lack integrity and research potential. Sites 44PW1045 and 44PW1046, while they retain some degree of integrity, do not appear to contain sufficient research potential to meet Criterion D of 36 CFR 60.4. Consequently, all the prehistoric sites are recommended not eligible to the NRHP. The historical sites consist of a cemetery (44PW1042), an early twentieth century bottle dump (44PW1043), and an artifact scatter (44PW1044) of unknown age. The cemetery dates to the

early nineteenth century and is still in use today. The cemetery occupies about two acres (0.8 hectare) in the northeast corner and has over 200 burial plots. The cemetery is used for new burials only by the descendants of the family that owned it when it was acquired by the Marine Corps in 1942. In 1976, the Marine Corps conveyed the cemetery with the Locust Shade Park tract to Prince William County (Stevens, et al., 1999). The cemetery as well as the other historical sites are considered to be not eligible to the NRHP.

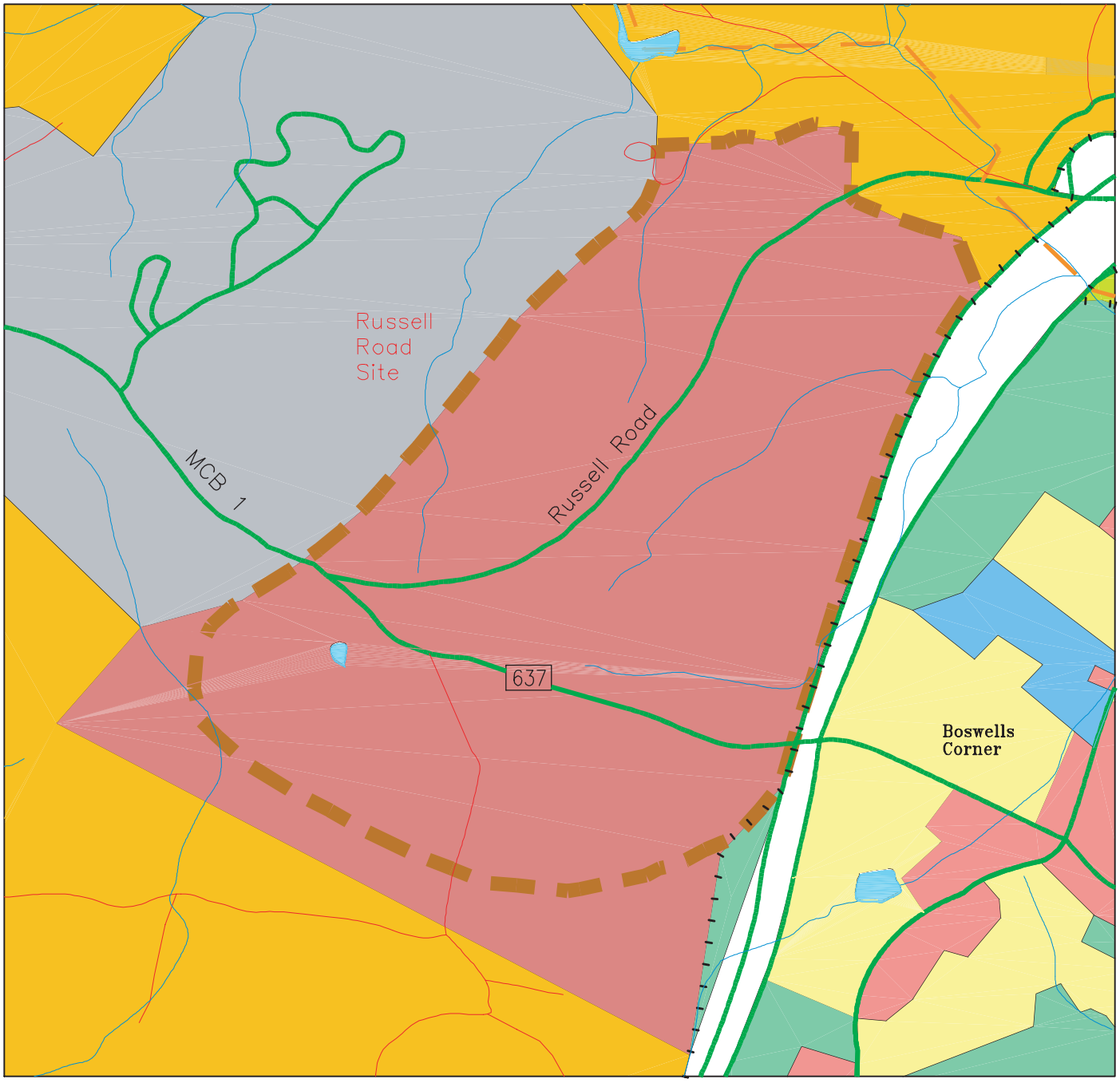
3.6.5 Northern Combined Site The Northern Combined site contains the characteristics and attributes described above for the Mainside North and the Locust Shade Park sites.

3.7 Land Use, Zoning, and Aesthetics

The alternative sites for the MCHC are located adjacent to the I-95/US-1 corridor near the boundary between Prince William and Stafford Counties. This area contains large tracts of undeveloped land owned by government agencies and designated for use as parks, a cemetery and military training. Development on private lands within this area is scattered and primarily occurs along major roadways. Private development consists of a mixture of residential and small businesses. The respective county and federal property owners control land use planning on parcels within the area. Development within MCB Quantico is guided by a variety of factors, including compatibility, physical site characteristics, environmental concerns, and ongoing operations and mission requirements.

3.7.1 Russell Road Site The Russell Road site is located on the western side of I-95 in Stafford County. This site is currently undeveloped except for two buildings occupied by the Natural Resources and Environmental Affairs Branch (a game check station and a Natural Resources and Environmental Affairs Branch office) and three old cemeteries. The east side of the site abuts the right-of-way (ROW) for I-95. A small stand of loblolly pine was planted on this site as part of the base forestry program. Hunting is also permitted within the Russell Road site. Other adjacent land uses include the military training and controlled access on the west, and military training on the north and south. This site is designated for administrative use (see Figure 3-14).

3.7.2 Mainside South Site The Mainside South site is located east of US-1, along VA-637 in Stafford County. Currently, the site is incidentally used for outdoor recreation, military training, and timber production. The eastern portion of the site is separated from other Marine



Legend

- Administration US Marine Corps
- Open Space
- Residential
- US Marine Corps Training Area
- Commercial
- Agriculture
- Light Industrial
- Ammunition Supply Point
- Russell Road Site Boundary
- MCB Quantico Boundary
- County Boundary
- Roads
- Streams

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Figure 3-14
Land Use
Russell Road Site

Parsons Harland Bartholomew & Associates, Inc., Richmond VA, 2000.

Corps property by an electric utility ROW. The vegetation within this ROW is maintained in a low growth form to avoid interference with the overhead power lines. This site is surrounded on north, west, and south by private land. To the north and south of the site property is zoned for residential use. Private land to the west is zoned for commercial use and abuts US-1. This site is designated for use by a tenant organization (see Figure 3-15).

3.7.3 Mainside North Site This site is located in the southeast quadrant of the intersection of US-1 and VA-619, which becomes Fuller Road at the Front Gate to MCB Quantico. The site is within the Prince William County portion of MCB Quantico. Across VA-619 are residential and commercial areas in the settlement of Triangle. To the west, across US-1 is Locust Shade Park. The majority of this site is undeveloped. A portion of Thomason Park family housing extends into the eastern portion of the site. This area is designated for family housing and residential use (see Figure 3-16).

3.7.4 Locust Shade Park Site The Locust Shade Park site is located in Prince William County and is the single off-base alternative site. An active cemetery covering about two acres (0.8 hectare) is located in the extreme northeast corner of the site. The site is bordered by I-95 to the west, US-1 to the east, and VA-619 to the north. To the south is additional land within Locust Shade Park. The Locust Shade Park site itself is classified as an agricultural, forestry, open space district in the Prince William County 1998 Comprehensive Plan (see Figure 3-17). This area is currently undeveloped and well separated from adjacent land uses.

3.7.5 Northern Combined Site The Northern Combined site is located within Prince William County. Land use in the portion of the site east of US-1 is planned by MCB Quantico while the portion to the west of US-1 is owned and planned by Prince William County. The land uses that have been designated for the site and for the surrounding area are shown in Figure 3-18. The majority of the site east of US-1 is undeveloped, but part of Thomason Park family housing extends into the eastern portion of the site. This area is designated for family housing and residential use. The western portion of the site has been classified as an agricultural, forestry, open space district in the Prince William County 1998 Comprehensive Plan. This area is currently undeveloped and well separated from adjacent land uses.

3.8 Traffic

A transportation assessment was completed as part of this EIS to analyze the affects that operation of the MCHC would have on the capacity of the transportation system in the area

(Parsons, June 1999). This study documents the situation by defining: 1) the existing traffic conditions in the area, 2) the background conditions projected for the area at MCHC completion, and 3) the traffic impacts that would be added by the MCHC on each of the four alternative sites. The transportation assessment also provides recommendations for roadway improvements, where necessary, to accommodate the traffic generated by existing development, regional growth, approved developments, and the proposed MCHC. The relationship of the alternative sites to the roadway system in the vicinity is outlined below (see Figure 3-19).

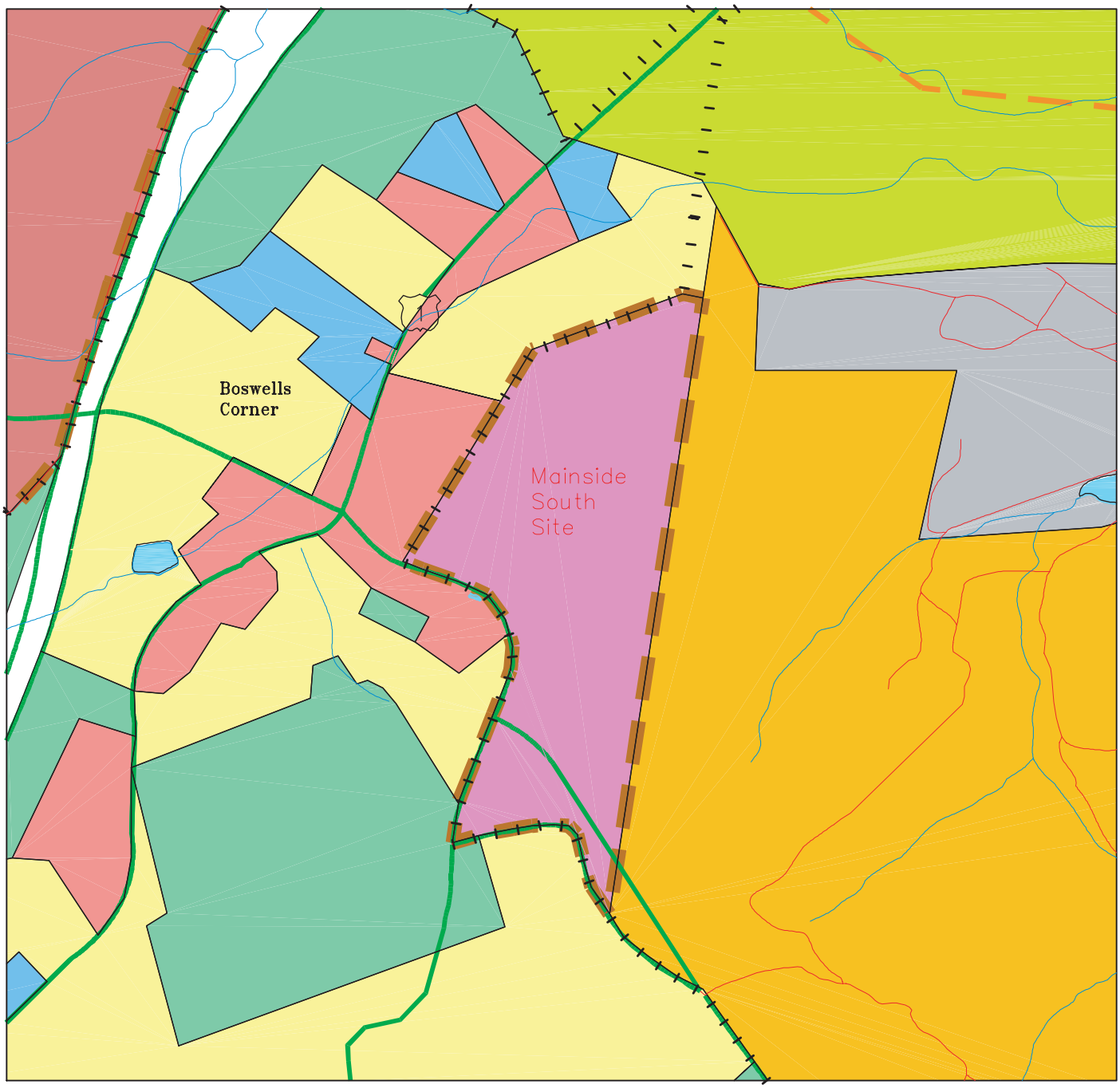
Data was collected to determine existing and future conditions of the transportation system in the vicinity of the five alternative sites to be evaluated. This information was then analyzed with the results providing a performance measure to compare three traffic conditions. The traffic conditions are those that are currently experienced, those that would be experienced in the future without the MCHC, and those that would be experienced in the future with the MCHC.

The ability of a roadway to accommodate traffic is expressed by Level of Service (LOS). The service levels are represented by a range of "A" to "F" with LOS A being the highest level of service and LOS E representing capacity or saturation levels. Level of service D is generally the lowest acceptable level of service for state highways and is considered to be the lowest acceptable for this assessment. LOS is used as the performance measure to compare the traffic conditions presented in this document.

3.8.1 Existing Traffic Conditions The existing roadways in the vicinity of the proposed MCHC sites are: VA-619, Russell Road, MCB-1, VA-637, VA-611, US-1 and I-95. The lane use configurations at the intersections in the area are shown in Figure 3-19.

From VA-619 to the north, the land use along US-1 consists of commercial and retail businesses that have uncontrolled access to US-1. Along US-1, between VA-619 to south of Russell Road, there are few traffic generating access roads. Locust Shade Park and Fritter Park abut US-1 to the west and MCB Quantico abuts it to the east. From south of Russell Road to VA-610, there are a few state roads that provide access to smaller communities and the Guadalcanal area of the base. There are also a few areas of commercial activity that have access to this segment of US-1. From VA-610 to the south, the land use along US-1 consists of commercial and retail businesses that have semi-controlled points of access to US-1.

US-1 in the vicinity of the study area parallels I-95 and serves as an alternative route for through traffic. The land use along VA-619, west of I-95 and along VA-611, east of VA-637 consists of



Legend

- Administration US Marine Corps
- Open Space
- Residential
- US Marine Corps Training Area
- Commercial
- Agriculture
- Light Industrial
- Ammunition Supply Point
- Mainside South Site Boundary
- MCB Quantico Boundary
- County Boundary
- Roads
- Streams

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Figure 3-15
Land Use
Mainside South Site

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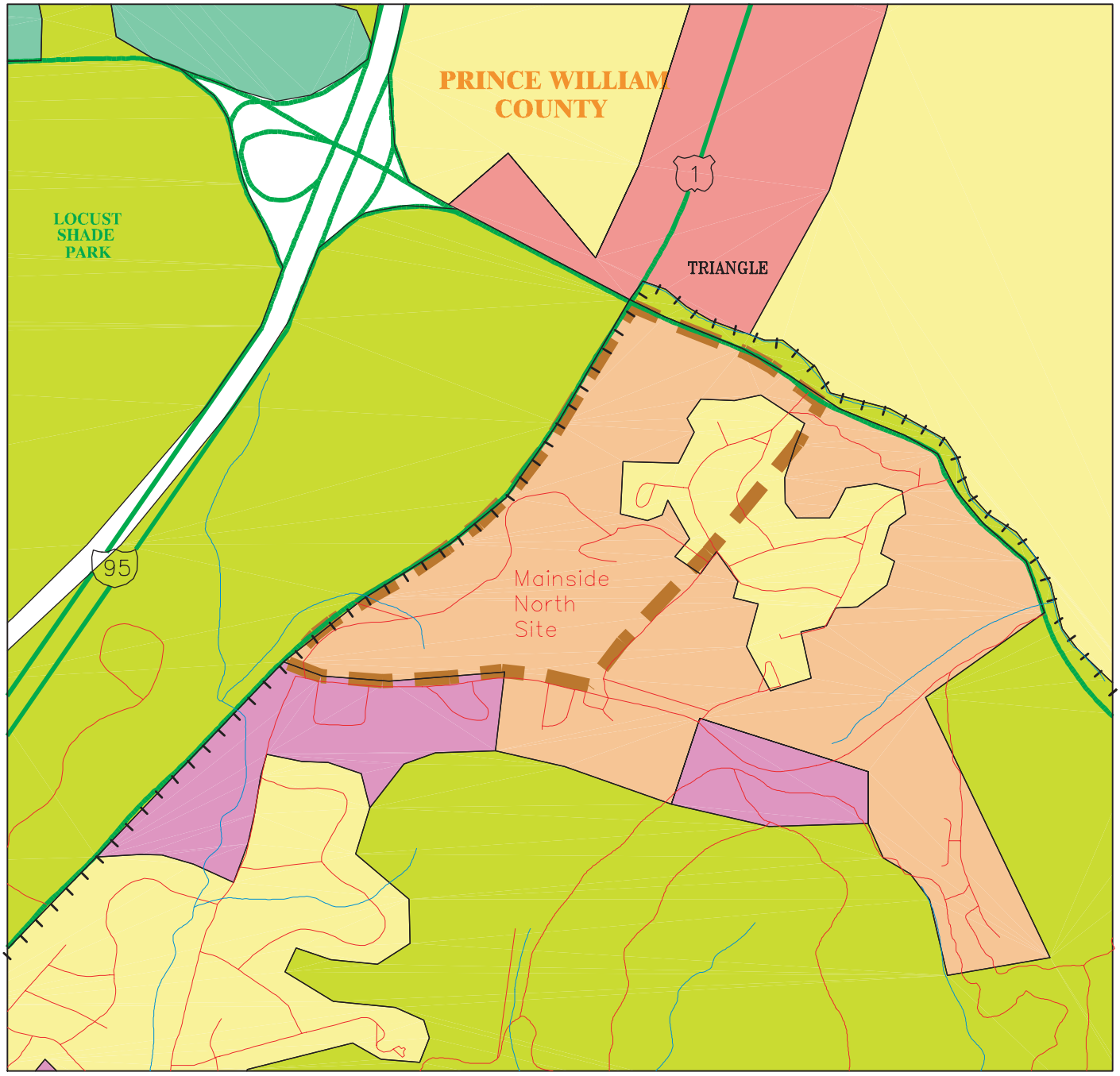

Legend

- Administration US Marine Corps
- Open Space
- Residential
- US Marine Corps Training Area
- Commercial
- Agriculture
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- Ammunition Supply Point
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- MCB Quantico Boundary
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- Streams

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Figure 3-16
Land Use
Mainside North Site

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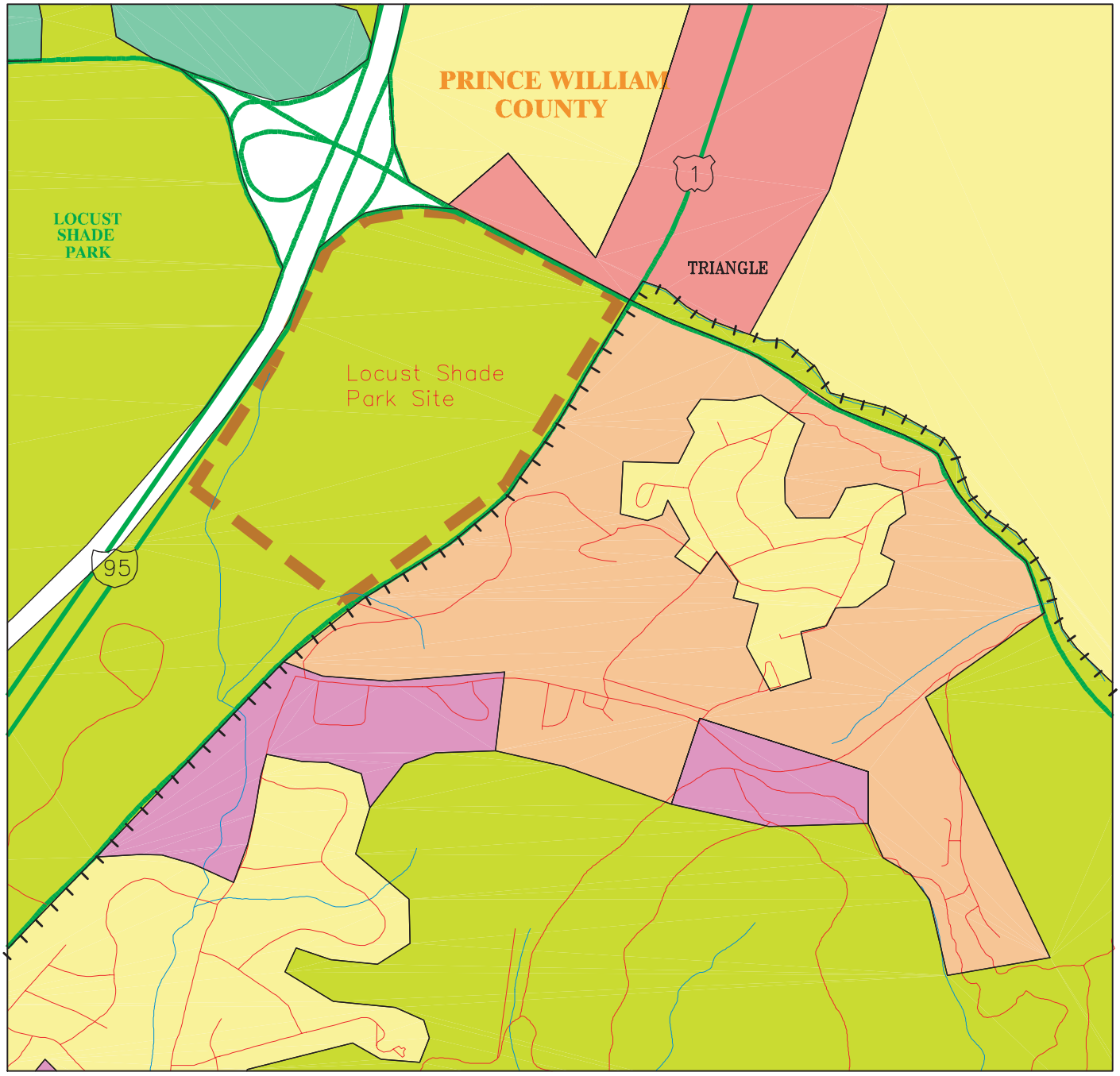

Legend

- Administration US Marine Corps
- Open Space
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Figure 3-17
Land Use
Locust Shade Park Site

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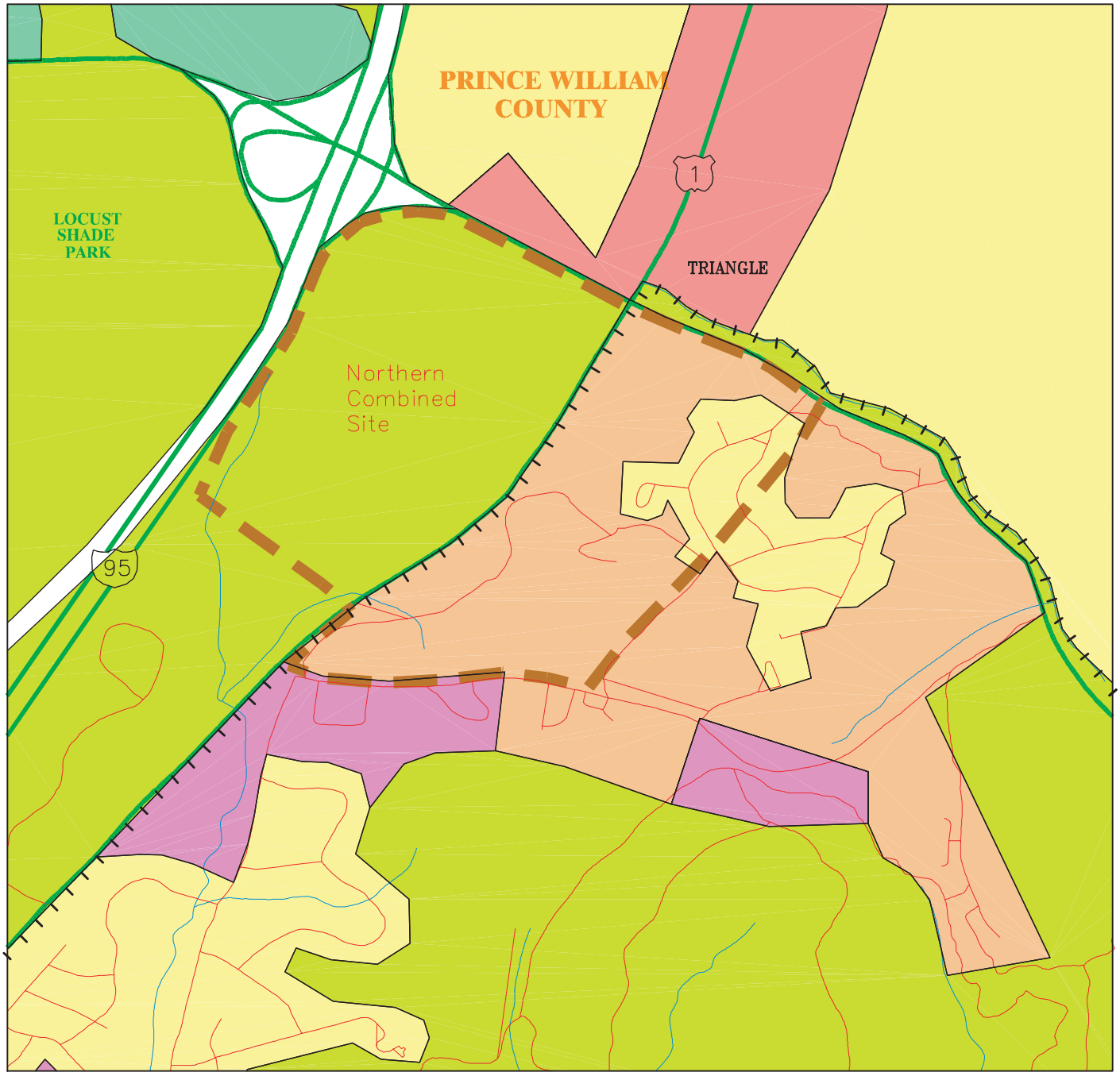

Legend

- Administration US Marine Corps
- Open Space
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- US Marine Corps Training Area
- Commercial
- Agriculture
- Light Industrial
- Ammunition Supply Point
- Northern Combined Site Boundary
- MCB Quantico Boundary
- County Boundary
- Roads
- Streams

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Figure 3-18
Land Use
Northern Combined Site

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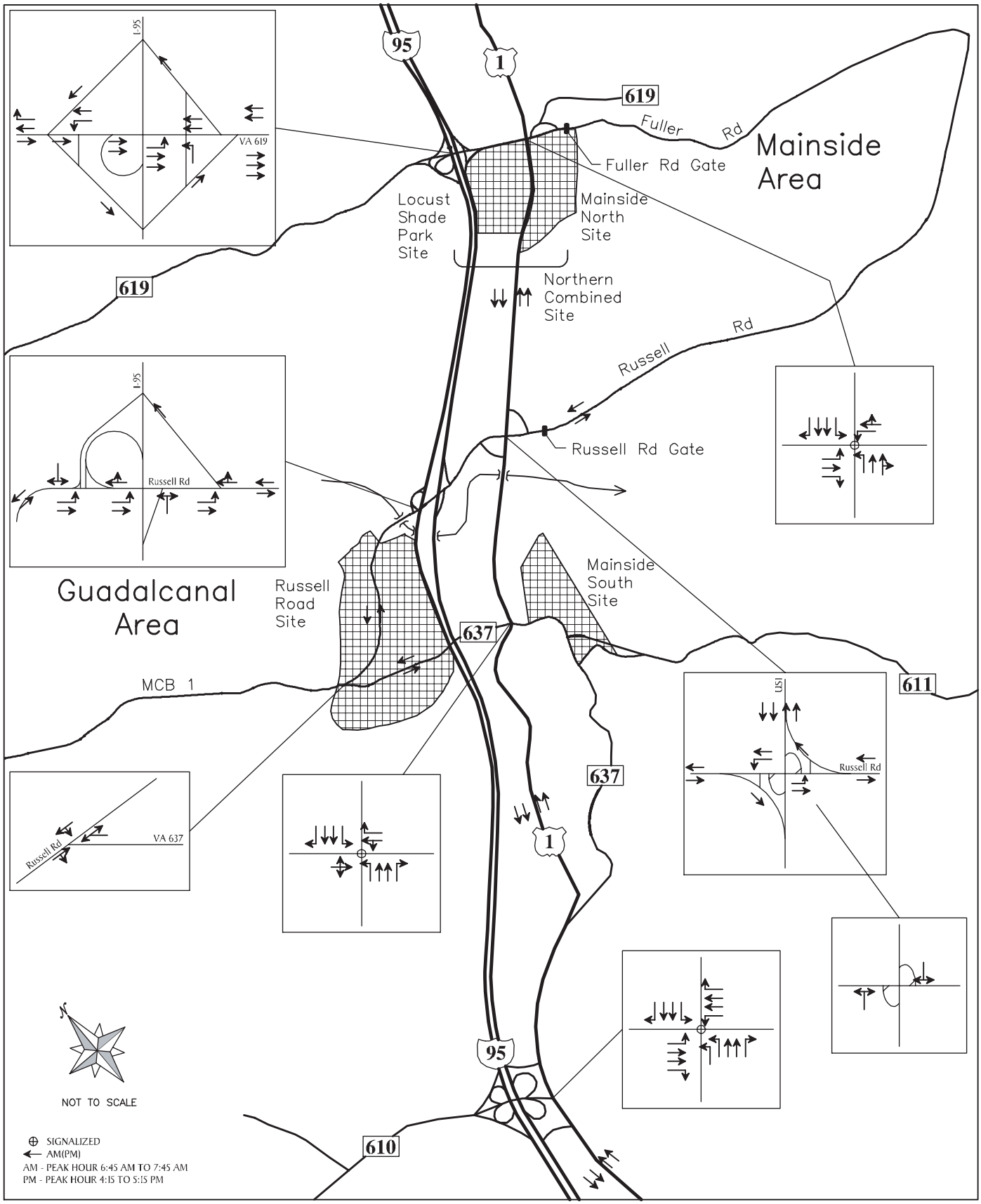

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Figure 3-19
Existing Road and Lane Uses

Parsons Harland Bartholomew & Associates, Inc., Richmond VA, 2000.

rural residential development. The land use along VA-610, west of US-1 consists of newer commercial and retail businesses that have semi-controlled points of access.

Traffic counts were performed during the week of October 4, 1998, (on Tuesday and Wednesday) at all critical locations except at the intersection Russell Road and MCB-1. The schedule of events for the MCB was confirmed so that the counts represented a typical day. Two-hour turning movement counts were performed at the intersections to determine the morning and afternoon peak hour counts and 24-hour machine counts were conducted at ramp locations. The traffic operations along the Russell and Fuller Road corridors were observed to determine how the operation of the intersections and gates influence each other.

The count information indicates that roadway use peaks between 6:45 AM and 7:45 AM in the morning and 4:15 PM and 5:15 PM in the afternoon. The morning and afternoon peak hour volumes are shown on Figure 3-20. The existing capacity analysis results are shown in Table 3-3. Most of the intersections operate at acceptable LOS during the peak hours. The exceptions are: 1) the I-95 northbound off-ramp intersection with Russell Road, and 2) the northbound US-1 off- and on-ramp intersection with Russell Road.

Table 3-3. Summary of Existing Condition Capacity Analyses

Intersection	AM Peak Hour LOS/ DELAY (in seconds)	PM Peak Hour LOS/DELAY (in seconds)
VA-619 at I-95 SB On-Ramp (U)	A/1.0	A/1.9
VA-619 at I-95 NB On-Ramp and Off-Ramp (U)	A/0.7	A/0.3
Russell Road at I-95 SB On-Ramp and Off- Ramp (U)	C/12.2	A/2.2
Russell Road at I-95 NB Off-Ramp (U)	F/122.6	A/0.6
Russell Road at I-95 NB On-Ramp (U)	A/0.0	A/0.9
Russell Road and VA-637 and MCB-1 (U)	A/0.9	A/0.2
Russell Road at US-1 SB On-Ramp and Off-Ramp (U)	A/0.7	A/0.9
Russell Road at US-1 NB On-Ramp and Off-Ramp (U)	F/148.0	A/1.1
US-1 and VA-619 and Fuller Road (S)	D/34.3	C/17.5
US-1 and VA-637 (S)	B/6.8	B/6.0
US-1 and VA-610 (S)	A/0.7	A/0.8

(S) - Signalized
(U) - Unsignalized
LOS - Level of service
A-F - A (unobstructed conditions) - F (jammed conditions)

3.8.2 Background Traffic Conditions The analysis for the background conditions assesses the roadway system as it is predicted to be in year 2015 without the proposed MCHC. Several approved developments are anticipated to be complete by year 2015 and will generate traffic that affects the roadway capacities in the Quantico area. They include the Manpower Center, located on Russell Road in the Mainside area, which is a 151,000 square foot (14,028 square meter) building that will be occupied by 900 new employees when fully staffed. It officially opened in August 1998 and was two-thirds occupied at the time the traffic counts were performed for the Heritage Center assessment. The Justice Training Center is being constructed in the Guadalcanal area of MCB Quantico. While most of the staff and students currently work in the area, an additional 100 students and staff of 36 are expected by the year 2000.

The additional traffic from this proposed development was distributed and assigned to the roadway system as documented in accordance with the traffic study completed for an FBI Laboratory relocation study. The FBI Laboratory is planning to relocate to the FBI Academy in the Guadalcanal area by the year 2000. The traffic anticipated to be generated by the 800 employees was distributed and assigned to the roadway system as documented in the assessment mentioned above. A four percent per year regional growth rate was applied to traffic on US-1 and a one percent per year regional growth rate was applied to all other roadways in the area. These values were derived from a US-1 corridor study completed in 1997 and from the evaluation of historical traffic counts. The regional growth represents the increase created by through traffic movements or developments that may occur but were not approved at the time this document was prepared.

There are several proposed roadway improvements that will affect the capacity of the roadway intersections in the study area. A US-1 corridor study proposed the widening of US-1 to a six-lane divided cross section, from the Stafford County line to north of the study area. The cross section includes a ten-foot wide trail on the west side. The proposed improvements include: 1) a separate northbound right lane at the US-1 intersection at VA-619; 2) intersection improvement or relocation at the VA-619 (Fuller Heights Road) intersection with Fuller Road, east of US-1; and 3) the redesign of the US-1 and Russell Road ramps to incorporate two through lanes in each direction on Russell Road and free-flowing movements from northbound to eastbound,

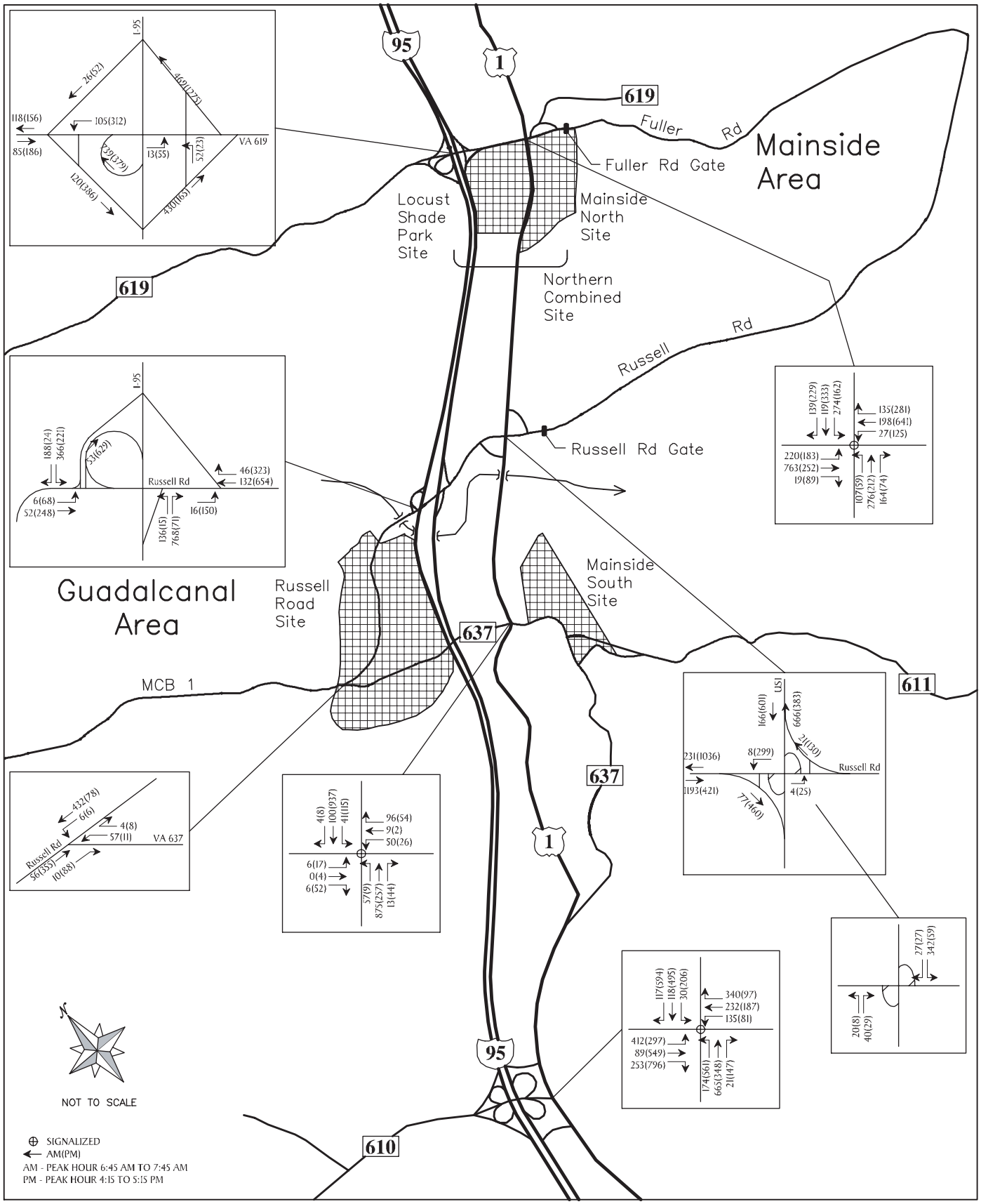

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Figure 3-20
Existing Peak Hour Volumes (1998)

Parsons Harland Bartholomew & Associates, Inc., Richmond VA, 2000.

northbound to westbound, southbound to eastbound, and eastbound to southbound. The proposed improvements are included in the Virginia Department of Transportation (VDOT) Long Range Plan and are anticipated to be in-place by 2015. (Similar improvements were studied for the US-1 corridor from the Stafford County line to south of the assessment area. These improvements were not considered in this analysis because funding for the improvements is currently uncertain.) Construction of an 800-foot (244-meter) acceleration lane on Russell Road at the I-95 northbound off-ramp is currently underway and is expected to be complete in 1999 to 2000. The lane use configurations anticipated in the study area by 2015 are shown in Figure 3-21. The background traffic volumes were determined by adding the existing traffic volumes to the traffic generated by the imminent developments and the traffic generated by regional growth. They represent the traffic volumes anticipated in the year 2015 separate from that of the MCHC. The morning and afternoon peak hour volumes for this condition are shown on Figure 3-22.

The background capacity analysis results are shown in Table 3-4. Most of the intersections operate at acceptable levels of service. The exceptions are: 1) the Russell Road and I-95 northbound off-ramp intersection would continue to experience severe delays during the morning peak hour, as it does currently, 2) the Russell Road and I-95 southbound on- and off-ramp intersection would experience severe delays in the morning peak hour due to the increase in traffic created by imminent developments and regional growth, and 3) the VA-610 and US-1 intersection would experience unacceptable levels of service if the growth on US-1 increases by four percent per year and no roadway improvements are implemented.

Table 3-4. Summary of Background Condition Capacity Analyses Results

Intersection	AM Peak Hour LOS/DELAY (in seconds)	PM Peak Hour LOS/DELAY (in seconds)
VA-619 at I-95 SB On-Ramp (U)	A/1.0	A/2.0
VA-619 at I-95 NB On-Ramp and Off-Ramp (U)	A/1.1	A/0.3
Russell Road at I-95 SB On-Ramp and Off- Ramp (U)	F/165.1	A/3.8
Russell Road at I-95 NB Off-Ramp (U)	F/189.5	A/0.7
Russell Road at I-95 NB On-Ramp (U)	A/0.1	A/0.1
Russell Road and VA-637 and MCB-1 (U)	A/1.1	A/0.3
Russell Road at US-1 SB On-Ramp and Off-Ramp (U)	A/1.6	A/1.2
Russell Road at US-1 NB On-Ramp and Off-Ramp (U)	A/0.1	A/0.7
US-1 and VA-619 and Fuller Road (S)	D/28.2	D/31.9
US-1 and VA-637 (S)	B/9.8	B/7.6
US-1 and VA-610 (S)	D/33.1	*

(S) - Signalized
(U) - Unsignalized
LOS - Level of Service
A-F - A (unobstructed conditions) - F (jammed conditions)
* - LOS F with excessive delays

Some improvements to the public transportation system are expected by the year 2015. They include: 1) widening of the railroad bridges to accommodate two tracks, the use of larger train passenger cars, and increased frequency of train service in the Quantico area; 2) the addition of a trail or bikeway along the US-1 corridor from the Stafford County line northward would increase the potential use of this mode of transportation; 3) potential increased bus service; and 4) the expansion of the park and ride facilities. These improvements primarily focus on improving peak hour service from the Quantico area in the morning and to the Quantico area in the afternoon. Therefore, no adjustments have been made to the background traffic analyses for these improvements.

3.9 Infrastructure and Utilities

The general vicinity of the five alternative sites is served by a full range of utility systems including electricity from Virginia Power; water from Prince William County, Stafford County, and MCB Quantico systems; wastewater collection by the counties and MCB Quantico; natural gas from Columbia Gas; and telecommunication from a selection of providers (see Figure 3-23). The proximity to and adequacy of existing utility systems for each of the alternative sites are discussed in the following paragraphs.

3.9.1 Russell Road Site The Russell Road site has a 13,200 thousand volt (kV) overhead line that runs parallel to VA-637/MCB-1 and serves existing facilities west of I-95. The line runs from a 345 kV main distribution feeder at US-1 and extends westward to the FBI Academy and beyond. The main feeder at US-1 emanates from a substation in Dumfries, which has between three and four megawatts of available capacity. Power could be made available at 34,500 kV if needed. Water service to the Russell Road site is currently provided from two on-base sources - a water treatment plant located east of I-95 and south of Russell Road and a four-inch MCB Quantico water line which extends along MCB-1 from a six-inch main near the Fuel Farm. Water service also is provided by Stafford County to Boswells Corner, approximately 3,000 feet (914 meters) to the east of the Russell Road site along VA-637. The Russell Road site is not currently served by a sanitary sewer collection system. Existing sanitary sewer infrastructure includes

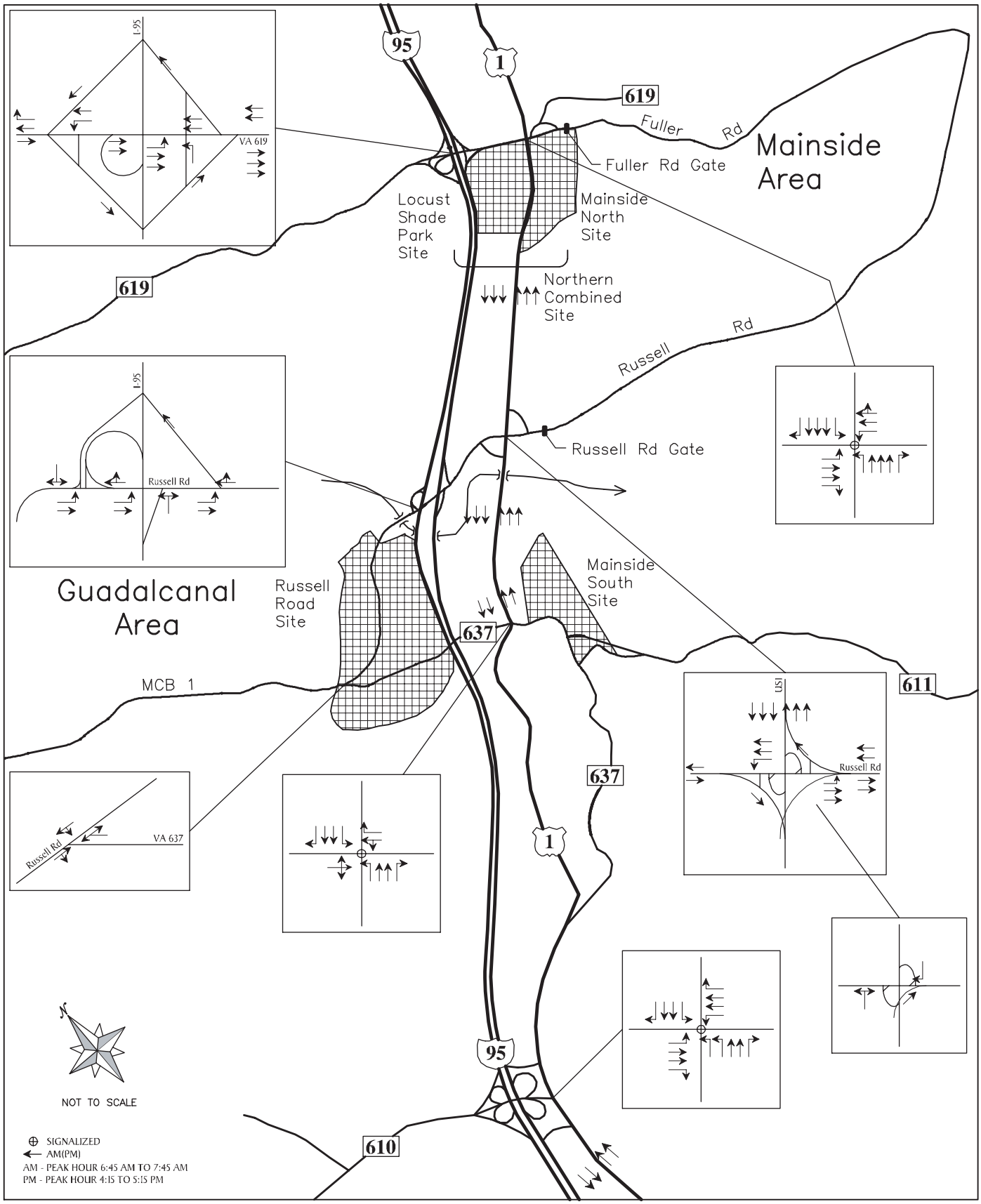

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Figure 3-21
Background Lane Uses

Parsons Harland Bartholomew & Associates, Inc., Richmond VA, 2000.

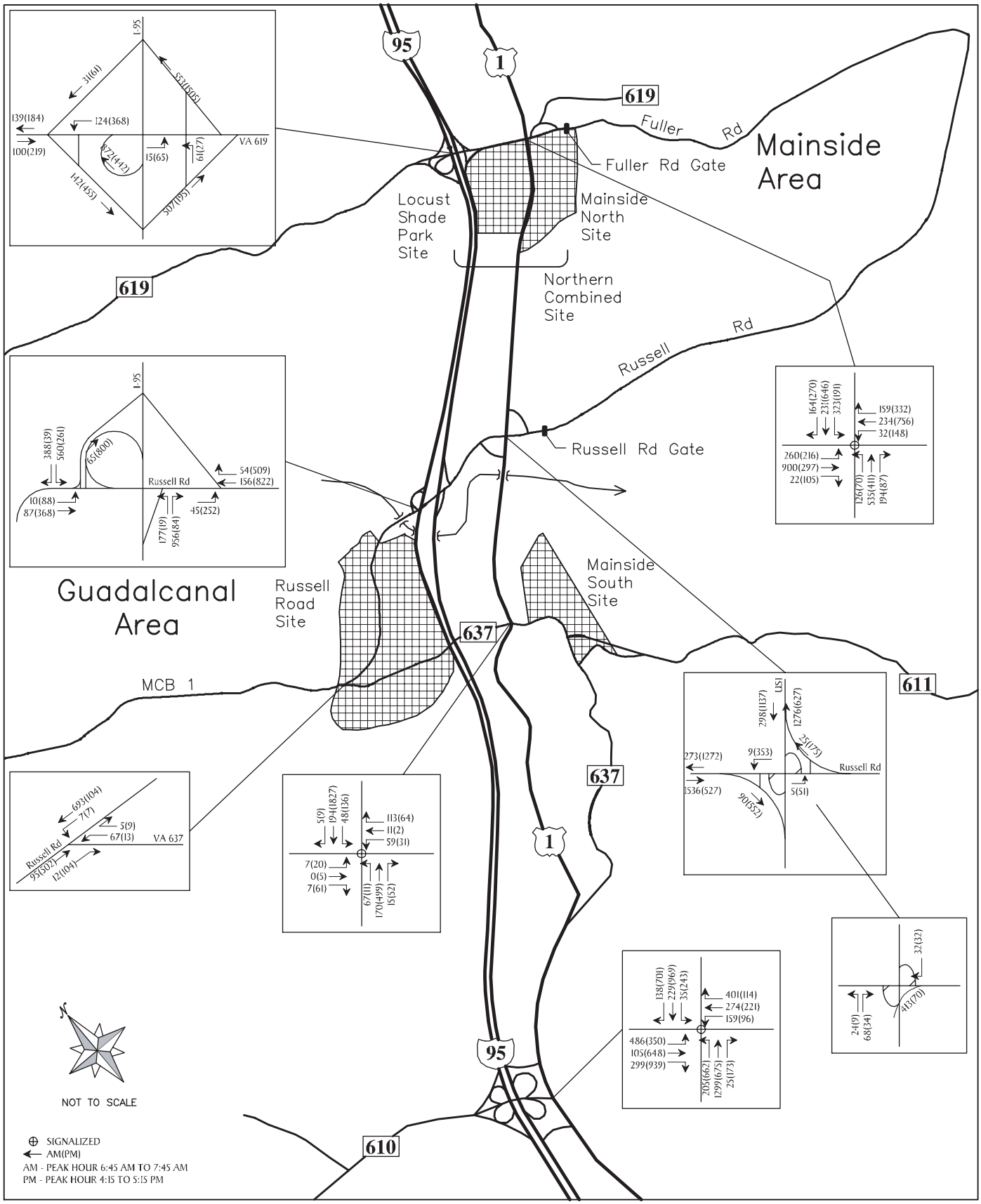

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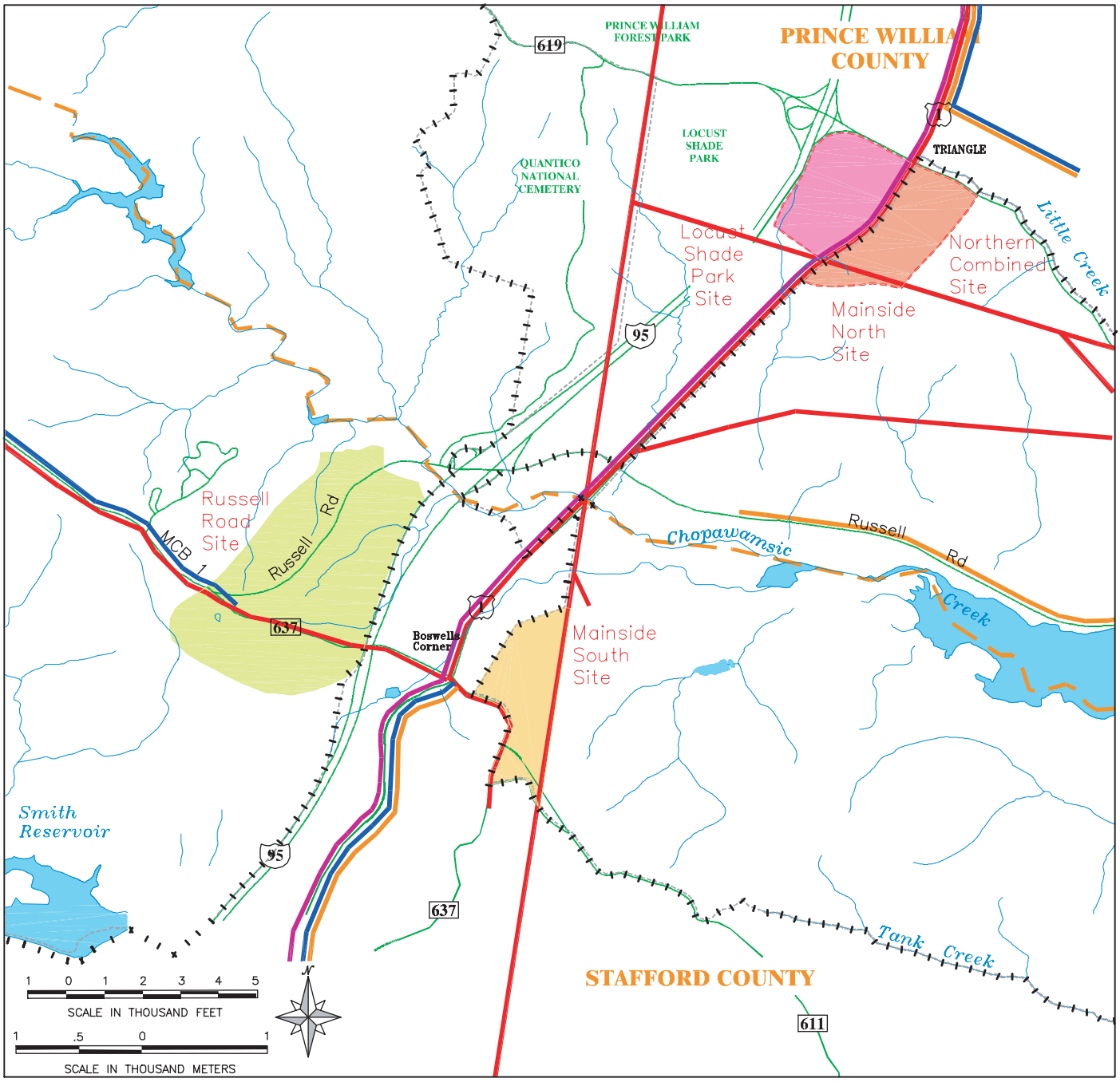
Figure 3-22
Background Peak Hour Volumes (2015)

Parsons Harland Bartholomew & Associates, Inc., Richmond VA, 2000.



Legend

- Existing Electric Distribution Line
- Existing Natural Gas Distribution Line
- Existing Water Distribution Line
- Existing Sanitary Sewer Line
- MCB Quantico Boundary
- County Boundary
- Roads
- Streams

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Figure 3-23

Utility Mains in the Vicinity

Parsons Harland Bartholomew & Associates, Inc., Richmond VA, 2000.

Stafford County mains near Camp Barrett to the southwest and to the east across I-95 near Boswells Corner (intersection of US-1 and BA-637). An existing pump station near the Commissary/Exchange complex on Russell road, to the east of the site, discharges wastewater to the MCB Quantico treatment plant. The treatment plant currently has available capacity to treat additional flow. The site is not currently served by natural gas, however, Columbia Gas operates a main which parallels US-1 to the east across I-95 and plans to extend a main from the Camp Barrett area to the FBI Academy in the near future. Both Columbia Gas mains have sufficient capacity to meet the Heritage Center demand.

3.9.2 Mainside South Site The Mainside South site has a 13,200 kV overhead line that runs parallel to VA-637 and abuts the southwestern edge of the site. This line runs from the 345 kV main distribution feeder at US-1 and continues southward along VA-637 beyond the site. A Stafford County water main parallels US-1 from the south and serves existing customers in the Boswells Corner area. The line has sufficient capacity to serve the daily demand that would be created by the Heritage Center, but lacks adequate flow for fire suppression. A Stafford County sanitary sewer force main lies less than 1,000 feet (310 meters) west of the site near Boswells Corner. No MCB Quantico water supply or sanitary sewer facilities extend to the vicinity of the Mainside South site. The Columbia Gas main that parallels US-1 lies less than 1,000 feet (310 meters) to the west of the site.

3.9.3 Mainside North Site The Mainside North site has the 345 kV main distribution feeder along the western edge of the site parallel to US-1. An additional line branches from the main and runs eastward across the southern end of the site to provide power to facilities throughout Mainside. The MCB Quantico water distribution system serves the Thomason Park housing area and could be adapted to meet the demand of the proposed development. Sanitary sewage could also be collected by the Thomason Park sanitary system and treated at the MCB Quantico plant. A Prince William County eight-inch water main follows the north side of Fuller Heights Road approximately 200 feet (61 meters) north of the site. This line has sufficient capacity to serve the daily demand of the MCHC but lacks adequate flow for fire suppression. Prince William County is investigating possible installation of an elevated storage tank in the vicinity of the Mainside North site which would boost the fire suppression capacity of the system. Prince William has an eight-inch gravity sanitary sewer collector just to the north of this site at Fuller Heights Road. The line currently has sufficient available capacity to serve the MCHC. The Columbia Gas main lies along the western edge of US-1.

3.9.4 Locust Shade Park Site The Locust Shade Park site has the 345 kV main distribution feeder along the eastern edge of the site parallel to US-1. An additional line branches from the main and runs westward across the southern end of the site. Due to the distance and the complexity of extending a new water line across US-1, it would likely not be practical to connect the Locust Shade Park site to the MCB Quantico system. A Prince William County eight-inch water main follows the north side of Fuller Heights Road approximately 200 feet (61 Meters) to the north of the site. This line has sufficient capacity to serve the estimated daily demand of the MCHC but lacks adequate flow for fire suppression. Prince William County is investigating possible installation of an elevated storage tank in the vicinity which would boost the fire suppression capacity of the system. Sanitary sewage could be discharged from the Locust Shade Park site to the Thomason Park housing area, but a pump station and force main would be required. Prince William County has an eight-inch gravity sanitary sewer collector just to the north of this site at Fuller Heights Road. The line currently has sufficient available capacity to serve the MCHC. The Columbia Gas main lies along the western edge of US-1 is adjacent to the eastern site boundary.

3.9.5 Northern Combined Site The Northern Combined site has the 345 kV main distribution feeder that parallels US-1 passes through the middle of the site. An additional line branches from the main and runs westward across the southwestern perimeter of the site. The MCB Quantico water distribution system and sanitary sewage collection system that serve the Thomason Park housing area are located in the northeastern corner of the site. Prince William County water and sanitary sewer lines extend southward to Fuller Heights Road approximately 200 feet (61 meters) north of the eastern portion of the site. The Columbia Gas main that lies along the western edge of US-1 is adjacent to the eastern site boundary.

3.10 Socioeconomics

The socioeconomic region of influence for the MCHC is Prince William and Stafford counties. Both of these counties are currently experiencing rapid residential, industrial, and business growth. The counties are poised to provide infrastructure and services relating to this expansion, and, in fact, are encouraging development that is in accordance with their respective land use plans.

Two federal Executive Orders have been issued which address the relationship of federal actions with regard to minority, low income, and youthful segments of the population. They are intended to avoid disproportionately high and adverse environmental effects on those populations. In

order to provide a thorough evaluation, this socioeconomics presentation provides data based on race and income, as well as the distribution of population by age in areas potentially affected by implementation of the proposed action.

Socioeconomic data for the project area was derived from various government agencies, reports, and publications. They include 1990 Census of Population and Housing (US Census Bureau, 1993): Stafford County Planning Commission Comprehensive Plan Committee (Stafford County, 1996); Prince William County Office of Information Technology (Prince William County, 1998a); Prince William County Office of Planning (Prince William County, 1998b); Weldon Cooper Center for Public Service, 1998; US Bureau of Labor Statistics, 1998; and Virginia Department of Education, 1998. Population statistics for state, county, and census tracts within the project area are presented for comparative purposes. Data used for the analysis relating to the two Executive Orders were collected from the *1990 Census of Population and Housing* (US Census Bureau 1993); although these data are now more than eight years old, they present the most complete, detailed, and accurate statistics available addressing population distribution and income. The project area is split among six common tracts (see Figure 3-24). Even though the region has experienced significant population growth, there are no regional trends that have occurred since 1990 that have significantly altered the composition of the general population

3.10.1 Population The 1990 populations of Stafford and Prince William counties were 61,236 and 215,686, respectively. Stafford County had a minority population of just over nine percent and Prince William County had a minority population of just over 16 percent. These levels are lower than the Virginia state-wide minority population of just over 22 percent. Data shows that the six census tracts surrounding the project area all had minority population rates higher than their respective county (see Figure 3-24 and Table 3-5). These rates ranged from just over 11 percent to just under 56 percent (US Census Bureau, 1993).

Almost one-quarter of the population of Stafford and Prince William counties were of school age (5 to 18 years old), 22.7 percent and 22.5 percent, respectively. Almost six percent of the population of Stafford County was aged 65 years and above while 2.9 percent of the population of Prince William County was in this age group. Just less than 19 percent of the population of the State of Virginia was aged five to 18 years old and just over 10 percent of the Virginia population was over 65 years old. The six census tracts surrounding the project area had populations aged 17 years old and younger, that ranged from 22 to 44 percent. (US Census Bureau, 1993).

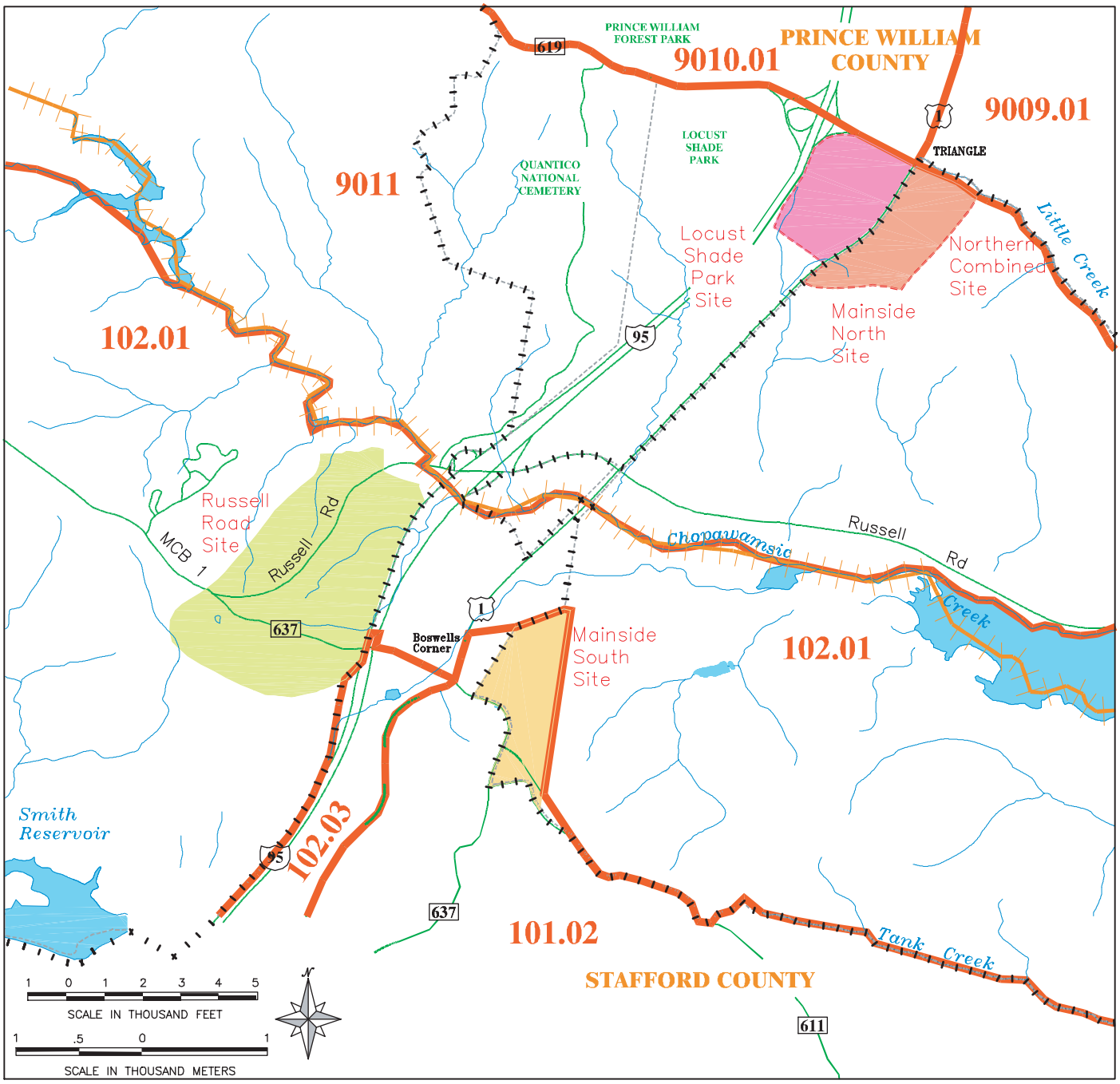
The populations of Stafford County and Prince William County have both experienced significant amounts of growth and are anticipated to continue growing. From 1980 to 1997 the population of Stafford County grew by 118.2 percent and the population of Prince William County grew by 127.1 percent. It is estimated that the population of Stafford County will grow by another 49.5 percent by the year 2020 (to 131,971). The population of Prince William County is expected to grow by 62.6 percent (to 410,200) in the same time period. Comparatively, the population of Virginia grew by 25.9 percent from 1980 to 1997 and is expected to grow by another 25.7 percent (to 8,466,000) by the year 2025 (Stafford County, 1996; Prince William County, 1998a; Weldon Cooper Center for Public Service, 1998; US Census Bureau, 1993).

3.10.2 Labor Force and Employment In 1990 the largest employment sectors in Stafford and Prince William counties were, in descending order of magnitude, retail trade, public administration, and manufacturing of nondurable goods. These same sectors were the three largest employment sectors in 1980 as well. In 1990, the largest employment sectors for the State of Virginia were, in order of magnitude, retail trade, public administration, health service, and educational services (health and educational services had approximately the same share of the labor market) (US Census Bureau, 1993).

The labor force of Stafford County increased by 172.5 percent from 1980 to August 1998; the Prince William County labor force increased by 82.7 percent over the same time period. This compares to an increase of 40.8 percent in the labor force for Virginia from 1980 to August 1989. Both Stafford and Prince William counties have unemployment rates lower than the rate for the state. The unemployment rate for Stafford County, Prince William County, and the state all decreased from 1980 to August 1998 (US Census Bureau, 1993; US Bureau of Labor Statistics, 1998).

3.10.3 Income The 1989 median family income for Stafford County ($47,526) and Prince William County ($52,078) were both higher than the 1989 median family income for Virginia ($38,213). The 1989 median family income for Stafford County increased by 107.3 percent from the 1979 median family income; the median family income for Prince William County increased by 96.3 percent during the same time period. The Virginia 1989 median family income increased by 90.4 percent over the 1979 level (US Census Bureau, 1993).

The poverty rates for both Stafford County (4.1 percent) and Prince William County (3.2 percent) were notably less than the 1990 poverty rate for the state (10.2 percent) . From 1980 to 1990 the poverty rates for Stafford and Prince William counties declined by over 30 percent each, while



Legend

- Census Tract Boundaries
- 9009.01 Census Tract Number
- MCB Quantico Boundary
- County Boundary
- Roads
- Streams

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Figure 3-24
Census Tracts

Parsons Harland Bartholomew & Associates, Inc., Richmond VA, 2000.

the poverty rate for the state declined by less than 15 percent. Poverty rates for the six census tracts surrounding the project area ranged from 0 percent to just under 12 percent. (US Census Bureau, 1993).

3.10.4 Housing From 1980 to 1990, both Stafford and Prince William counties experienced notable increases in the total number of housing units, 56.2 percent and 61.0 percent, respectively. By comparison, the number of housing units in the State of Virginia only increased by 23.5 percent for the same time period. Over three-fourths of occupied housing units were occupied by owners in Stafford County in 1990 and just over two-thirds were owner occupied in Prince William County in 1990. Both of these rates were higher than the owner occupancy rate (60.9 percent) for the State of Virginia in 1990. Both counties had lower vacancy rates than the state during 1980 and 1990 (US Census Bureau, 1993).

The 1990 median value of owner occupied housing units was $126,200 for Stafford County and $137,700 for Prince William County. The 1990 median value of owner occupied housing units was $90,400 for the state. The 1990 median value of owner occupied housing units for Stafford and Prince William counties more than doubled from the 1980 value. The median value for the state rose by almost 90 percent from 1980 to 1990 (US Census Bureau, 1993).

3.10.5 Environmental Justice In order to comply with executive orders 12989 and 13045, ethnicity, poverty status, and age of the populations in census tracts in the vicinity of MCB Quantico were examined and compared to regional, state and national data.

All six of the census tracts that abut MCB Quantico in the area of the proposed action, three in Stafford County and three in Prince William County, had higher percentages of minority population than their respective county. The percentage of minority population in Stafford and Prince William counties were lower than the state and national percentages (US Census Bureau, 1993).

Of the six census tracts that abut MCB Quantico in the area of the proposed action, one tract in Stafford County and all three tracts in Prince William County had higher poverty rates than their respective county. The overall poverty rates for Stafford and Prince William counties were lower than the state and national rates (US Census Bureau, 1993).

Table 3-5. Environmental Justice				
		Total Percent Minority	Poverty Rate	Percent Aged 17 years or Younger
United States		19.7%	13.1%	25.6%
Virginia		22.5%	10.2%	24.3%
Stafford County		9.1%	4.1%	29.4%
	Tract 101.02	14.7%	3.5%	22.4%
	Tract 102.01	55.9%	0.0%	44.1%
	Tract 102.03	11.7%	4.6%	33.7%
Prince William County		16.3%	3.2%	30.5%
	Tract 9009.01	28.7%	11.6%	30.3%
	Tract 9010.01	28.1%	10.7%	25.5%
	Tract 9011	25.4%	4.3%	28.5%

Source: US Census Bureau

Of the six census tracts that abut MCB Quantico in the area of the proposed action, two tracts in Stafford County had higher percentages of persons aged 17 years old or younger than the rate for the county. The percentage of persons aged 17 years old or younger in Stafford and Prince William counties were higher than the state and national percentages (US Census Bureau, 1993).

3.11 Community Facilities

Law enforcement in Stafford and Prince William counties is provided by county sheriffs' departments, the Virginia State Police, and several city or town police departments (Stafford County, 1996; Prince William County, 1998b). Law enforcement at MCB Quantico is provided by the Provost Marshall, a unit of the Security Battalion.

Stafford County is served by seven rescue squads and nine volunteer fire departments. Additionally, the City of Fredericksburg is served by a rescue squad and fire department. Prince William County is served by 17 fire or rescue squad stations. The City of Manassas is also served by a fire department (Stafford County, 1996; Prince William County, 1998b). Fire protection at MCB Quantico is provided by the Base Fire Department, a unit of the Security Battalion.

The Stafford County School Board currently operates three secondary schools, five middle schools, and eleven elementary schools. School enrollment for the 1996-1997 school year was estimated to be just over 17,000 students. School capacity is estimated at 21,750. The School Board is currently expanding the school system with a new secondary school and an elementary

school expansion to open in 1999, expanding the capacity to 23,075 (Stafford County, 1996, Virginia Department of Education, 1998).

The Prince William County School Board administers seven secondary schools, eleven middle schools, and forty-one elementary schools. School enrollment for the 1996-1997 school year was estimated at just under 48,000. Current school capacity is estimated at just over 50,000 students. There is one secondary school and one middle school set to open in 2000. These schools will raise the capacity to almost 54,000. (Prince William County, 1998; Virginia Department of Education, 1998). The student/teacher ratios for each county are both below the maximum ratio of 25:1 as set forth by the Virginia Department of Education.

Both Stafford and Prince William counties are served by county health departments that provide a wide variety of services. Stafford County is served by one 318 bed hospital and Prince William County is served by two hospitals with a total of 326 beds. The counties are also supported by a wide variety of private medical professionals. All three hospitals are operating below the maximum occupancy rate, 85 percent, as set forth by the Virginia Department of Health. MCB Quantico is served by the Naval Medical Clinic, Quantico (an ambulatory care facility) and a full service Dental Clinic.

The Stafford County Department of Parks and Recreation and the Prince William County Park Authority maintain numerous facilities that provide a wide variety or recreational and sporting opportunities. Recreation activities at MCB Quantico include bowling, camping, picnicking, golf, a gymnasium, a marina, the (MWR) Theater, recreation classes, the Rifle and Pistol Club, stables, an olympic sized pool, and tennis courts.

3.12 Solid Waste, Hazardous Waste, and Environmental Contamination

Nonrecyclable solid waste from MCB Quantico is disposed of by the Department of Public Works and private contractors who remove the waste to one on-base landfill and to off-base facilities in the area. The on-base landfill is approximately 10 acres (4 hectares) and is located 2.4 miles west of I-95. Access to the landfill is via Russell Road, MCB-1, and MCB-2. The Department of Public Works at MCB Quantico is currently investigating disposal technologies and methods to minimize dependence on disposal at the on-base landfill.

A recycling program is in operation at MCB Quantico. Hazardous wastes are collected at a temporary (less than 90-day) accumulation point which is located in Area B at the intersection of MCB-1 and MCB-2. This building (Building 27401) is specifically designed in accordance with

federal guidelines to store these wastes. Wastes are periodically removed by a licensed contractor for eventual processing and/or disposal. Hazardous materials and waste management are regulated under the federal Resource Conservation and Recovery Act (RCRA) which is enforced by the EPA. Pest management is conducted in accordance with the current edition of the MCB Quantico Pest Management Plan. The plan is maintained by the NREAB.

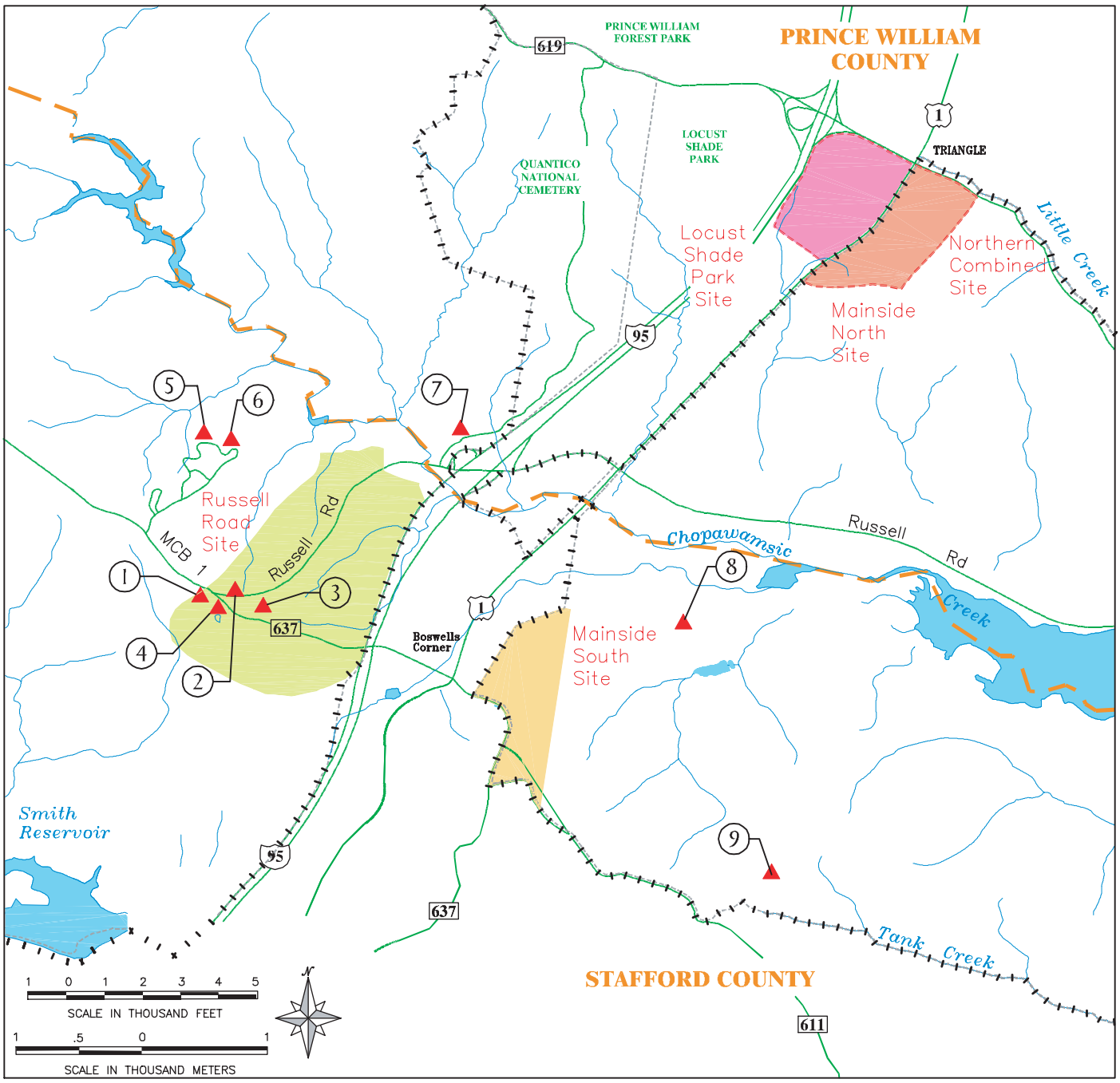
3.12.1 Environmental Contamination The three on-base alternative sites for the MCHC have been surveyed for areas of soil and groundwater contamination as part of ongoing base-wide investigations required by a number of federal and DoD clean-up programs. In addition, a Phase I Environmental Site Assessment was completed for the Locust Shade Park site in 1999 (Parsons, June 1999). Of the five alternative sites, only the Russell Road site contains areas where contamination has been identified. Within the Russell Road site there are four areas of contamination that have been identified through the Installation Restoration (IR) Program (see Figure 3-25).

Site 1 Circumstantial evidence has led investigators to suspect contamination of the Russell Road Clear Cut. Testing of this site was conducted in August 1999 and the data is currently being analyzed. A report on the findings is expected in October 2000.

Site 2 Testing of the Russell Road Waste Disposal Area (IR site APS-6A) has been completed and a screening report is expected in August 2000. Preliminary data show evidence of metals, although further testing is underway to establish background levels of these contaminants.

Site 3 Circumstantial evidence has led investigators to suspect contamination of the Route 637 Clear Cut. No data on the type or extent of contamination for this site is available at this time. Testing of this site is not scheduled to begin until 2003.

Site 4 The Pesticide Burial Area has undergone remediation, although groundwater within the area will be monitored to verify that the site does not pose a threat to human health or the environment.



Legend

1. Russell Road Clear Cut
2. Russell Road Waste Disposal Area
3. Route 637 Clear Cut
4. Pesticide Burial Area; Pesticide Burn Area Disposal Area; Drum Disposal Area
5. Ammo Storage Facility Cleaned Area
6. Ammo Storage Facility Disturbed Ground
7. Closed Landfill
8. Engineering Test Site
9. Training Area 3 Disposal Area

MCB Quantico Boundary
County Boundary
Roads
Streams

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Figure 3-25
IR Program Sites

Parsons Harland Bartholomew & Associates, Inc., Richmond VA, 2000.

SECTION 4: Environmental Consequences and Mitigation

4.1 Topography, Geology, and Soils

Construction of the MCHC would involve grading and excavation to accommodate construction of buildings, outdoor activity areas, parking lots, roadways, utilities, and stormwater management structures. Limited off-site trenching would be needed to bring utilities to each of the sites. Blasting of bedrock may be required to create level areas, or excavations for foundations and utilities. Soils within the area of construction disturbance would be changed through mixing, augmentation, and compaction. These changes would be necessary to facilitate construction of the MCHC complex and landscaping of the grounds. Areas of the sites that would be the most susceptible to erosion are those where erodible soils and steep slopes both occur. Implementation at any of the alternative sites would include preparation of, and adherence to, a site specific erosion and sediment control plan and a stormwater management plan.

4.1.1 Russell Road Site The Russell Road site has considerable areas of steep slopes and erodible soils (see Figure 4-1). Much of the western, northern, and eastern margins of the site have rugged terrain formed by numerous drainage ravines separated by narrow and steep ridges. Construction within these steeper areas would involve extensive soil movement and incorporation of stabilization structures, which would increase the potential for soil erosion and site preparation costs. Where bedrock is encountered during construction, it will likely require blasting for removal.

4.1.2 Mainside South Site The Mainside South site has some areas along the western edge where steep slopes and erodible soils combine to constrain development (see Figure 4-2). Most of the balance of the site could be graded without excessive difficulty in controlling stability.

4.1.3 Mainside North Site The topography at this site would accommodate development of the MCHC with only minor grading and/or stabilization structures (see Figure 4-3).

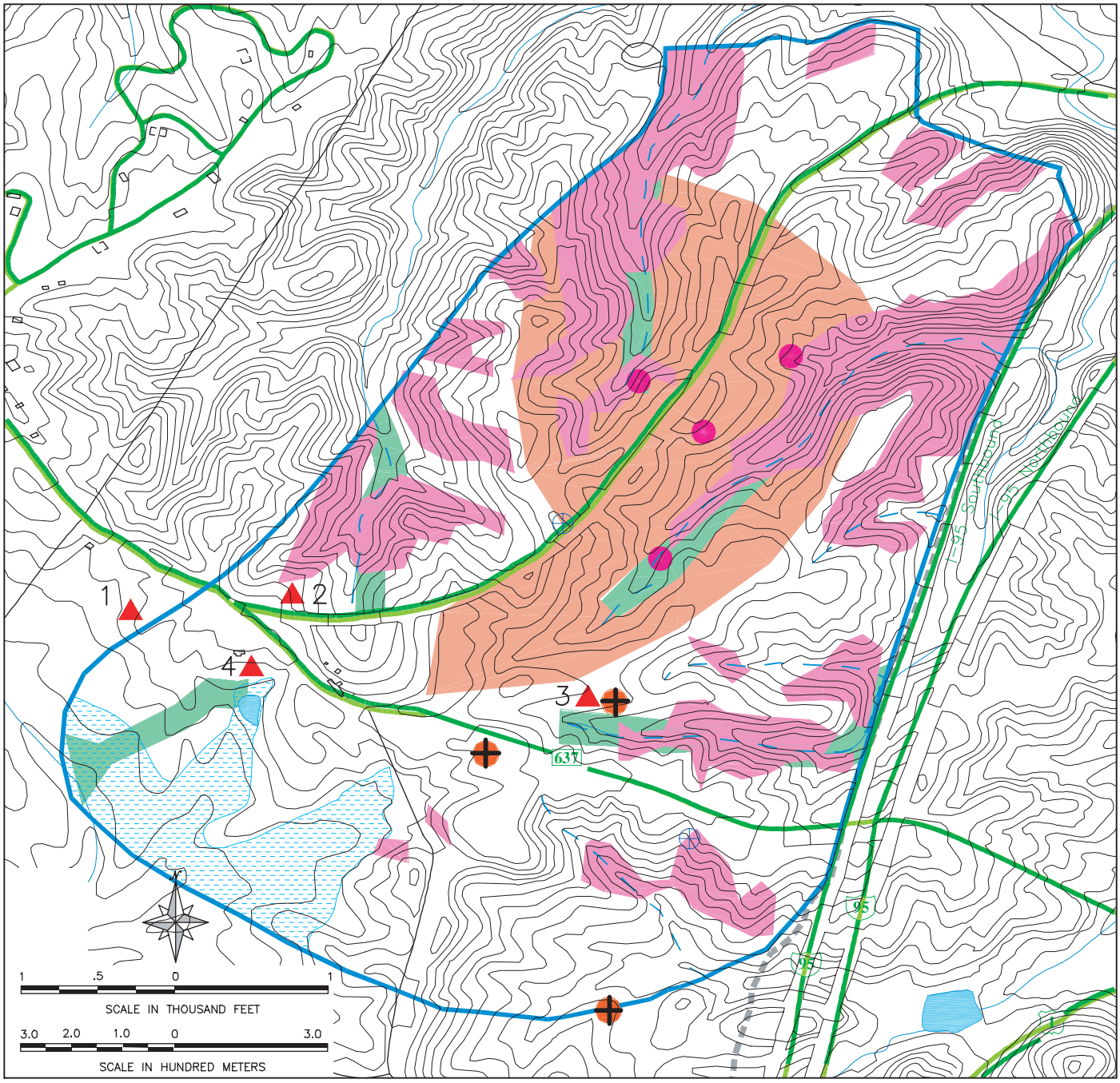
4.1.4 Locust Shade Park Site The majority of the Locust Shade Park site is not constrained by topography, geology, or soil conditions (see Figure 4-4). Development of the MCHC at this location would involve only a minor amount of site preparation earthwork.

4.1.5 Northern Combined Site The topography of this site east of US-1 would accommodate development of anticipated MCHC facilities with only minor grading and/or stabilization structures (see Figure 4-5). The majority of the site west of US-1 is not constrained by topography, geology, or soil conditions. Development of the MCHC would involve only minor site preparation work.

4.2 Water Quality and Hydrology

Development of the MCHC on any of the alternative sites would change the existing surface cover from predominantly forest to buildings, roadways, and landscaped grounds. These changes have the potential to reduce infiltration of precipitation, thereby increasing the volume of stormwater runoff. Based on preliminary estimates, buildings would cover approximately five acres (2 hectares), while parking and other paved surfaces would cover approximately 15 acres (6 hectares). The balance of the developed area within the MCHC complex would be maintained in lawns and landscaping. Because roofs and paving are impervious, rainfall would be prevented from infiltrating into the soil over approximately 20 acres (8 hectares) of the developed site. Rainfall would be expected to continue to infiltrate the landscaped areas much as it currently does under the existing forest canopy, however, some increase in runoff may occur on sloping lawn areas.

Increased runoff from the developed site would have the potential to cause a surge in volume and velocity of runoff entering streams. When the increase is unchecked, it can cause stream channel erosion, flooding, and harm to downstream aquatic habitats. Runoff from parking lots, roadways, and lawns can also add pollutants to the waterways. Phosphorous and nitrogen are of particular concern because they stimulate the growth of algae which can alter aquatic habitat for fish, underwater plants, and stream bottom-dwelling organisms.



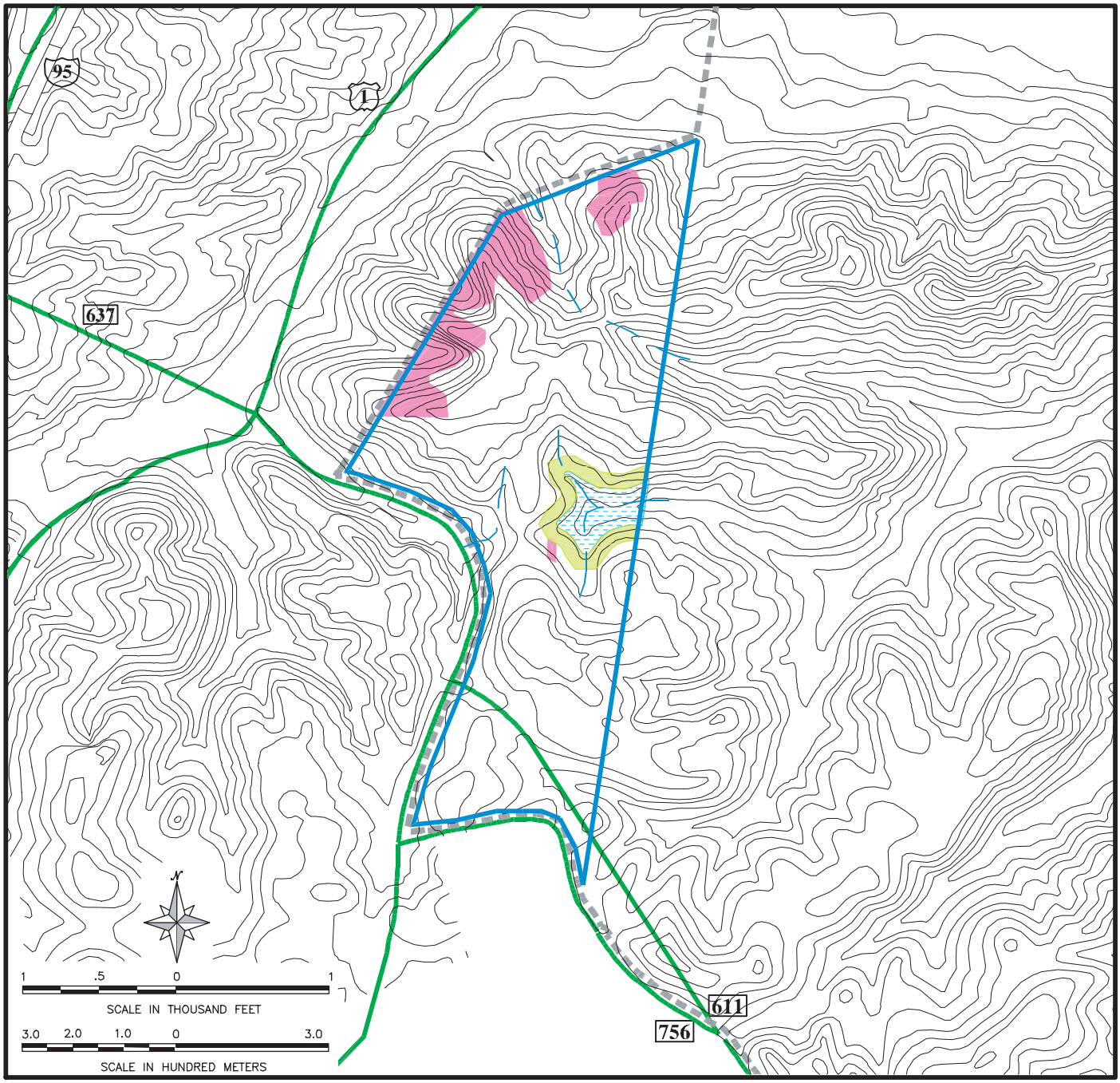
Legend

- Approximate Wetland Boundary
- 100 Foot (31 meter) Wetland Buffer
- Intermittent Streams
- 100 Foot (31 meter) Intermittent Stream Buffer
- Areas With Severe Building Limitations
- USFWS Consultation Area
- ESQD Arc
- 1–4 IR Sites
- Colony of small whorled pogonia
- American Chestnut Trees
- Cemetery
- Roads
- MCB Quantico Boundary
- Russel Road Site Boundary

Marine Corps Heritage Center
MCB Quantico, VA
Environmental Impact Statement

Figure 4-1
Combined Constraints
Russell Road Site

Parsons Harland Bartholomew & Associates, Inc., Richmond VA, 2000.



Legend

- Mainside South Site Boundary
- MCB Quantico Boundary
- Roads
- Intermittent Streams
- 100 Foot(31 meter) Wetland Buffer
- Area With Severe Building Limitations
- Approximate Wetland Boundaries

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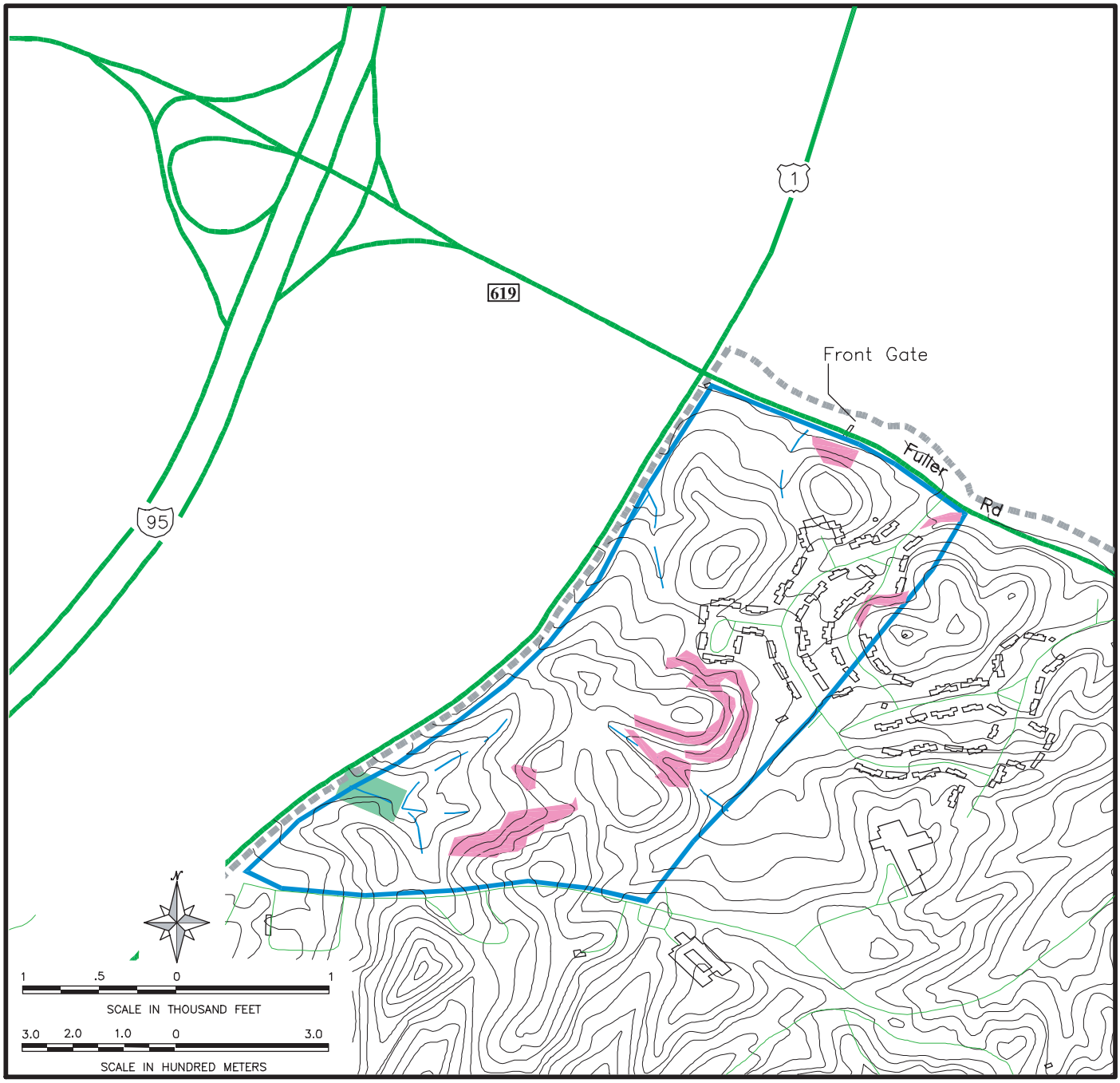
Figure 4-2
Combined Constraints
Mainside South Site

Parsons Harland Bartholomew & Associates, Inc., Richmond VA, 2000.



Legend

- Mainside North Site Boundary
- MCB Quantico Boundary
- Area With Severe Building Limitations
- 100 Foot(31 meter) Intermittent Stream Buffer
- Roads
- Intermittent Stream

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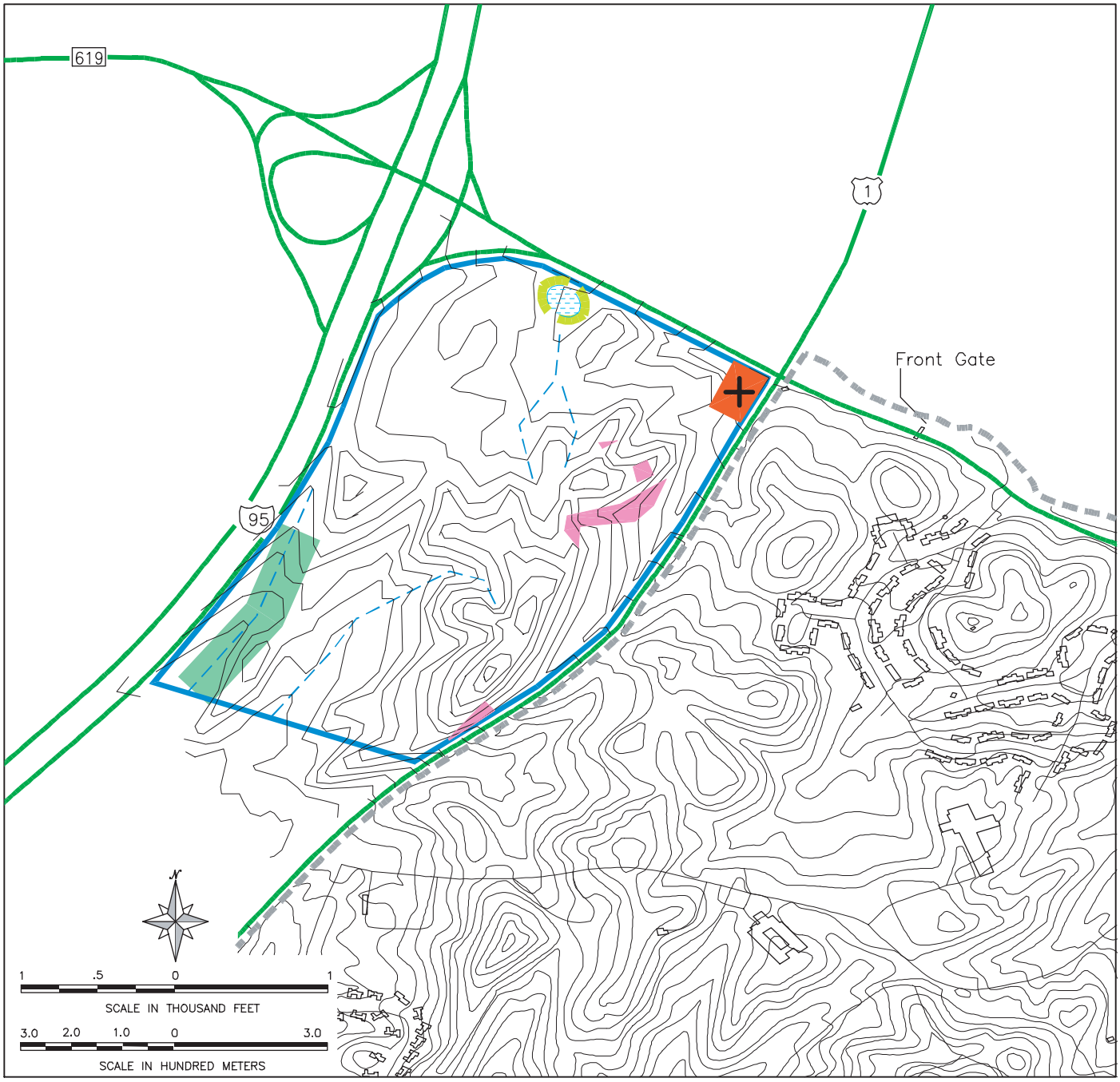
Figure 4-3
Combined Constraints
Mainside North Site

Parsons Harland Bartholomew & Associates, Inc., Richmond VA, 2000.



Legend

- MCB Quantico Boundary
- Locust Shade Park Site Boundary
- Roads
- Area With Severe Building Limitations
- 100 Foot(31 meter) Intermittent Stream Buffer
- Approximate Wetland Boundaries
- 100 Foot(31 meter) Wetland Buffer
- Intermittent Streams
- Cemetery

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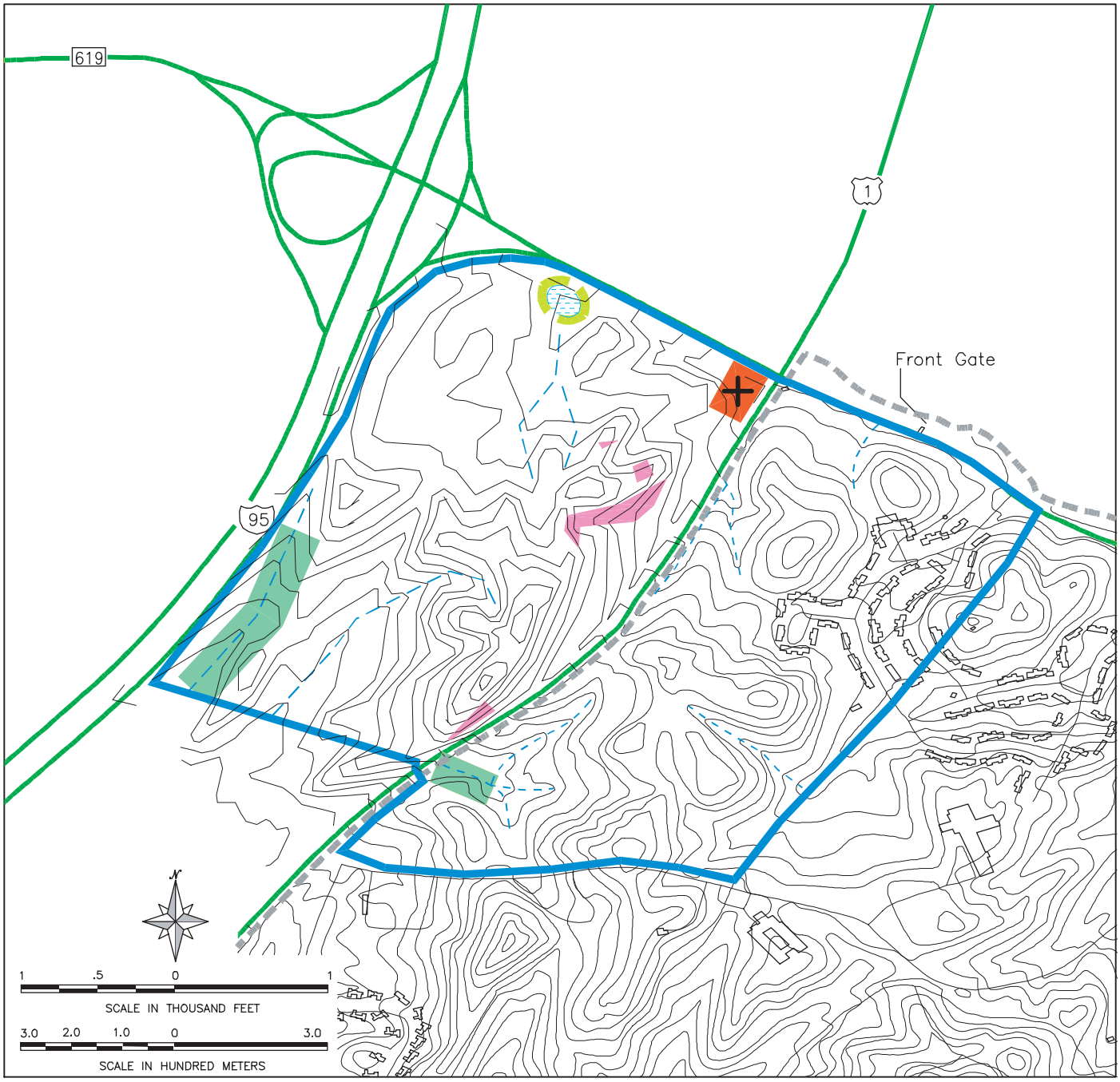
Figure 4-4
Combined Constraints
Locust Shade Park Site

Parsons Harland Bartholomew & Associates, Inc., Richmond VA, 2000.



Legend

- MCB Quantico Boundary
- Locust Shade Park Site Boundary
- Roads
- Area With Severe Building Limitations
- 100 Foot(31 meter) Intermittent Stream Buffer
- Approximate Wetland Boundaries
- 100 Foot(31 meter) Wetland Buffer
- Intermittent Streams
- Cemetery

Marine Corps Heritage Center
MCB Quantico, VA
Environmental Impact Statement

Figure 4-5
Combined Constraints
Northern Combined Site

Parsons Harland Bartholomew & Associates, Inc., Richmond VA, 2000.

Any increase in surface water runoff over that which occurs under present site conditions would be managed during and after construction through erosion control and stormwater management practices. Erosion and sediment control plans and stormwater management plans would be developed for each phase of construction in compliance with applicable federal and Virginia laws and regulations, and with appropriate agency coordination. Potential impacts to the receiving streams that carry stormwater from the sites to larger creeks and reservoirs would be mitigated such that the water quality downstream would not be significantly affected by either the construction or operation of the MCHC.

The impervious surfaces of the MCHC complex could cause some reduction in the amount of rainfall that would ultimately infiltrate to the groundwater and deeper aquifers, which are believed to recharge within the general vicinity. This proportional decrease in groundwater recharge would be very small given the limited area of impervious surface anticipated for the completed complex and the infiltration that would occur in stormwater management structures. Therefore, the impact of the proposed action on groundwater and aquifer recharge in the area is expected to be insignificant.

4.3 Aquatic and Terrestrial Environment

4.3.1 Wetlands Wetlands have been identified on four of the five alternative sites. Development at any of the alternative locations would consider potential impact to wetlands, as well as other constraints, in the siting and design of project components. Construction within wetland areas is typically avoided not only because of the ecological impact, but because it presents special design requirements and increases project costs. In some instances wetlands cannot be avoided, such as roadways and utility lines. Siting of the MCHC at any of the alternative locations in expected to have incidental and/or temporary impacts to wetland areas through the installation of utility lines and access roads to the selected site, and would involve compliance with applicable regulatory procedures. The project would include development and implementation of an Erosion and Sediment Control Plan and a Stormwater Management Plan, which are designed to control and mitigate potential impacts to off-site wetlands and downstream water quality from precipitation runoff from the project site.

4.3.1.1 Russell Road Site Development of the MCHC at this alternative location would avoid siting project components within the 34 acre (14 hectare) wetland and nearby one acre (0.4 hectare) pond and wetland located in the southwestern portion of this site.

4.3.1.2 Mainside South Site The five acre (2 hectare) wetland which lies in a drainage along the east-central boundary of the site could be affected by development of the MCHC. To accommodate the proposed facilities, grading and construction would likely occur to the north, west, and south of the wetland. A considerable area of the most developable part of the site slopes, and therefor drains toward the wetland. Erosion and sediment control and stormwater management could protect the wetland, but the protection structures would by necessity be positioned close to the outer edge of the wetland buffer.

4.3.1.3 Mainside North Site No wetlands occur on the Mainside North site.

4.3.1.4 Locust Shade Park Site The 0.4 acre (0.15 hectare) wetland at the northwestern corner of the Locust Shade Park site is located adjacent to the ROW of VA-619. It is unlikely that development of the MCHC would involve grading and excavation in that area because no access can be constructed along frontage due to the presence of the I-95 off-ramp. Also, new utility connections for the MCHC would approach from the eastern end of the VA-619 frontage as water, sewer, electrical, and gas lines are along US-1 and in the Triangle area.

4.3.1.5 Northern Combined Site The 0.4 acre (0.15 hectare) wetland at the northwestern corner of the site is adjacent to the ROW of VA-619. Development of the MCHC would not involve grading or construction in the vicinity of the wetland because access to the perimeter of the site at that point would be blocked by the presence of the I-95 off-ramp. New utility connections would be made with mains along US-1 and in the Triangle area, so all construction related to those services would be away from the wetland corner of the site.

4.3.2 Vegetation, Including Threatened and Endangered Species Construction of the MCHC on any of the five sites would impact up to 100 acres (40 hectares) of existing forest habitat, which is less than one-half of one percent of the existing forested area on base. In general, the development area would be converted to approximately five acres (2 hectares) of building coverage, 15 acres (6 hectares) of paving, and 80 acres (32 hectares) of lawns and landscaping.

4.3.2.1 Russell Road Site The survival of the two American chestnut trees on the Russell Road site trees is dependent upon stability in their immediate environment and not affected substantially by overall changes in the area. As long as the soil and drainage conditions immediately around the trees remains favorable, the main factor in their survival is likely to be their continued resistance to the chestnut blight fungus.

The four colonies of small whorled pogonia (*Isoteria medeoloides*) are located near the center of the Russell Road site (see Figure 4-1). The presence of these rare plants can be attributed to a unique combination of ecological conditions conducive to the survival of this species. The buffer area (USFWS Consultation Area) identified through coordination with the USFWS is intended to protect this habitat. Development of the MCHC at the Russell Road site would avoid siting any major structures within the buffer area identified for the small whorled pogonia. It may be necessary, however, to pass through the buffer area in order to install utility lines or improve access to the site. Should this be necessary, formal (section 7) consultation with the USFWS would be conducted to address specific concerns. This process is designed to facilitate project requirements with the least amount of impacts to affected species.

4.3.2.2 Mainside South, Mainside North, Locust Shade Park, and Northern Combined Sites

Construction of the MCHC complex within the Mainside South site, the Mainside North site, or the Locust Shade Park site would result in conversion of approximately 100 acres of existing forested uplands to buildings, paving, lawns, and landscaping. No federally-listed or threatened or endangered plant species are known to occupy the three sites

4.3.3 Wildlife, Including Threatened and Endangered Species

Development of the MCHC at any of the alternative locations would result in similar impacts to wildlife. Most of the larger and more mobile species would vacate the project when construction begins. A small number of these displaced individuals are not expected to survive. Species that cannot or do not move from areas of disturbance would most likely perish as a result of construction related activities. The proposed development would convert approximately 100 acres of forest habitat to a large open area of landscaped turf. Some species of wildlife within the area would continue to use areas along the edge of the developed site as well as areas of turf. Implementation of the proposed action is not expected to adversely impact bald eagles. The large open expanse and building perch sites may be used by birds of prey.

4.4 Air Quality

The EPA has promulgated numerous regulations designed to implement the provisions of the CAA. A key initiative of the implementation program is the requirement for SIPs, in which each state establishes goals to achieve clean air standards within a given time period. The SIP approach recognizes localized conditions and integrates community development plans with local regulations to achieve CAA goals.

The General Conformity Rule, established in 40 CFR, Part 93 and entitled "Determining Conformity of Federal Actions to State or Federal Implementation Plans" (the rule), serves as a guide for determining the level at which unregulated emissions could potentially affect the ability of the state to achieve and maintain the National Ambient Air Quality Standards (NAAQS). The rule applied to Federal actions located in areas of non-attainment of the NAAQS, and establishes thresholds for project related emissions of criteria pollutants. Threshold levels are based on the severity of pollution within a non-attainment area. The threshold level for the ozone precursor pollutants volatile organic compounds (VOC) and nitrogen oxides (NO_x) is 50 tons per year (tpy). Projects with annual emissions above the threshold must be coordinated with the state regulators to either include the project as part of the SIP or offset the anticipated increases. Projects with annual emissions below the threshold are not expected to impact attainment of CAA/SIP goals and therefore would not be subject to the Conformity Rule.

Air emissions associated with the MCHC project are not expected to differ as a result of project siting. An Applicability Analysis (AA) was prepared for the proposed action, in accordance with EPA and Navy guidance on the CAA and the General Conformity Rule, to identify the level of anticipated air emissions associated with construction and operation of the project. The results of this analysis are discussed below. The Applicability Analysis in Appendix E provides detailed information on project related emissions.

4.4.1 Construction Activities Emissions from construction activities would result from the use of heavy equipment and delivery vehicles during site preparation and structure erection. Heavy equipment emissions were estimated using emission rates from the EPA document *Compilation of Air Pollutant Emission Factors Volume II: Mobile Sources (AP-42)*. Emissions in pounds per hour of equipment use were averaged for nine classes of construction diesel equipment, multiplied by an assumed amount of equipment in use at the site and subsequently by an assumed number of operating hours per year. For calculation purposes, the following assumptions were used: 10 pieces of equipment would be in use daily, equipment would be in operation for eight hours a day, and the work year consisted of 240 days. It was also assumed that 20 delivery trips would be made daily.

Estimates for construction related emissions also include VOCs associated with painting of the structures. These VOC emissions were calculated based on the estimated amount of paint necessary to cover wall and ceiling space, and to paint vehicle parking space lines. Project Plans call for large open-space facilities for exhibits and smaller working spaces that would be partitions

rather than a large amount of interior walls that would require painting. Only a small portion of personnel would have individual offices.

Additional wall space would be included for closets, rest rooms, conference rooms and the like. Based on these assumptions, it is estimated that the total paintable wall space will be approximately 115,000 square feet (ft^2) (10,684 square meters).

Table 4-1. Construction Emissions Summary

Pollutant	Equipment	Paint Use	Total
VOC	1.624 tpy	6.95tpy	8.574 tpy
NO_x	24.743 tpy	--	24.743 tpy

tpy = tons per year

4.4.2 Operations Emissions Operation emission sources fall within two general categories: direct emissions and indirect emissions. Direct emissions from facility operation are considered to be those emitted by the facility as part of its normal daily functions, primarily from the operation of facility boilers. Indirect emissions are considered to be those emissions generated by employee vehicle trips, visitors and facility delivery vehicles traveling on the site.

Heat for the proposed structures would be supplied by a central gas fired boiler. It is expected that the MCHC complex will have a heat demand of 33,220 million British thermal units (Btu) per year. That size boiler would emit a 0.096 tpy of VOCs and 1.66 tpy of NO_x.

Operational demonstrations would occur about 12 times per year, and involve one to three pieces of equipment/aircraft. Equipment would be operated from one to two hours during each event. Air emissions associated with these operations would vary depending upon the type of aircraft/equipment involved and number of engines per vehicle. The projected annual air emissions associated with operational demonstrations are estimated to be 0.10 tpy for VOCs and 0.69 tpy for No_x.

<u>Vehicle Emissions</u> Daily vehicle emissions during operation were estimated for employee vehicle trips, on-site delivery vehicle travel, and total vehicle travel by visitors to the facility. The vehicle emissions rates used were based on rates calculated by using the MOBILE5 air modeling program which estimates emissions per vehicle mile traveled. The vehicle emission rates used were based on rates calculated by the EPA approved MOBILE5 vehicle emissions model. MOBILE5a calculates an average fleet emission rate in grams of pollutant per vehicle mile travels

(g/VMT). The results of the emissions analysis are summarized in Table 4.3. A complete listing of calculation estimates and results is contained in Appendix E. These results are annual emission levels and result primarily from the operation of motor vehicles. Initially air emissions would be generated from construction activities and change to operation type emissions and the various phases of construction are completed.

Table 4-2: Summary of Net Annual Emissions Increase

Pollutant	Museum Visitors	Employees	Conference Attendees	Operational Demonstrations	Heating Cooling	Total
VOC	6.23 tpy	0.49 tpy	1.87 tpy	0.10 tpy	0.096 tpy	8.79 tpy
NOx	9.16 tpy	0.72 tpy	2.76 tpy	0.69 tpy	1.66 tpy	14.99 tpy

tpy = tons per year

The annual rate of emissions for both construction and operation is well below threshold levels established in the Conformity regulations, and, therefore, is not expected to affect attainment of SIP goals or regional air quality significantly. Therefore, preparation of a conformity determination is not required.

Table 4-3: Summary of Annual Emissions and Comparison to *de minimis* Values

Pollutant	Construction	Operation	***De Minimis***
VOC	8.574 tpy	8.79 tpy	50 tpy
NO_x	24.743 tpy	14.99 tpy	50 tpy

tpy = tons per year

4.5 Noise and Explosive Safety

Anticipated noise generated by the proposed action would result from operation of construction equipment in preparing the site and in erection of the structures. Following construction, routine operations at the MCHC would generate traffic related noise. Operational noises at the new MCHC would also include activities such as military ceremonies and operational demonstrations. Ceremonial events are expected to occur monthly and to include activities such as band music and cannon salutes. Operational demonstrations are expected to occur less frequently and would involve the use of aircraft, wheeled and tracked vehicles, and tactical exercises. In general, these types of noise generating activities already occur at MCB Quantico and impacts to or from the MCHC are expected to be within the limits of ongoing operations. Noise generated by the MCHC

is expected to remain well within federal agency guidelines for noise as it relates to affecting adjacent land uses, which state that 70 dB(A) is acceptable for most administrative and professional activities, with a lower threshold of 65 dB(A) for certain specific activities, such as education, governmental services, and certain outdoor activities. Noise generated by high speed travel along major roadways within the project area is particularly evident at the Locust Shade Park site, and may interfere with outdoor ceremonies should the MCHC be sited at this location.

The threat of injury to MCHC complex workers and visitors from accidental detonation of the ASP was evaluated for each of the alternative sites. Development unrelated to the ASP is prohibited within the ESQD arc and subject to special design considerations outside it. A small portion of the western edge of the Russell Road site is within the ESQD arc of the ASP and would not be used for the MCHC complex. The Russell Road site is located in the proximity of but beyond (by approximately 1,000 feet, 305 meters) the ESQD safety zone. Accordingly, from an explosive safety viewpoint, personnel and facility exposures would be permitted in the proposed development area. However, substantially diminished air overpressure impacts (if any) and remote fragmentation possibilities from a worst case mishap should be considered in development scenarios should Russell Road be the selected Heritage Center site.

The closest part of the Mainside South site is more than one mile (1.6 kilometers) from the ESQD arc for the ASP. The Mainside North site, the Locust Shade Park site, and the Northern Combined site are more than two miles (3.2 kilometers) away. Therefore, these three sites are beyond the zone where special consideration for a potential blast would be needed in the design of the facility to limit risk of damage or injury.

4.6 Cultural Resources

The Phase I archaeological surveys conducted on the four alternative sites for the MCHC resulted in the identification of 23 archaeological sites; however, due to their lack of integrity and/or research potential, none of the sites are eligible for listing on the NRHP. Therefore, implementation of the proposed action at any of the alternate locations is not expected to result in adverse effects to cultural resources. The Russell Road site contains three small cemeteries, and plans that include development of the cemetery sites must provide for their protection or relocation. Sisson Cemetery is located within the northeast corner of the Locust Shade Park site, and is not expected to be included as part of the site that would be developed for the MCHC complex. Table 4-4 provides additional details on cultural resources at the alternate sites.

Table 4-4. NRHP Status of Archaeological Sites

Alternative	Area(Temp. No.)	Site No.	Site Type[1]	Time Period[2]	NRHPStatus[3]
Russell Road	Location 1	44ST257	P/H	A/W/19-20th	NE
Russell Road	Location 1	44ST299	P	Unknown	NE
Russell Road	Loc.1-Area 1	44ST361	P/H	Unk/19th c.	NE
Russell Road	Loc. 1-Area 2	44ST362	H	19th c.	NE
Russell Road	Loc. 1-Area 3	44ST363	H	early-19th c.	NE
Russell Road	Loc. 1-Area 7	44ST367	P	Unknown	NE
Russell Road	Loc. 1-Area 8	44ST368	P	Unknown	NE
Mainside South	D (D-1)	44ST375	P	Unknown	NE
Mainside South	D (D-2)	44ST376	P	Unknown	NE
Mainside South	D (D-3)	44ST374	P	Unknown	NE
Mainside South	E (E-1)	44ST377	H	early-20th c.	NE
Mainside South	E (E-2)	44ST378	P	Archaic	NE
Mainside South	G (G-1)	44ST379	P	Unknown	NE
Mainside North	A (A-1)	44PW1001	P	Unknown	NE
Mainside North	B (B-1)	44PW1002	P	Unknown	NE
Mainside North	C (C-1)	44PW1003	P	Late Archaic	NE
Locust Park	H (H-1)	44PW1042	H/Cemetery	early19/late20th c.	NE
Locust Park	I (I-1)	44PW1043	H	1st qtr 20th c.	NE
Locust Park	J (J-1)	44PW1045	P	Unknown	NE
Locust Park	K (K-1)	44PW1048	P	Unknown	NE
Locust Park	M (M-1)	44PW1047	P	Unknown	NE
Locust Park	N (N-1)	44PW1046	P	Unknown	NE
Locust Park	O (O-1)	44PW1044	H	Unknown	NE

1 P=Prehistoric; H=Historic; P/H=Prehistoric and Historic
2 A=Archaic; W=Woodland; Unk=Unkonwn Prehistoric
3 NE=Not Eligible

Under the No-Action Alternative, the MCHMD would continue to operate out of existing facilities at the WNY and MCB Quantico. These facilities are seriously overcrowded, afford minimal protection for collection material, and provide only limited space for presentation of exhibits and access to archival information. Implementation of the No Action Alternative would significantly affect the ability of the MCHMD to perform its mission by restricting development of enhanced museum facilities to protect and exhibit historical collections, and by limiting its ability to better serve patrons, or improve its operational efficiency and capabilities.

4.7 Land Use, Zoning, and Aesthetics

This section analyzes the impacts to land use resources resulting from the proposed action. Land use at the alternative sites would change from passive recreation, training, family housing, and or open space to developed institutional and recreation land use. The MCHC is expected to draw visitors to the general area, which may encourage additional economic and commercial growth on private land along the US-1 corridor in the immediate vicinity of the project site, and the general area. This development would occur in accordance with the corresponding county and town land use and zoning guidelines. The MCHC would enhance and diversify the recreational and educational opportunities within the general area. Because of the design concept, the visual impact of the MCHC would be limited and would not negatively impact adjacent land. The MCHC would be designed to be aesthetically pleasing, and the design would be in accordance with the MCB Quantico Base Exterior Architecture Plan.

4.7.1 Russell Road Site Implementation of the proposed action at the Russell Road site would be consistent with base land use management plans. Existing land use would change from training, outdoor recreation, and timber production to developed institutional and recreation land use. Several small wooden buildings, which include Building 27007 Natural Resources offices and Building 5-9 a game check station, would be demolished. A small number of personnel that occupy these facilities would be relocated to other facilities at the installation. Hunting within the Russell Road site would be discontinued. The MCHC would be separated from off-base land uses by I-95 and would have no direct impacts to off- land use. Indirectly, the additional visitors to the area generated by the MCHC would probably result in additional economic and commercial activity in the surrounding communities.

4.7.2 Mainside South Site The Mainside South site has been considered as appropriate for a variety of future uses. Development of the MCHC in this area would be appropriate. Existing land use would change from undeveloped/passive recreation/open space to developed as institutional and recreation land use. Siting the MCHC at this site is not expected to impact on-base land uses to the east and would be compatible with the field training that occurs there. The MCHC is not expected to impact off-base land uses to the west and would be compatible with those land uses. Indirectly, the additional visitors to the area generated by the MCHC would probably result in additional economic and commercial activity in the adjacent areas to the west. The large electrical towers along the eastern side of the site would detract visually from the site and could present a potential safety hazard to operational demonstrations involving the use of helicopters.

4.7.3 Mainside North Site The Mainside North site has been considered as appropriate for a variety of future uses. Development of the MCHC on this site would be consistent with current planning for the area. Existing land use would change from community facility and family housing to developed institutional and recreation land use. Siting the MCHC at this site would result in the ultimate demolition of enlisted family housing units at Thomason Park to accommodate later phases of MCHC development. The MCHC at this site would be compatible with the existing uses to the south and east of the site. The MCHC is not expected to impact off-base land uses to the west and north (open space and community facilities). Indirectly, the additional visitors to the area generated by the MCHC would probably result in additional economic and commercial activity within the commercial area of the Triangle, to the north along US-1.

4.7.4 Locust Shade Park Site The Locust Shade Park site is an undeveloped portion of a Prince William County outdoor recreation area. The County identified the site as an alternative location for the MCHC during public scoping for the EIS. Development at this location would change use from undeveloped recreation and open space to developed recreation/museum. In order to use the property for the MCHC, a real estate agreement (sale, donation, and/or lease) between Prince William County and the Marine Corps would be required.

4.7.5 Northern Combined Site Use of the Northern Combined site for the MCHC would involve development of only a portion of the area to the east of US-1. Therefore, only part of the area currently designated for community facility and family housing would be changed to institutional and recreation use. The Thomason Park family housing area would remain at its present site. Part of the area west of US-1 would change from undeveloped recreation and open space to developed recreation/museum use following execution of a real estate agreement between Prince William County and the Marine Corps.

4.8 Traffic

A detailed traffic assessment was conducted as part of the EIS to analyze the impacts of increased vehicle numbers during peak commuter periods at affected intersections within the project area (Appendix F). This section of the EIS summarizes the anticipated impacts to local traffic that are expected to result upon full operation of the MCHC in 2015. Anticipated impacts are based upon projected increases in traffic volume from both regional growth (no action) and operation of the MCHC. The increases in vehicle numbers for the MCHC are expected to be the same, regardless of project siting. Vehicle numbers associated with operation of the MCHC would include visitors, conference center attendees, and staff. The number of expected visitors was derived from a

market analysis prepared to study the feasibility of developing the MCHC. The level of staffing was based on a concept study and organizational structure projection for the MCHC. These numbers are proportionally distributed among the affected intersections in consideration of the anticipated timing and direction of travel. The proposed action would include minor roadway improvements, such as turn lanes and/or acceleration/deceleration lanes, to accommodate immediate access to the MCHC complex at each alternative site. These improvements are expected to mitigate potential traffic impacts within the immediate vicinity of the proposed MCHC associated with entering and leaving the facility complex. Detailed information on the traffic analysis can be found in Figures 4-6 through 4-10 and Tables 4-5 and 4-6.

4.8.1 Year 2015 (No Action/Background Growth) The analysis of impacts to local traffic indicates that the projected increase in vehicle numbers associated with regional growth by the year 2015 would substantially degrade the level of service (LOS) for three intersections within the project area. They include Russell Road at I-95 southbound on- and off-ramps, Russell Road at I-95 northbound off-ramp, and the intersection of US-1 and VA-610. The expected increase in vehicle numbers due to regional growth is anticipated to impede traffic flows at these intersections.

4.8.2 Year 2015 (Background Growth Plus the Proposed Action) Development of the MCHC is expected to increase vehicle numbers within the project area above the levels identified for regional development. The projected impacts to LOS for area intersections are expected to vary by alternative.

4.8.2.1 Russell Road Site Locating the MCHC at the Russell Road site is expected to cause additional delays at the Russell Road at I-95 southbound on- and off-ramps and the intersection of US-1 and VA-610. In addition, a significant deterioration in the LOS for the Russell road at I-95 northbound on-ramp is also expected to occur. Anticipated impacts to other area intersections resulting from siting of the MCHC at Russell Road are not expected to significantly change from the LOS identified for regional growth (see Figure 4-6).

4.8.2.2 Mainside South Site The anticipated impacts to traffic from development of the MCHC at the Mainside South site are unacceptable and are expected to further degrade the LOS for the Russell Road at I-95 southbound on- and off-ramps, the Russell Road at I-95 northbound off-ramp and the intersection of US-1 and VA-610 (see Figure 4-7). The LOS for Russell Road I-95 northbound on-ramp and the intersection of US-1 and VA-637 would also degrade, but not to unacceptable levels.

4.8.2.3 Mainside North, Locust Shade Park and Northern Combined Sites The number of vehicles added to roadways within the project area during the AM and PM peak commuter periods as a result of siting the MCHC at the Mainside North, Locust Shade Park or Northern Combined site is not expected to significantly change the LOS for area intersections from levels predicted to occur as a result of regional growth (see Figures 4-8, 4-9, and 4-10).

Table 4-5. Site Generated Trips

Type	AM Peak Hour	PM Peak Hour
Employees	73	73
Museum Visitors	0	57
Conference Center Visitors	250	250
Total Trips	323	380

To/From	Percent	
Quantico	10%	(5% on VA 619, 5% on Russell Rd.)
Manassas	5%	(3% on VA 619, 2% on VA 610)
Richmond	15%	(10% on I-95, 5% on US-1)
Washington, DC	70%	(65% on I-95, 5% on US-1)

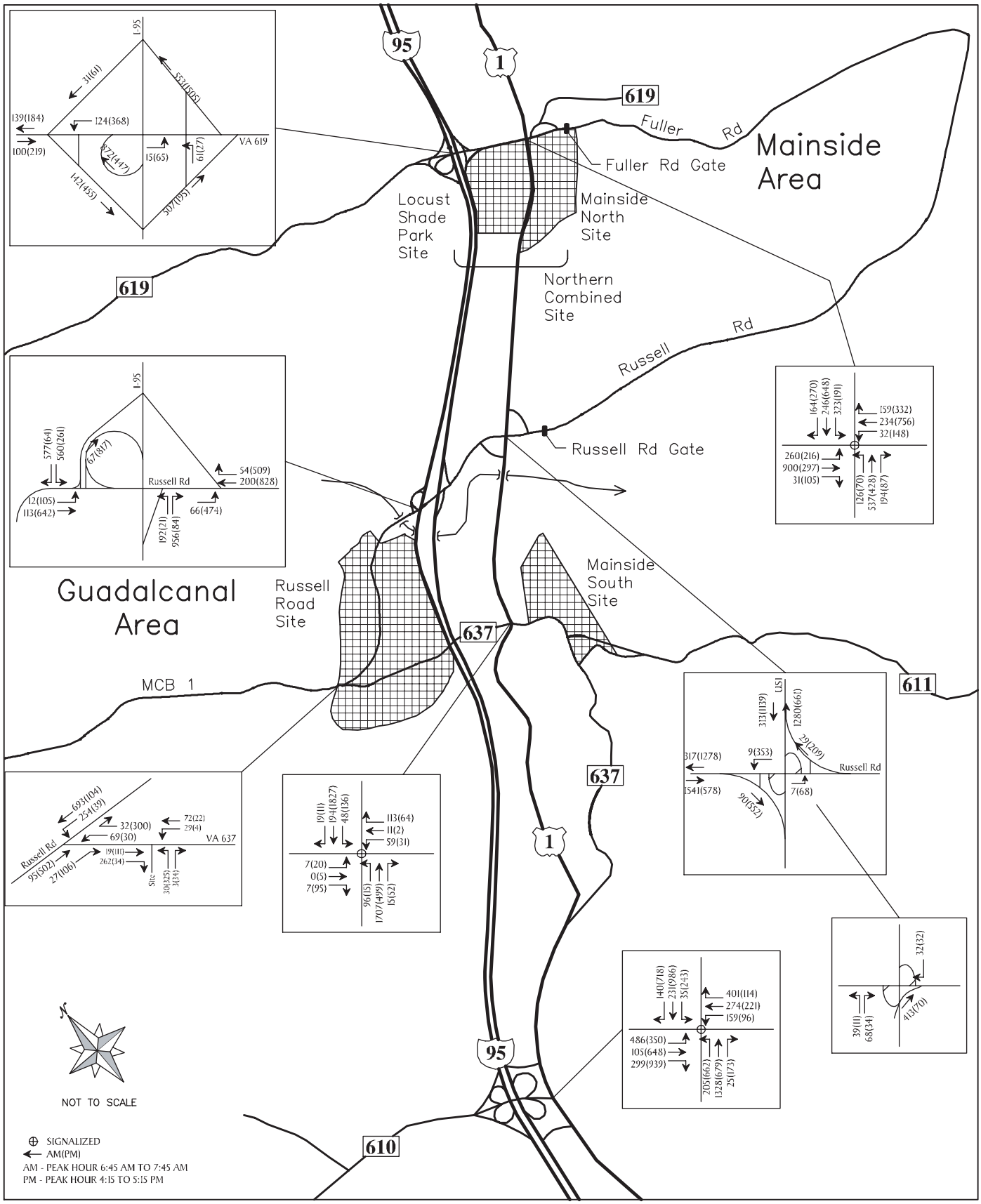
4.8.3 Improvements Anticipated by Year 2015 (No Action) Vehicle numbers have been and are expected to continue to increase on roadways within the project area as a result of regional growth. At the same time, various improvements have been planned and are expected to be in place by the year 2015 (see below). The predicted LOSs for background growth identified on Table 4-6 were developed in consideration of these changes, but do not reflect traffic associated with the proposed MCHC.

1. US-1 would be widened to 6-lanes from the Stafford County line to north of study area. (As proposed in VDOT's US-1 Corridor Study)

2. The Fuller Heights Road (VA 619) and Fuller Road (VA 619) intersection would be relocated or improved. (As proposed in VDOT's US-1 Corridor Study)

3. The interchange at US-1 and Russell Road would be redesigned to incorporate two through lanes on Russell Road and free-flowing movements from northbound to eastbound, northbound to westbound, southbound to eastbound and eastbound to southbound. (As proposed in VDOT's US-1 Corridor Study)

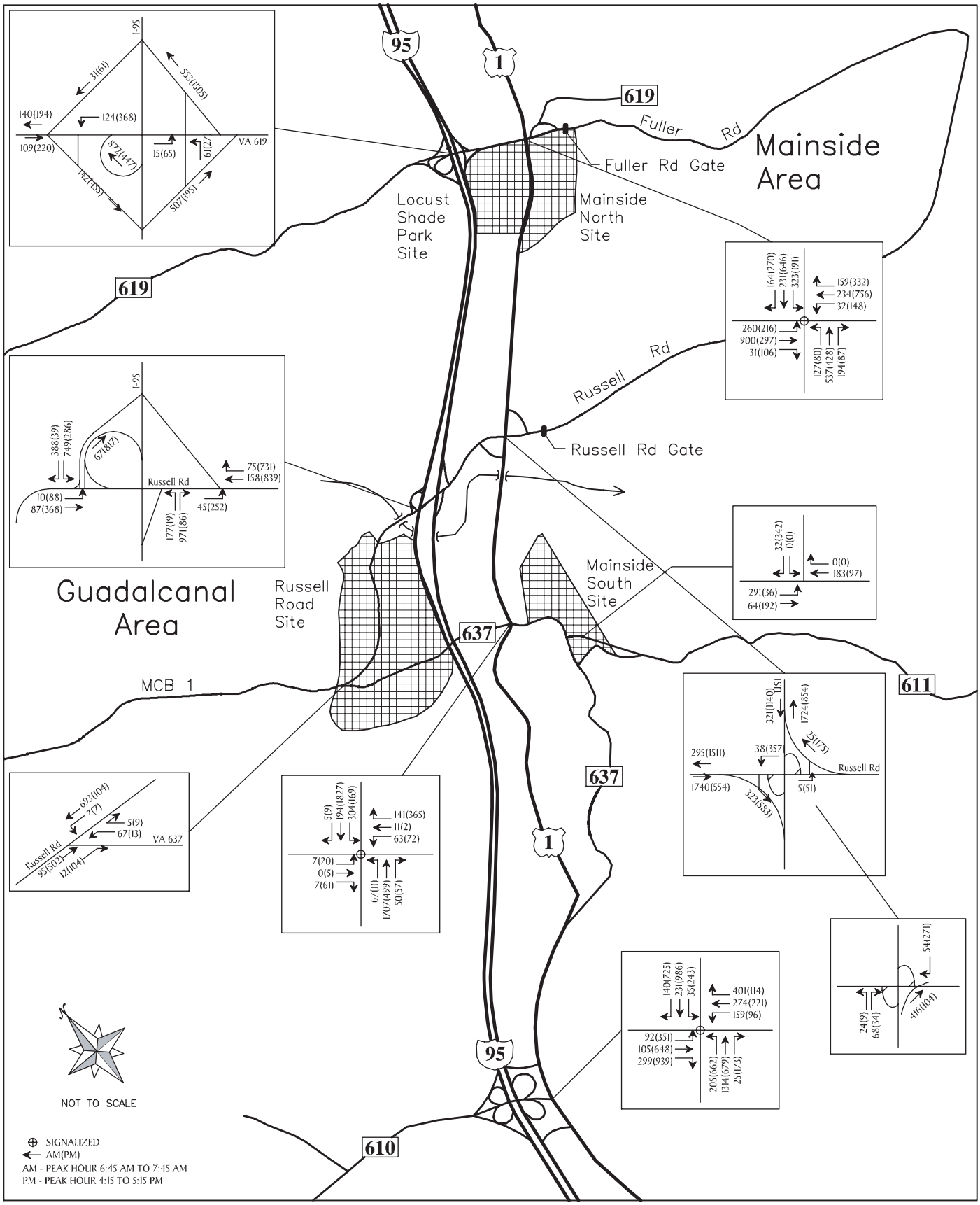
4. Construction of an 800-foot acceleration lane on Russell Road from the I-95 northbound off ramp (which is expected to be completed by December of 1999).



Marine Corps Heritage Center
MCB Quantico, VA
Environmental Impact Statement

Figure 4-6
Russell Road Site
Total Peak Hour Volume (2015)

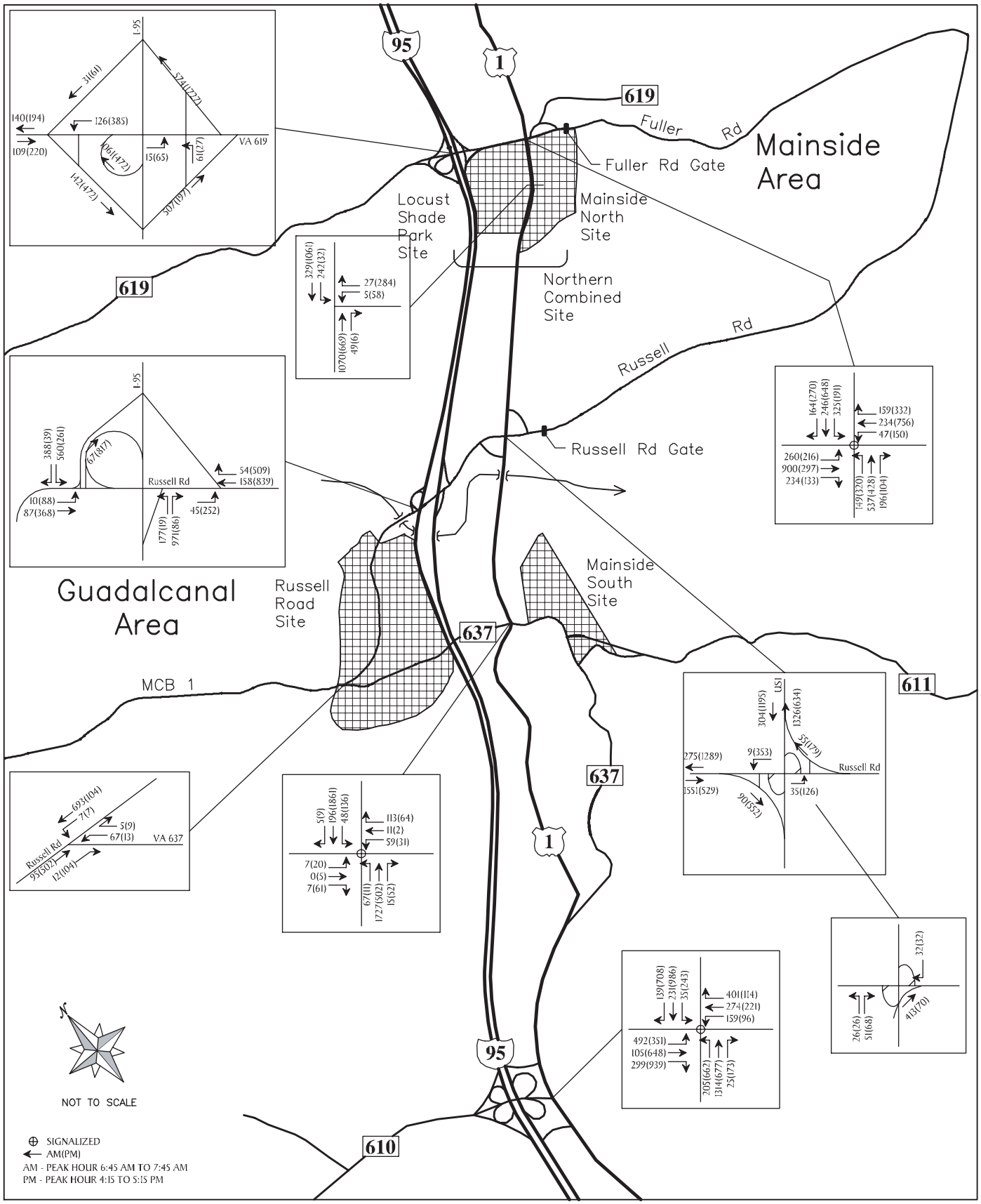
Parsons Harland Bartholomew & Associates, Inc., Richmond VA, 2000.



Marine Corps Heritage Center
MCB, Quantico, VA
Environmental Impact Statement

Figure 4-7
Mainside South Site
Total Peak Hour Volume (2015)

Parsons Harland Bartholomew & Associates, Inc., Richmond VA, 1999.



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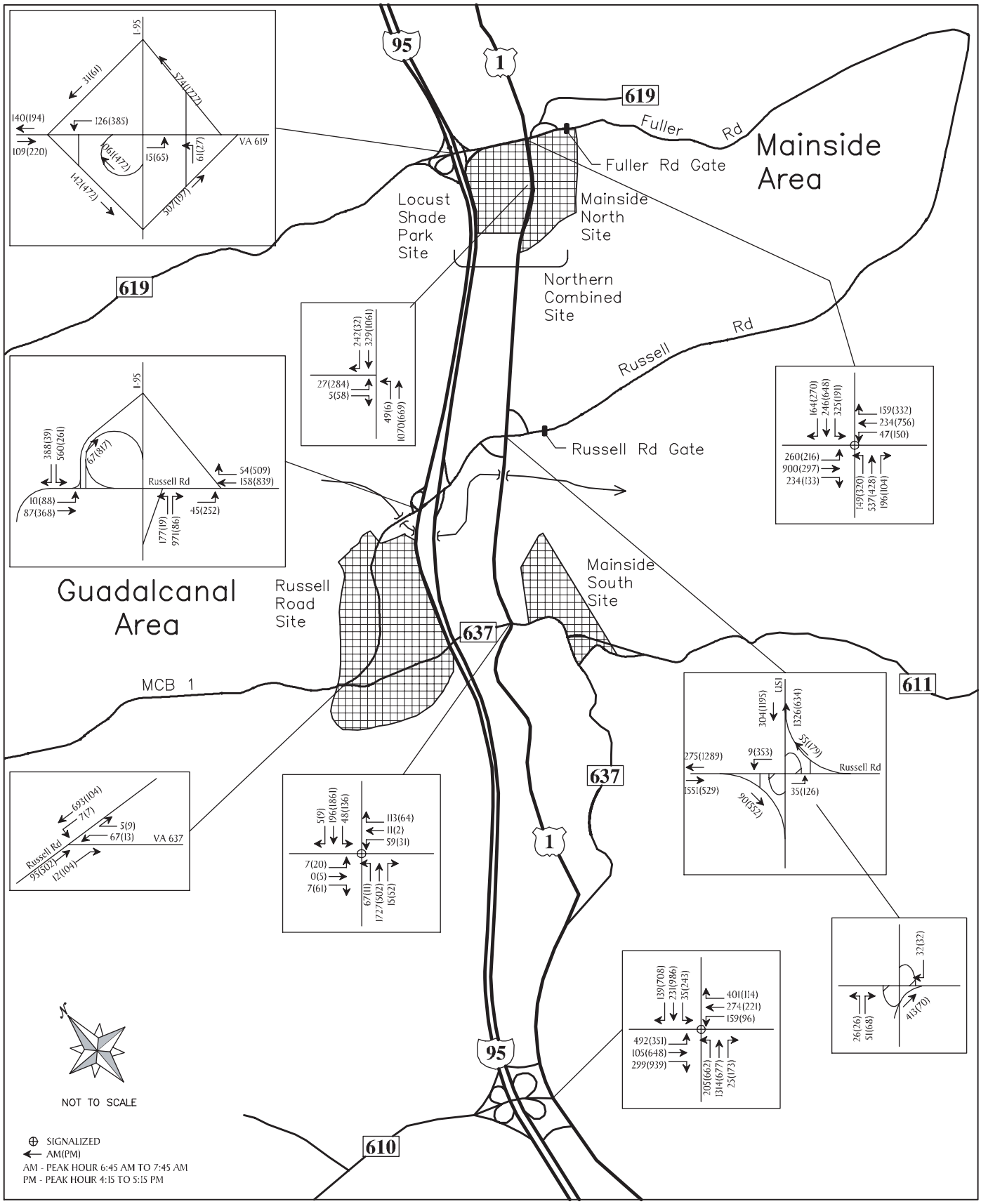
Environmental Impact Statement

Figure 4-8
Mainside North Site
Total Peak Hour Volume (2015)

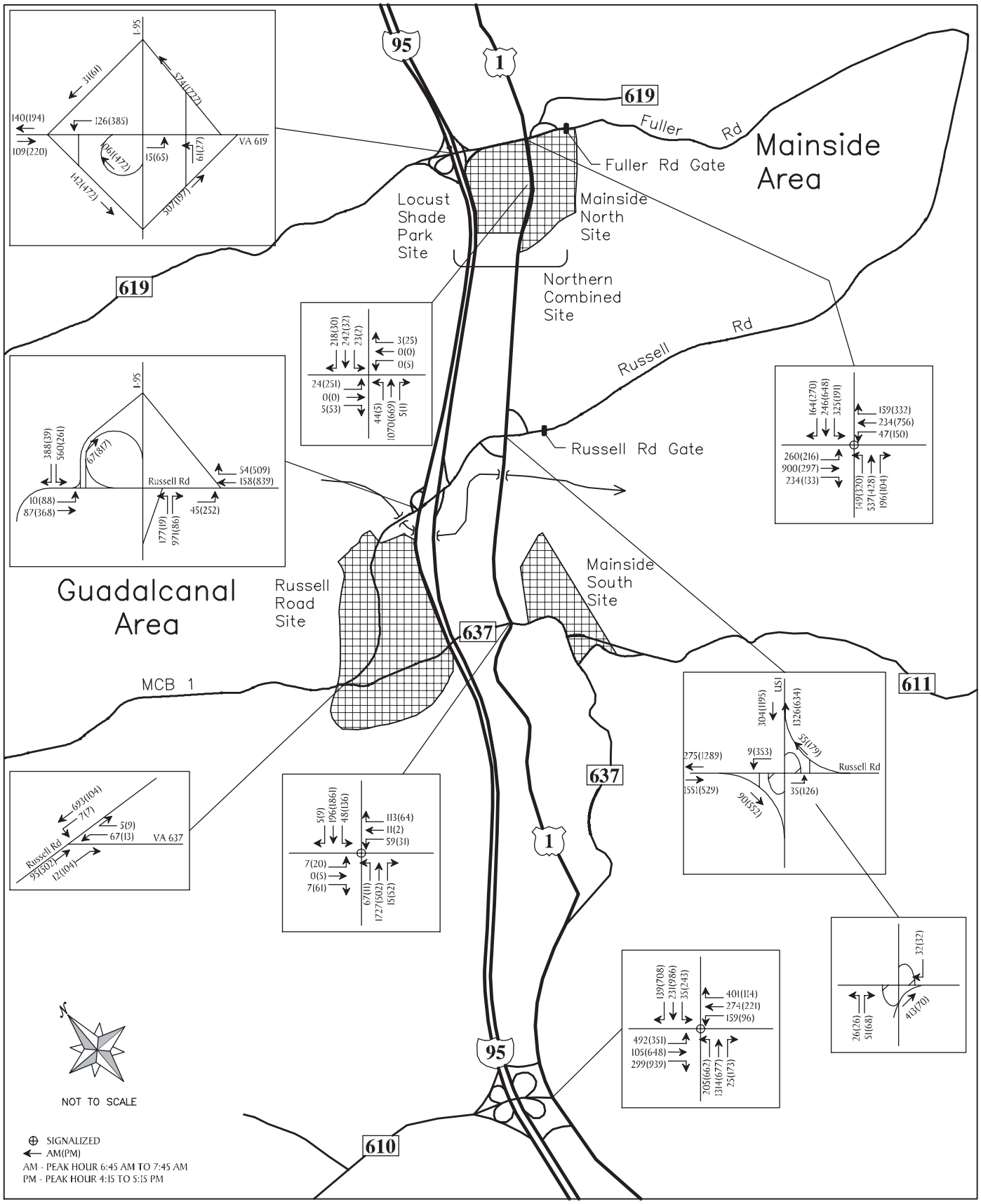
Parsons Harland Bartholomew & Associates, Inc., Richmond VA, 2000.



Marine Corps Heritage Center
MCB Quantico, VA
Environmental Impact Statement

Figure 4-9
Locust Shade Park Site
Total Peak Hour Volume (2015)

Parsons Harland Bartholomew & Associates, Inc., Richmond VA, 2000.



Marine Corps Heritage Center
MCB Quantico, VA
Environmental Impact Statement

Figure 4-10
Northern Combined Site
Total Peak Hour Volume (2015)

Parsons Harland Bartholomew & Associates, Inc., Richmond VA, 2000.

Table 4-6. Summary of Alternative Condition Capacity Analyses Results

Intersection	Without Proposed Action		Mainside North		Mainside South		Russell Road		Locust Shade Park		Northern Combined	
	AM Peak Hour LOS/ Delay	PM Peak Hour LOS/ Delay	AM Peak Hour LOS/ Delay	PM Peak Hour LOS/ Delay	AM Peak Hour LOS/ Delay	PM Peak Hour LOS/ Delay	AM Peak Hour LOS/ Delay	PM Peak Hour LOS/ Delay	AM Peak Hour LOS/ Delay	PM Peak Hour LOS/ Delay	AM Peak Hour LOS/ Delay	PM Peak Hour LOS/ Delay
1. VA 619 at I-95 SB On-Ramp (U)	A/1.0	A/2.0	A/1.0	A/2.1	A/1.0	A/2.0	A/1.0	A/2.0	A/1.0	A/2.1	A/1.0	A/2.1
2. VA 619 at I-95 NB On-Ramp and Off-Ramp (U)	A/1.1	A/0.3	A/1.7	A/0.3	A/1.0	A/0.4	A/1.1	A/0.3	A/1.7	A/0.3	A/1.7	A/0.3
3. Russell Road at I-95 SB On-Ramp and Off- Ramp (U)	F/165.1	A/3.8	F/164.8	A/3.8	F/286.8	A/4.7	F/293.0	C/14.1	F/164.8	A/3.8	F/164.8	A/3.8
4. Russell Road at I-95 NB Off-Ramp (U)	F/189.5	A/0.7	F/189.5	A/0.7	F/271.2	A/1.0	F/188.2	A/1.0	F/189.5	A/0.7	F/189.5	A/0.7
5. Russell Road at I-95 NB On-Ramp (U)	A/0.1	A/0.1	A/4.7	A/5.0	A/0.1	C/11.0	A/0.1	F/53.0	A/4.7	B/5.0	A/4.7	B/5.0
6. Russell Road and VA 637 and MCB-1 (U)	A/1.1	A/0.3	A/1.1	A/0.3	A/1.1	A/0.3	A/3.6	A/4.2	A/1.1	A/0.3	A/1.1	A/0.3
7. Russell Road at US-1 SB On-Ramp and Off-Ramp (U)	A/1.6	A/1.2	A/1.7	A/2.9	A/1.8	A/1.3	A/2.4	A/1.5	A/1.7	A/2.9	A/1.7	A/2.9
8. Russell Road at US-1 NB On-Ramp and Off-Ramp (U)	A/0.1	A/0.7	A/0.1	A/0.7	A/0.1	A/2.4	A/0.1	A/0.9	A/0.1	A/0.7	A/0.1	A/0.7
9. US-1 and VA 619 and Fuller Road (S)	D/28.2	D/31.9	D/29.5	D/33.3	D/28.2	C/21.9	D/28.3	C/21.3	D/29.5	D/33.3	D/29.5	D/33.3
10. US-1 and VA 637 (S)	B/9.8	B/7.6	B/10.2	B/10.5	C/19.2	D/27.0	B/10.0	B/6.80	B/10.2	B/10.5	B/10.2	B/10.5
11. US-1 and VA 610 (S)	D/33.1	*	D/34.0	*	D/34.0	*	D/34.5	*	D/34.0	*	D/34.0	*
12. Entrance to Mainside North Site (along US-1) (S)	-	-	A/4.5	A/7.5	-	-	-	-	-	-	-	-
13. Entrance to Mainside South Site (along VA 637) (U)	-	-	-	-	A/2.5	A/2.3	-	-	-	-	-	-
14. Entrance to Russell Road Site (along VA 637) (U)	-	-	-	-	-	-	A/0.5	A/4.6	-	-	-	-
15. Entrance to Locust Shade Park Site (along US-1) (S)	-	-	-	-	-	-	-	-	B/8.6	B/14.4	-	-
16. Entrance to Northern Combined Site (along US-1) (S)	-	-	-	-	-	-	-	-	-	-	B/8.4	B/14.9

(S) - Signalized
(U) - Unsignalized
LOS - Level of Service
A-F - A (unobstructed conditions) - F (jammed conditions)
* - LOS F with excessive delays

The following improvements are recommended to offset the effects of anticipated increases in area traffic due to regional growth by 2015. These improvements, or similar ones, will be necessary to achieve an acceptable LOS ("D" or better) for the conditions analyzed in the Transportation Assessment. The actual improvements that may be implemented by 2015 to offset the increases in background traffic will be decided upon and programmed by specific local, state, and federal agencies. The environmental impacts anticipated from those improvements would be addressed in separate NEPA documentation as appropriate.

1. The intersection of VA 610 and US-1 will require signal-timing modification; the eastbound through lane to be changed to a shared left/through lane and the construction of an acceptance lane for the eastbound right turn movement (to allow for right-turns-on-red).

2. Russell Road requires two through lanes in each direction between the existing I-95 southbound on-ramp through the Russell Road entrance gate.

3. The I-95 and Russell Road ramp configuration should be redesigned to a cloverleaf configuration. At a minimum, free-flowing movements from northbound to eastbound, northbound to westbound, southbound to westbound and eastbound and westbound to northbound and eastbound to northbound are required. The existing westbound to southbound and eastbound to southbound ramp is sufficient to accommodate background and alternative conditions.

The aforementioned improvements will provide adequate traffic capacity along the Russell Road corridor up to the Russell Road gate entrance. The MCB should consider relocating the gate to the east to allow additional distance between the US-1 off-ramps. The preferred distance could be determined by performing studies, during various levels of threat condition (THREATCON), to determine the average length of time it takes to secure vehicles and the anticipated queue lengths for the prevailing conditions. This could also help determine if a pull-off area and a building facility designed to issue permits would be beneficial. The study should be conducted concurrently at both gates, so the results are not skewed.

4.8.4 Improvements Anticipated by Year 2015 (With the Proposed Action)

Additional improvements that are necessary for the individual sites are summarized below:

4.8.4.1 Russell Road Site

1. Re-alignment of the MCB-1 and Russell Road intersection to improve sight distance. The improvement would incorporate a southbound left-turn lane, a northbound right-turn lane and westbound separate left- and right-turn lanes.

2. The Transportation Assessment assumed the Russell Road site would have a driveway at an unsignalized intersection on MCB-1, east of its intersection with Russell Road. The intersection would have a deceleration and acceleration lanes and separate outbound lanes to meet design standards. A review of the traffic volumes indicates that if a driveway is located on Russell Road, rather than MCB-1, a unsignalized intersection would be sufficient, but a left turn lane into the site would be necessary.

3. The addition of an eastbound right turn lane at the intersection of US-1 and VA 637 would be beneficial but is not necessary to maintain an acceptable level of service.

4. The intersection of MCB-1 and Russell road should be realigned to meet VDOT sight distance criteria.

5. Russell Road provides access to military ammunition facilities and is used to transport other explosives. The design of the public access areas and the roadways should adhere to the United States Department of Transportation requirements for routes used to transport explosives.

4.8.4.2 Mainside South Site

1. The Mainside South site would have access at an unsignalized intersection on VA 637, east of the US-1 and VA-637 intersection. An eastbound left lane and westbound deceleration and acceleration lanes would be required to meet design standards.

2. Realignment of the eastern approach of the US-1 and VA 637 intersection to improve angle of approach and the right turn movement is an improvement that would be beneficial.

3. VA 637, between US-1 and the proposed driveway, is a narrow winding road with no shoulders. Safety modifications to improve the roadway to meet current design standards would be beneficial. (This improvement is currently funded for in VDOT's capital improvement/maintenance program.)

4.8.4.3 Mainside North Site

1. The Mainside North site would require a signalized intersection on US-1 with separate left and right turning lanes.

2. A full access driveway at Fuller Road between US-1 and the MBC gate is not recommended without a study of the proposed relocation of the VA 619 intersection. A driveway at this location may impede anticipated traffic flow along Fuller Road. A partial eastbound, right-in and right-out driveway may be acceptable.

4.8.4.4 Locust Shade Park Site

1. The Locust Shade Park site would require a signalized intersection on US-1 with separate left and right turning lanes.

2. Access to the Locust Shade Park site along VA 619 is not recommended without additional study of the weave movements and distances between adjacent intersections and exit ramps.

4.8.4.5 Northern Combined Site

1. The Locust Shade Park site would require a signalized intersection on US-1 with separate left and right turning lanes.

2. A full access driveway at Fuller Road between US-1 and the MBC gate is not recommended without a study of the proposed relocation of the VA 619 intersection. A driveway at this location may impede anticipated traffic flow along Fuller Road. A partial eastbound, right-in and right-out driveway may be acceptable.

3. Access to the Locust Shade Park site along VA 619 is not recommended without additional study of the weave movements and distances between adjacent intersections and exit ramps.

Improvements required for an acceptable level of service in year 2015 for traffic conditions with and without the proposed action are shown in Table 4-7.

The planned public transportation improvements anticipated by the year 2015 are primarily focused on improving commuter peak hour service (towards Washington D.C. in the morning and towards the Quantico area in the afternoon). No adjustments have been made to the traffic analyses for these improvements since the site-oriented traffic is primarily in the nonpeak

direction. However, it would be beneficial to work with public transportation agencies to provide service to the proposed Heritage Center.

Table 4-7. Summary of Roadway Improvements Required for Acceptable LOS by Alternative for Year 2015 Traffic Conditions

	No Action	Alternative Sites				
Improvement		Mainside North	Mainside South	Russell Road	Locust Shade Park	Northern Combined
US-1 - improved to 6-lanes from Stafford County Line to north[1]	Yes	Yes	Yes	Yes	Yes	Yes
US-1 and Russell Road Interchange - re-design[1]	Yes	Yes	Yes	Yes	Yes	Yes
US-1 and VA 619 - addition of NB right lane[1]	Yes	Yes	Yes	Yes	Yes	Yes
US-1 and VA 610 - construction of acceptance lane for right-turn on-red from eastbound approach, lane re-configurations and signal timing changes	Yes	Yes	Yes	Yes	Yes	Yes
Russell Road - widened to two through lanes in each direction[1]	Yes	Yes	Yes	Yes	Yes	Yes
I-95 and Russell Road Interchange - re-design	Yes	Yes	Yes	Yes	Yes	Yes
Signalized driveway on US-1	No	Yes	No	No	Yes	Yes
Acceleration/Deceleration lanes at driveway	No	Yes	Yes	Yes	Yes	Yes
Left turn lane entering driveway	No	Yes	Yes	Yes	Yes	Yes
Re-align MCB-1 and Russell Road Intersection	No	No	No	Yes	No	No
VA 637 safety upgrades (between driveway and US1) and possible re-alignment of westbound approach	No	No	No[2]	No[2]	No	No
VA 637 and US-1 addition of EB right turn lane	No	No	No[2]	No[2]	No	No

1 - As proposed by VDOT's US-1 Corridor Study
2 - Not required for acceptable LOS, but highly recommended to mitigate potential safety hazards and traffic conflicts.

Market studies performed for other museums indicate improved public transit increases the attendance at national museums. Some considerations for improving public transit are:

1. Coordinate with the Virginia Rail Express, Amtrak, and Potomac and Rappahannock Transportation Commission (PRTC) Omni-Link to provide service during the peak arrivals and departures. On-call service to and from local hotels could be a viable option.

2. Incorporate a pedestrian and bicycle trail along the length of US-1 at the Mainside North site to parallel the proposed trail on the west side of US-1. Provide a similar trail along the length of Russell Road.

3. Incorporate a park and ride lot into the site to promote public transit to the site and advertise the site to local commuters.

4. Expand the USMC shuttle bus service between Quantico and the USMC Headquarters in Alexandria to the site and encourage military conference attendees to use the provided services.

5. Expand the Base Motor Transport shuttle to provide service between the site and the MCB lodging facilities.

The analysis indicates that major improvements will be required to obtain or maintain an acceptable level of service by the year 2015. These improvements will be required even if the proposed action is not implemented. The analysis indicates that if the improvements are made they will be able to maintain an acceptable level of service if the proposed action is implement.

The analysis also indicates that certain site-related roadway improvements will be required at all of the sites. These improvements include acceleration, deceleration and left, inbound turn lanes. The Mainside North and Locust Shade Park sites would require signalized intersections. The Russell Road site would benefit from the re-alignment of the Russell Road and MCB-1 intersection and the addition of a right turn lane at the US-1 and VA 637 intersection. The Mainside South site would operate more efficiently with improvements to VA 637 and its westbound approach at the intersection with US-1.

4.9 Infrastructure and Utilities

Utility services for the MCHC could be provided by locally available utility systems. Service lines would be installed from trunk lines located within the general area. Visitors to the MCHC are expected to vary between 1,133 and 2,266 persons per day. The level of required service, identified in Table 4-8, is within the capabilities of the providers to deliver.

Table 4.8 Utility Demand Levels		
Utility	**Usage**	**Unit**
Electricity	824,100	kilowatt hours per year
Domestic Water Flow	9,350	gallons per day, average
	15,700	gallons per day, peak
Fire Fighting Water	8,000	gallons per minute
Fire Storage Capacity	3,300,000	gallons
Wastewater Discharge	7,480	gallons per day, average
	12,560	gallons per day, peak
Natural Gas	33,200	million BTU per year

To provide utility services to each of the alternative sites, various pumps, storage tanks, valves, and connection vaults would be required. The number and locations of these items and the exact lengths of service lines connections to existing trunk lines would be determined during the design of the MCHC. Utility services required for the MCHC would be the same for each of the five alternative sites. Branch lines to the Russell Road site are expected to be longer than those required to connect to the other four sites. Routing of utility lines to the selected site is expected to occur along existing rights-of-way, easements, or roadways. The resulting impacts form installation of the utility services would be minor or temporary for any of the alternative sites.

4.10 Socioeconomics

Significance of population and expenditure impacts are assessed in terms of their direct effects on the local economy and related effects on other socioeconomic resources (e.g., housing). The magnitude of potential impacts can vary greatly depending on the location of a proposed action; for example, implementation of an action that creates 20 employment positions may be unnoticed in an urban area but may have significant impacts in a more rural region. If potential socioeconomic impacts would result in substantial shifts in population trends, or adversely affect regional spending and earning patterns, they would be significant.

The affect of the proposed action on the existing social and economic conditions/environment in the area have been analyzed using the Economic Information Forecasting System (EIFS). The EIFS includes data relating to the region of economic influence (Stafford and Prince William counties), the dollar value of construction expenditures, and the numbers of military families and personnel moving into the area (see Appendix G). Given the geographic proximity of the alternative sites

and the methodology of the EIFS, the anticipated economic impact of the MCHC on the region is expected to be the same regardless of the alternative selected.

The outputs for the model express $4,440,000 in sales volume attributed to direct and indirect sales which result from the project construction. The output also reflects 19 persons in direct employment created in the private sector from project construction. The direct personal income generated from project construction is anticipated at $321,000. Because most of the construction will be done by companies and personnel already living in the area, no increase in the numbers of school children is anticipated as a result of construction workers and other employees directly associated with the construction of the project. The demands for rental and owner-occupied housing is not expected to increase as a result of the construction.

Subsequent annual operations of the project and resulting annual economic impacts are determined using the EIFS Operation and Maintenance Model which uses inputs relating to the region of influence including expenditures for services and supplies associated with the project and civilian and military employment associated with the project. The average annual salary or income of both civilian and military employees is estimated at $32,000 per employee. The outputs from the EIFS Operation and Maintenance Model express $5,034,000 in sales volume attributed to direct and indirect sales which result from the project construction. The output also reflects 135 persons in direct and indirect employment created in the private business from project construction. The annual direct and indirect personal income generated from project construction is anticipated at $3,641,000. Approximately 17 additional school children are anticipated as a result of the project construction over the entire 20 year time span. The demands for rental housing will be approximately 12 units and owner-occupied housing is estimated to increase by 33 over this same time period as a result of the construction.

Development of the MCHC is not expected to result in any direct impacts to the population levels of Stafford or Prince William counties. It is anticipated that the Heritage Center would employ approximately 90 persons and may have an additional 30 volunteers. The employees would either be transfers from the existing Air-Ground Museum at MCB Quantico and other facilities at the WNY or new employees hired from within the region. Any increase in population due to the construction of the MCHC would be minimal compared to the population increases anticipated by Stafford and Prince William counties.

Current and anticipated expansions in the labor force of Stafford and Prince William counties would support any new positions at the MCHC. It is also anticipated that the construction

associated with the MCHC is expected to have a positive short-term impact on the employment levels of the region. Income levels for the region should be positively impacted with the construction of the MCHC from the payroll on the MCHC employees and the short-term payroll associated with the construction. It is anticipated that this influx of tourists would have a generally positive impact on the economy and businesses throughout the region.

Overall, implementation of the proposed action is not anticipated to significantly impact the local housing market. A portion of the estimated 90 MCHC staff already work at the existing facilities on base and are not expected to relocate. A small number of additional personnel associated with the MCHC may relocate to the area, but these numbers would be well within anticipated growth levels for the surrounding counties.

If the Mainside North site were used, approximately half of the Thomason Park housing units would be demolished to make way for the later phases of the complex. Phased development of the MCHC would provide adequate time to gradually phase out occupancy of these dwellings as military personnel are reassigned to other military installations. Incoming personnel would be housed off-base, rather than be assigned to Thomason Park units. This would gradually shift personnel out of the affected housing units and into the surrounding communities.

Economic activity in the region would result from construction and operation of the MCHC at any of the four alternative sites. Some localized benefits would vary depending on which alternative sites was developed

4.10.1 Environmental Justice Although population data reveals that census tracts surrounding the project area have higher percentages of minorities, low-income families and children than the counties of which they are part, construction and operation of a museum complex is not expected to have disproportionately high and adverse human health or environmental effects on these populations.

4.11 Community Facilities

The proposed development of the MCHC is not expected to place a large demand on local community services. As part of MCB Quantico, many of the required services for the MCHC would be provided by the Installation. The MCHC would employ a small number of personnel, and any demand by new employees relocating to the area would be incidental.

4.12 Solid Waste, Hazardous Waste, and Environmental Contamination

A small amount of hazardous waste would be generated at the MCHC through administrative activities, maintenance, and the restoration of artifacts and exhibits. This hazardous waste would be stored, handled, and disposed of in accordance with all applicable federal and Virginia regulations.

Of the five alternative locations being considered for the MCHC, only the Russell Road site has known or suspected contamination. Ongoing investigations, monitoring, and remediation within the Russell Road area could interfere with timely development and operation of the MCHC at this location. Remediation of contamination conducted as part of site preparation work for the MCHC would be subject to applicable regulations and must follow established procedures. Implementation of this process is expected to delay project development and significantly increase project costs. Due to a lack of specific information on the type, level, and extent of contamination at the Russell Road site, development prior to testing and remediation, if necessary, could adversely affect the use and operation of the MCHC facilities

SECTION 5: Cumulative Impacts

5.1 General A cumulative impact is that which could result from incremental effects of the proposed action when added to other past, present, and planned actions. Other major development activities in the vicinity include:

- The Marine Corps Manpower Center was recently constructed on the north side of Russell Road inside the Back Gate. It will eventually be occupied by 900 employees, 600 of which are currently located there. It is a single multi-story building with terraced parking on the hill behind it to the north. It is served by MCB Quantico utility systems and most employees commute from their residences in the surrounding counties.
- The Justice Training Center was recently constructed in the Guadalcanal area near the FBI Academy. Approximately 36 staff members and 100 students were added to this facility in 2000.
- The FBI Laboratory is planning to relocate to the FBI Academy area by 2001. When fully operational, this facility would add 800 employees, most of whom would be new, to the area.
- Prince William County continues to experience a substantial population growth rate and many new developments are planned, including a conference center and new hotels. The closest and largest proposal is for construction of a new community on the Cherry Hill Peninsula, just north of MCB Quantico. This project is expected to include a variety of residential and

commercial uses mixed with considerable recreation and open space. A loop road would connect the development to US-1 and a proposed Potomac River Drive would link to existing roads northward along the shore near Occoquan. The Potomac River Drive proposal also may include a link southward to connect the Town of Quantico if bridge access across Quantico Creek can be arranged. However, this link is dependent on issuance of Prince William County bonds which voters failed to approve in 1998.

- A mixed-use development has recently been proposed for the Widewater Area. The project may consist of 700 residential units and a convention center. VA-637 from US-1 to the east would be used to travel between I-95 and the proposed development. A Widewater Parkway is also proposed as a new roadway that would provide access from the US-1 corridor south of the existing VA-637 intersection with US-1. This development is currently not defined as a taxing district. Utility systems in northern Stafford County are being planned and extended to adequately keep pace with development in the US-1 and VA-610 corridors.
- Recent upgrades to the Stafford County sanitary sewer system will enable MCB Quantico to divert wastewater discharge to that system. Additional MCB Quantico connections to utility systems in the adjacent counties are being evaluated as an alternative to expansion and upgrades to MCB Quantico utility systems. Revenue generated by major new customers should help the utility systems finance further upgrades and expansions.
- The Western Transportation Corridor proposes a major roadway from the southern boundary of the Guadalcanal side of the MCB Quantico to points north and west of the Washington, DC, region. The purpose of this route would be to provide an alternative route for regional traffic using I-95. One alternative suggests an interchange on I-95 between Russell Road and VA-610.

New development is a result of economic growth, advances in technology, increasing populations and the infrastructure and services to support all of these. This growth is guided by land use plans and regulated by various federal, state, and county laws.

Land use plans are blue prints for future growth and development. These plans are designed to provide an organized approach to control and facilitate area growth. They identify the type and location of specific development and program the necessary infrastructure to accommodate this development, such as utilities, transportation, and community services.
The environmental effects of regional growth and development are addressed through legislative action, which establishes regulations and administering agencies. This process identifies

environmental concerns and implements programs and processes to regulate specific activities that affect the human and natural environment. In order for developers or businesses to obtain authorization, they are required to follow certain procedures and fulfill specific requirements. For instance, developers are required to submit plans and obtain permits in order to construct new structures. Through this process regulators identify requirements specific to the site, activity and/or type of equipment associated with that business. Permits or licenses may also include specific requirements, such as mandatory operating procedures, record keeping, and/or reports to the regulatory agency. There are specific federal, state, or county programs/agencies that are responsible for licensing, permitting, or authorizing actions that may impact air quality, wetlands, threatened or endangered species, hazardous materials, and cultural resources. These agencies are sensitive to cumulative thresholds and consider the overall impacts to these resources in administering the program.

The cumulative effects of incremental increases in water and air pollution for area development are identified through regional monitoring and addressed through changes in laws, regulation and permits/licensing for activities that impact these resources. The cumulative effects of continued development reduces the amount of native vegetation within the region, which supports and benefits a wide range of environmental factors. The obvious effect of development is the loss of trees, wildlife habitat, and recreation opportunities. Forest environments also serve to clean the air by taking in carbon dioxide and producing oxygen. They improve water quality by absorbing and slowing the release of precipitation, filtering out pollutants, and cooling water temperatures. In addition, forested areas serve as a noise buffer and are aesthetically pleasing.

The proposed MCHC would replace and enhance existing facilities at Quantico to accommodate the consolidation of collections from various locations. It is intended to enhance protection of the Marine Corps historical collections and improve access to this information through exhibits, displays, and electronic media. It would require a staff of approximately 90 personnel and is expected to draw over 400,000 visitors annually. This type of operation can be expected to attract service type establishments within the area, which would employ a small number of personnel. The anticipated increase in residential populations resulting from implementation of the MCHC and associated projects is expected to be well within the estimated range of growth. Businesses within the local area support a small customer base and are supportive of this economic opportunity. Most of this economic development is expected to involve redevelopment of older, existing establishments.

The development of natural areas in the region has the potential to affect all aspects of the environment. Site preparation activities are required to include implementation of erosion and sediment controls to minimize the movement of soil off site and into surrounding surface waters, which would degrade water quality. Replacing forest cover with hard surfaces can also impact downstream water quality by increasing the amount and consistency of precipitation leaving the site. To minimize these effects developers are required to implement measures to control the release of stormwater from the site. Wetlands are typically found in lowland areas and along watercourses. Projects sited in wetland areas are subject to regulatory approval, which require the replacement of wetlands lost through development. Linear routes of utility lines and access roads typically cross wetlands within ravines and drainage channels. These impacts are usually temporary, and do not constitute a permanent loss of these resources. A history of development throughout the region is continually reducing the amount of natural habitat for wildlife. Larger species of wildlife are particularly affected by this development. Fragmentation of forested areas can isolate groups of species, disrupt migration and affect the behavior of some species. This mosaic creates microenvironments and interferes with the overall ecology of the region. Development increases air pollution through the loss of vegetation, which cleans the air, and human activities and requirements. Development generates noise through human activities and reduces the quieting effect through the loss of natural areas. Historical and archaeological resources are affected through regional development. Although development associated with federal actions are required to identify and record information associated with significant historic and archaeological resources within a project site, the site itself and less significant artifacts are lost through development. Regional development has and will continue to occur in response to the economic growth and supplying the needs of the population. An area of particular concern in the northern Virginia area is the increase in vehicle traffic. The traffic assessment for this DEIS shows that some intersections within the project area currently operate at a poor level of service and the anticipated increase in vehicle numbers from regional growth (with or without development of the MCHC) is not expected to improve this situation. Overall, regional growth is expected to result in an incremental reduction in forested/natural areas and a corresponding impact on natural resources.

SECTION 6: Unavoidable Adverse Environmental Effects

6.1 General Unavoidable adverse environmental effects are those which would occur if the proposed action is implemented and that cannot be avoided or mitigated as part of the project.

- The proposed action would cause conversions of approximately 100 acres (40 hectares) of undeveloped land into developed land, with an attendant destruction of habitat, flora, and fauna that cannot relocate.

- Traffic volumes would increase in the region as MCHC visitorship increase over the 15-20 year expansion period. The volume attributable to the MCHC would be only a small part of the increases in traffic in the area, but it would, if successful, be a factor in stimulating secondary development as the region would generally prosper.

- Increases in traffic due to MCHC visitation would increase vehicle emissions within the region. Construction and operation of the MCHC facility would also contribute to increased air emissions.

- Archaeological resources, already poorly preserved, would be further disturbed by construction of the MCHC. Their utility for research will be further diminished.

SECTION 7: Relationship Between Short-Term Uses of the Environment and Maintenance and Enhancement of Long-Term Productivity

7.1 General Short-term uses of the environment associated with the development of the MCHC on any of the four alternative sites would result in the loss of existing resources on 100 acres (40 hectares) of forested habitat. This would occur in phases over a period of time, extending up to about 20 years.

In contrast, continuous and permanent enhancements created by the MCHC would include:

- Increases in regional economic activity derived from new employment and growth in visitorship to the Heritage Center over time.
- Improved curation of historic artifacts and their display and exhibition for military and public long-term benefit.

SECTION 8: Irreversible and Irretrievable Commitment of Resources

8.1 General Resources that would be irreversibly and irretrievably committed by development of the MCHC on each of the four sites would include:

- One hundred acres (40 hectares() of upland forested habitat and its resident populations of fauna and flora;
- Fuels used during demolition, clearing, and construction of the MCHC and the operation of facilities;
- Building materials, labor, and funds would be consumed in the implementation of each phase of development.

SECTION 9: Distribution List

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The Honorable Charles S. Robb
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The Honorable John W. Warner
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The Honorable Thomas Davis, III
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Washington, DC 20515

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US Department of Defense
Army Corps of Engineers
Northern Virginia Field Office
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D. P. Lewis	Division Director
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SECTION II: References

MCB Quantico, 1995. *Outdoor Recreation Management Plan for Marine Corps Base, Quantico, VA,*

_____, 1996. *Fish and Wildlife Management Plan for Marine Corps Base, Quantico, VA,* Section III of the Integrated Natural Resources Management Plan.

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APPENDICES

APPENDIX A: Comments Received

The scoping process for this EIS began with publication of a Notice of Intent to Prepare an EIS in the *Federal Register* on August 26, 1998. A public scoping meeting was held on September 17, 1998 at the Ramada Inn in Triangle, VA which is near MCB Quantico in Prince William County. Legal notices with details about the public scoping meeting were placed twice (August 27 and 30, 1998) in each of two local newspapers: *The Free Lance-Star* and the *Potomac News*. An announcement was also published in the MCB Quantico newspaper, *The Sentry*. In addition, a scoping notification letter was mailed the local and regional elected representatives, organizations, and agencies listed in Section 9. The letter provided general information on the proposed action and alternatives, and invited the recipients to participate in the scoping process. Responses received from the public, and federal and Virginia state agencies, during the scoping process are included on the following pages.

Marine Corps Base Quantico
Heritage Center Public Meeting

COMMENT SHEET

of the three sites proposed the most benefical to the local economies of Triangle and Quantico is the Mainside North site. This would be an accessible site as all are but it would also provide access to the many small businesses in the Quantico and Triangle area. It would also provide a tie to the AMTRAK and VRE station and the Heritage Center. Either locally provided or governmental provided transportation could tie the Town of Quantico to the Heritage Center and greatly increase the accessibility of the Center to visitors travelling from anywhere in the United States without putting more cars on an overcrowded US 95.

(additional space on the back) >>>>>

SEND COMMENTS TO:
Commanding General
Marine Corps Base (B-046)
3040 McCawley Avenue, Suite 2
(Attention: Mr. Jeff Shrum)
Quantico, Virginia 22134-5053
Fax: 703.784.5809
The deadline for comments is October 5, 1998.

YOUR NAME: Albert R. Gasser Jr.

Organization: Former Mayor Town of Quantico / Owner Command Post Pub

Address: 335 Potomac Ave
Quantico, Virginia 22134

Marine Corps Base Quantico
Heritage Center Public Meeting

COMMENT SHEET

THE THREE ALT. SITES CURRENTLY PROPOSED ALL HAVE GOOD MERITS REASONS, THE BEST ONE IS THAT THEY ARE ALL ON PROP. OWNED BY THE FED GOVT. HOWEVER, NONE OF THE SITES HAVE WATER ACCESS. PRINCE WILLIAM CO. CONTROLS AND MAY PROVIDE A 50 AC SITE, IN CHERRY HILL, 4 MILES NORTH OF QUANTICO TOWN ON THE PROPOSED NEW PARKWAY/ RIVER DRIVE. THIS SITE SHOULD BE CONSIDERED BECAUSE A WATER SITE WILL ALLOW FOR YOUR PLANNER TO EXTEND THE PLAN TO WATER (OVER)

(additional space on the back) >>>>>

SEND COMMENTS TO:
Commanding General
Marine Corps Base (B-046)
3040 McCawley Avenue, Suite 2
(Attention: Mr. Jeff Shrum)
Quantico, Virginia 22134-5053
Fax: 703.784.5809
The deadline for comments is October 5, 1998.

YOUR NAME: DOUGLAS HUMSTON
Organization: HUMSTON AND ASSOC.
Address: 17206 JEFFERSON DAVIS HWY
DUMFRIES VA. 22026.

ADDITIONAL COMMENTS

MARITIME HERITAGE IN A MORE DRAMATIC MANNER. A WATER SITE ALWAYS DRAWS MORE VISITORS AND CAN BE PLANNED // FUNDED IN WITH THE NEW CHERRY HILL COMPLEX AND RIVER DRIVE.

COUNTY OF PRINCE WILLIAM

OFFICE OF EXECUTIVE MANAGEMENT
1 County Complex Court, Prince William, Virginia 22192-9201
(703) 792-6600 Metro 631-1703 FAX (703) 792-7484

Henry Bernhard Ewert, II
County Executive

BOARD OF COUNTY SUPERVISORS
Kathleen K. Seefeldt, Chairman
L. Ben Thompson, Vice Chairman
Hilda M. Barg
Maureen S. Caddigan
Mary K. Hill
John D. Jenkins
David A. Rutherford
Edgar S. Wilbourn, III

September 17, 1998

Mr. Robert M. McLeod
Project Manager
Harland Bartholomew & Assoc., Inc.
One Park West Circle
Suite 302
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RE: Comments on Location for Proposed Marine Corps Heritage Center

Dear Mr. McLeod:

Thank you for the opportunity to respond to the proposal related to the future location of the Marine Corps Heritage Center. I believe a site in Prince William County would be very appropriate for the Heritage Center.

Attached is information for a site on the Cherry Hill Peninsula, which is just north of the base. This area would be highly desirable from the Marine Corps' perspective because of its proximity to the Command Center for the Marine Corps Base, Interstate 95 and/or U.S. Route 1, the Town of Quantico, the Potomac River, and the proposed Potomac River Drive.

Legend Corporation, which is the owner of the property and the surrounding 1,800± acres, is very enthusiastic about identifying the Cherry Hill Peninsula as the future home for the Marine Corps Heritage Center.

Your review and favorable consideration of this material is appreciated. I look forward to the opportunity of working with you in the future on what is a very important project, not only for the Marine Corps but for Prince William County and the region as a whole.

Sincerely,

H B Ewert

H. B. Ewert
County Executive

Attachments

Copy to: Prince William County Director of Planning
Prince William County Director of Economic Development
Thomas W. Eitler, Prince William County Planning Office

HBE/JRW:eas\c:\eas\twe\cxo\mcleod.doc
T 4910

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MARINE CORPS HERITAGE CENTER

PROPOSAL FOR LOCATION ON THE CHERRY HILL PENINSULA

- The Cherry Hill Peninsula is located approximately one fourth of a mile north of the Quantico Marine Corps Base, one mile north of the Marine Corps Base Command Center in Lejeune Hall, and one-half mile north of the Town of Quantico.

- The current proposal to connect the Cherry Hill Peninsula with the Town of Quantico by way of the proposed Potomac River Drive will allow direct access from the proposed Marine Corps Heritage Center to the town and the Marine Corps Base itself.

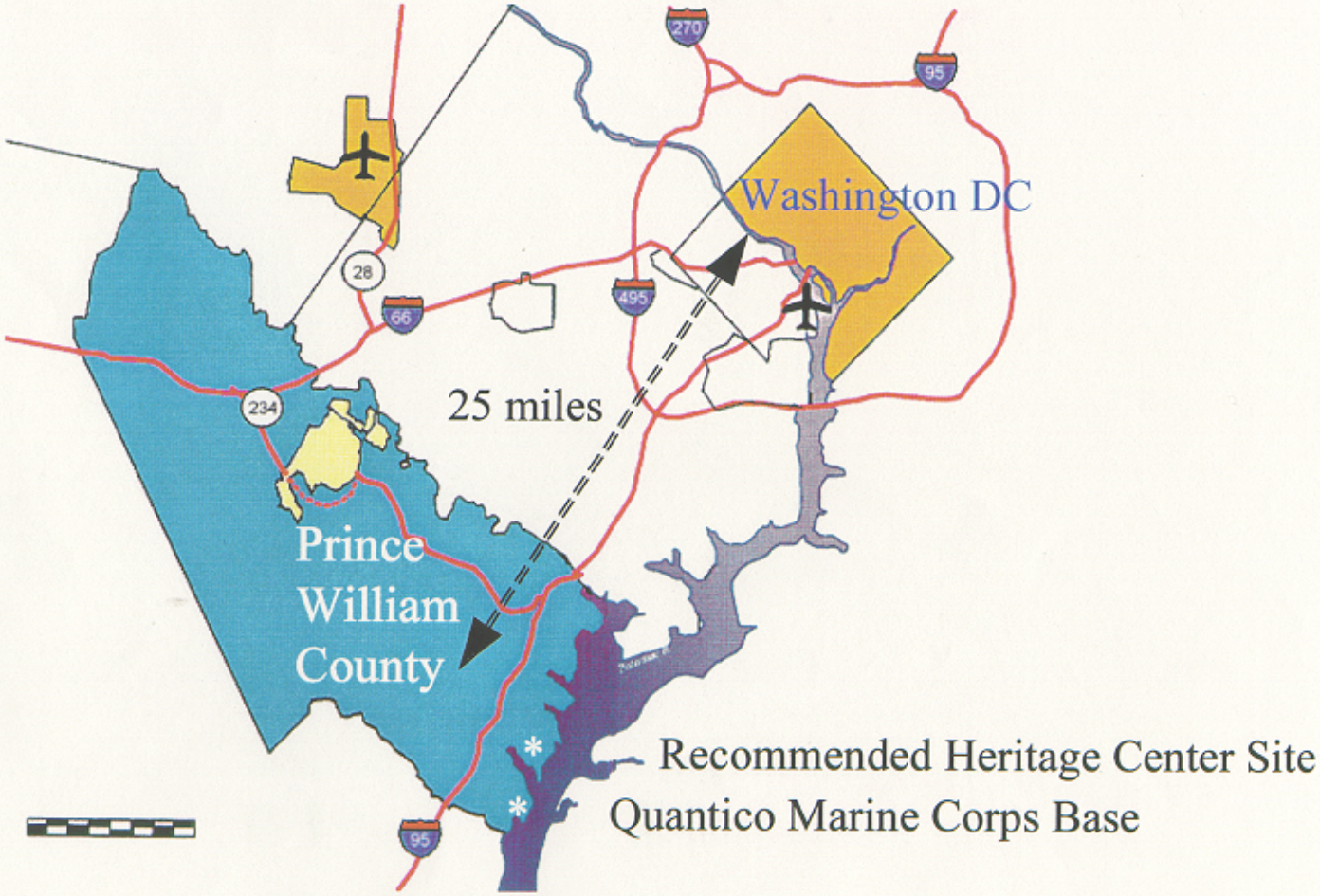
- Access to the site can also be provided from I-95, U.S. Route 1, and Route 234 by way of a proposed four-lane divided highway that will loop through the Cherry Hill Peninsula.

- A Virginia Railway Express train station is proposed for the Cherry Hill Peninsula. Funds have been budgeted for construction. Additionally, the CSX rail line currently includes commuter rail service from Fredericksburg to Washington, D.C.

- A potential site on the Cherry Hill Peninsula, consisting of approximately 260 acres, has been identified on a bluff above the Potomac River near Cockpit Point. This bluff has extensive visual vistas five miles north up the Potomac River towards the District of Columbia. There is accessibility to the Potomac River waterfront, which will allow a water component to be incorporated into the Marine Corps Heritage Center. This would provide for access to a deep water terminal which would permit boat rides (such as landing craft) and historic boat and marine exhibits. Such exhibits could bring to life the rich nautical heritage of the Marine Corps.

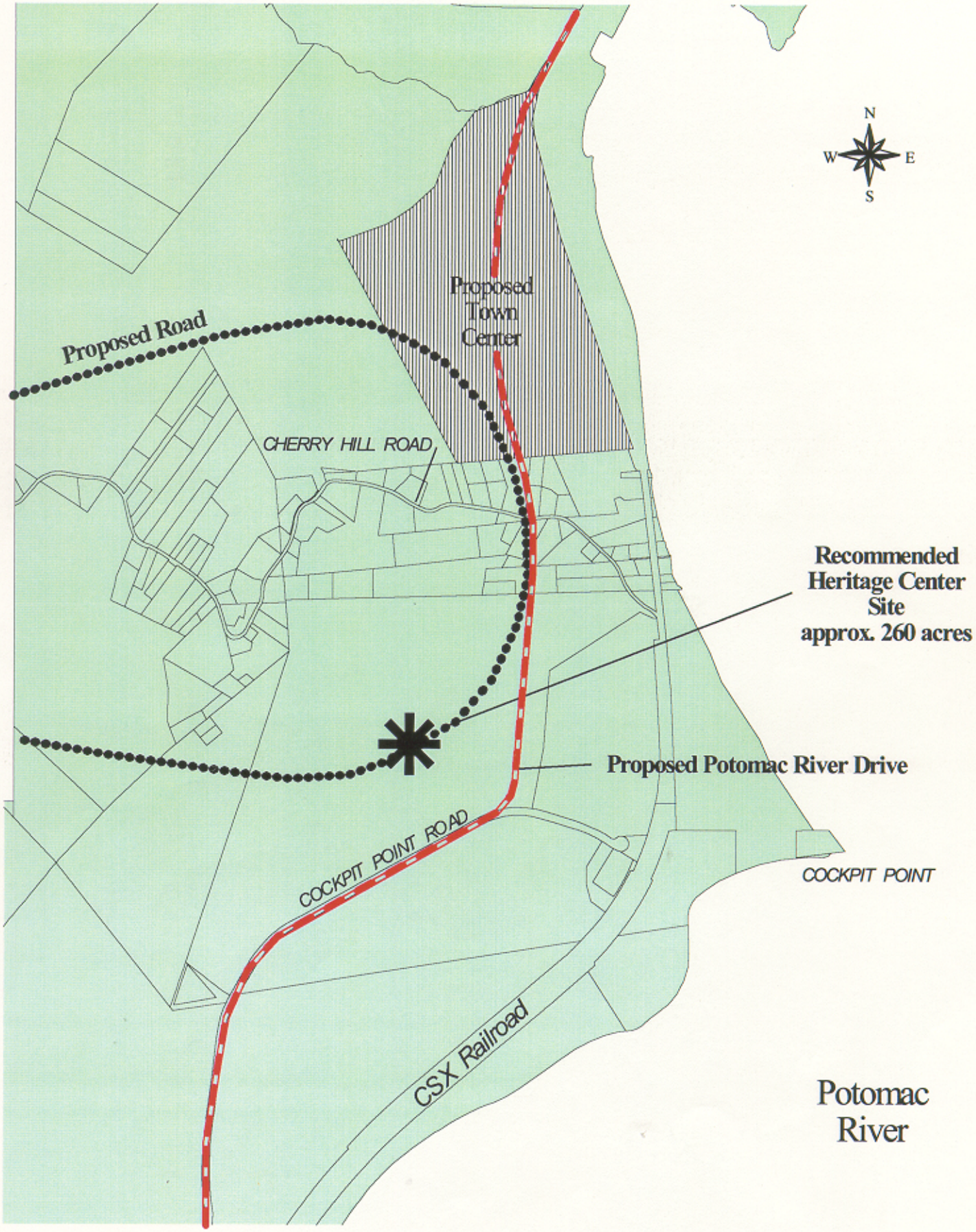
- Plans for the Cherry Hill Peninsula include a proposal for a hotel/conference and other specific amenities such as a town center with retail and commercial activity, a golf course, housing, as well as senior housing--a great benefit for potential Marine Corps retirees.

Marine Corps Heritage Center Proposal



Marine Corps Heritage Center Proposal

N
W
E
S
James Madison Highway
Rt. 15
Sudley Road
Rt. 234
I-66
HAYMARKET
Rt. 29
I-66
Lee Highway
Linton Hall Road
Rt. 234 Bypass
MANASSAS PARK
Vint Hill Road
Rt. 215
Rt. 28
CITY OF MANASSAS
Prince
Davis Ford Road
William Parkway
Dumfries Road
Rt. 234
Brentsville Road
Nokesville Road
Bristow Road
Rt. 619
Hoadly Rd.
Dale Blvd.
Old Bridge Rd.
OCCOQUAN
Rt. 640
Proposed Potomac River Drive
Minnieville Road
Rt. 784
US-1
Dumfries Road
Rt. 234
I-95
DUMFRIES
Proposed Road
Recommended Heritage Center Site
Quantico Marine Corps Base
TOWN OF QUANTICO


N
W
E
S
Proposed Town Center
Proposed Road
CHERRY HILL ROAD
Recommended Heritage Center Site approx. 260 acres
Proposed Potomac River Drive
COCKPIT POINT ROAD
COCKPIT POINT
CSX Railroad
Potomac River

COMMONWEALTH of VIRGINIA

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William A. Pruitt
Commissioner

October 29, 1998

Mr. Robert M. McLeod
Project Manager
Harland Bartholomew & Associates, Inc.
One Park West Circle, Suite 302
Midlothian, Virginia 23113

RE: U.S. Marine Corps Heritage Center
Marine Corps Base
Quantico

Dear Mr. McLeod:

Thank you for the opportunity to review and comment on the above-referenced project in Prince William County.

The Marine Resources Commission, pursuant to Title 28.2 of the Code of Virginia, is responsible for protecting and preserving marine fisheries, submerged lands, and tidal wetlands throughout the Commonwealth. Permits are issued for encroachment over tidal wetlands and State-owned submerged lands, including streams with a mean annual flow rate in excess of five cubic feet per second and a drainage area that exceeds five square miles. Accordingly, any construction activity associated with the Heritage Center impacting submerged lands channelward of ordinary high water in non-tidal streams or channelward of mean low water in tidal streams in the area will require the submission of a Joint Permit Application to this agency. Copies of the application will be forwarded to the U.S. Army Corps of Engineers and the Prince William County Wetland Board for their review and action as appropriate.

I hope this information is helpful in planning this project. Should you require further assistance please do not hesitate to contact me at (757) 247-8028.

Sincerely,

Heather L. Wood
Environmental Engineer

RECEIVED
NOV - 4 1998
Harland Bartholomew
& Associates, Inc.

HLW/ncp
HM

O. GENE DISHNER
DIRECTOR

BENNY R. WAMPLER
DEPUTY DIRECTOR

DIVISIONS
ENERGY
GAS AND OIL
MINED LAND RECLAMATION
MINERAL MINING
MINERAL RESOURCES
MINES
ADMINISTRATION

COMMONWEALTH of VIRGINIA

Department of Mines, Minerals and Energy
Division of Mineral Resources
P.O. Box 3667
Charlottesville, Virginia 22903
(804) 293-5121
Stanley S. Johnson, State Geologist

October 15, 1998

Mr. Robert M. McLeod
Harland Bartholomew & Associates, Inc.
One Park West Circle, Suite 302
Midlothian, VA 23113

Re: U. S. Marine Corps Heritage Center, Quantico, Virginia

Dear Mr. McLeod:

Geologic maps and data on the Marine Corps Base Quantico and surrounding area are available from the U.S. Geological Survey, Reston, Virginia. Dr. Robert Mixon, U.S. Geological Survey, has knowledge of the geology of the Quantico area. He can be contacted at 703-648-6940.

Sincerely,

Eugene K. Rader

Eugene K. Rader
Geologist Supervisor

EKR/kh

RECEIVED
OCT 16 1998
Harland Bartholomew
& Associates, Inc.

James S. Gilmore, III
Governor

John Paul Woodley, Jr.
Secretary of Natural Resources

David G. Brickley
Director

COMMONWEALTH of VIRGINIA

DEPARTMENT OF CONSERVATION AND RECREATION

203 Governor Street, Suite 326

TDD (804) 786-2121 Richmond, Virginia 23219-2010 (804) 786-2556 FAX (804) 371-7899

October 9, 1998

Mr. Robert M. McLeod
Project Manager
Parsons-Harland Bartholomew & Associates
One Park West Circle, Suite 326
Richmond, VA 23219

RECEIVED
OCT 16 1998
Harland Bartholomew & Associates, Inc.

Re: U. S. Marine Corps Heritage Center in Quantico, Virginia

Dear Mr. McLeod:

Comments are provided herein on the above referenced project.

DIVISION OF NATURAL HERITAGE

The Department of Conservation and Recreation (DCR) has searched its Biological and Conservation Data System (BCD) for occurrences of natural heritage resources from the area outlined on the submitted map. Natural heritage resources are defined as the habitat of rare, threatened, or endangered plant and animal species, unique or exemplary natural communities, and significant geologic formations.

According to the information currently in our files, the small whorled pogonia (*Isotria medeoloides*, G2G3/S2/LT/LE) has been documented at the Russell Road site. The other two sites may support habitat appropriate for the small whorled pogonia as well. Small whorled pogonia grows in a variety of woodland habitats in Virginia, but tends to favor mid-aged woodland habitats on gently north or northeast facing slopes often within small draws. Direct destruction as well as habitat loss and alteration are principle reasons for the species' decline (Ware, 1991). Please note that small whorled pogonia is currently listed as threatened by the United States Fish and Wildlife Service (USFWS) and as endangered by the Virginia Department of Agriculture and Consumer Services (VDACS).

Due to the potential for these sites to support populations of the small whorled pogonia, DCR recommends an inventory of suitable habitat in the study area. A survey will aid in minimizing adverse impacts to this sensitive resource and its respective habitat as a result of the proposed action. With the survey results we can more accurately evaluate potential impacts to natural heritage resources and offer specific protection recommendations for minimizing impacts to the documented resources. DCR also recommends coordination with the USFWS and the VDACS to ensure compliance with protected species legislation.

DCR-Division of Natural Heritage biologists are qualified and available to conduct inventories for rare, threatened, and endangered species. Please contact J. Christopher Ludwig, Natural Heritage Inventory Manager, at (804) 786-7951 to discuss arrangements for field work. A list of other individuals who are qualified to conduct inventories may be obtained from the USFWS.

Any absence of data may indicate that the project area has not been surveyed, rather than confirm that the area lacks other natural heritage resources. New and updated information is continually

added to BCD. Please contact DCR for an update on this natural heritage information if a significant amount of time passes before it is utilized.

DIVISION OF SOIL AND WATER CONSERVATION

If the proposed project disturbs over 10,000 square feet of a land-disturbing activity an erosion and sediment (E&S) control plan will be needed **prior** to any land-disturbing activity on site. If the total disturbance for the project exceeds one acre, a separate **stormwater management plan** (SWM) may also **be required**. The project is proposed by a federal agency, therefore the **E&S** plan **should be developed** according to the guidelines set forth by the **Department of Conservation and Recreation, Division of Soil and Water Conservation**. **The federal agency** is required to comply with the E&S Law/Regulations and SWM Law and Regulations. The ***Division's Warrenton Field Office*** will be available for assistance for the E&S plan development and review, all plans should comply with the guidelines set forth in Chapter VI of the Virginia Erosion and Sediment Control Handbook.

DIVISION OF PLANNING & RECREATION RESOURCES

The proposed project is not anticipated to have any adverse impacts on existing or planned recreational facilities nor will it impact any streams on the National Park Service Nationwide Inventory, Final List of Rivers, potential Scenic Rivers or existing or potential State Scenic Byways.

Thank you for the opportunity to comment on this project.

Sincerely,

John R. Davy, Jr. /saw

John R. Davy, Jr.
Planning Bureau Manager

/saw

cc: Cindy Schulz, USFWS
John Tate, VDACS

Literature Cited

Ware, D.M.E. 1991. Small whorled pogonia. In Virginia's Endangered Species: Proceedings of a Symposium. K. Terwilliger ed. The McDonald and Woodward Publishing Company, Blacksburg, Virginia.

Virginia Department of Conservation and Recreation
Definition of Abbreviations Used in Natural Heritage Resource Lists

Natural Heritage Ranks

The following ranks are used by the Virginia Department of Conservation and Recreation to set protection priorities for natural heritage resources. Natural Heritage Resources, or "NHR's," are rare plant and animal species, rare and exemplary natural communities, and significant geologic features. The primary criterion for ranking NHR's is the number of populations or occurrences, i.e. the number of known distinct localities. Also of great importance is the number of individuals in existence at each locality or, if a highly mobile organism (e.g., sea turtles, many birds, and butterflies), the total number of individuals. Other considerations may include the quality of the occurrences, the number of protected occurrences, and threats; however, the emphasis remains on the number of populations or occurrences so that ranks will be an index of known biological rarity.

S1 Extremely rare and critically imperiled, with 5 or fewer occurrences or very few remaining individuals in Virginia; or because of some factor(s) making it especially vulnerable to extirpation in Virginia.

S2 Very rare and imperiled, with 6 to 20 occurrences or few remaining individuals in Virginia; or because of some factor(s) making it vulnerable to extirpation in Virginia.

S3 Rare to uncommon in Virginia with between 20 and 100 occurrences; may have fewer occurrences if found to be common or abundant at some of these locations; may be somewhat vulnerable to extirpation in Virginia.

S4 Common and apparently secure, with more than 100 occurrences; may have fewer occurrences with numerous large populations.

S5 Very common and demonstrably secure in Virginia.

SH Historically known from Virginia, but not verified for an extended period, usually > 15 years.

SU Status uncertain, often because of low search effort or cryptic nature of the element.

SX Apparently extirpated from Virginia.

S#B Breeding status of an animal within Virginia.

S#N Non-breeding status within the state. Usually applied to winter resident species.

Global ranks are similar, but refer to a species' rarity throughout its total range. Global ranks are denoted with a "G" followed by a character. Note that GA and GN are not used and GX means apparently extinct. A "Q" in a rank indicates that a taxonomic question concerning that species exists. Ranks for subspecies are denoted with a "T". The global and state ranks combined (e.g. G2/S1) give an instant grasp of a species' known rarity. ***These ranks should not be interpreted as legal designations.***

Federal Legal Status

The Division of Natural Heritage uses the standard abbreviations for Federal endangerment developed by the U.S. Fish and Wildlife Service, Division of Endangered Species and Habitat Conservation.

LE - Listed Endangered - threatened with extinction throughout all or a significant portion of its range
LT - Listed Threatened - likely to become endangered in the foreseeable future
PE - Proposed Endangered **PT** - Proposed Threatened
E(S/A) - treat as endangered because of similarity of appearance **T(S/A)** - treat as threatened because of similarity of appearance
C - Candidate - enough information is available to propose for listing, but listing is "precluded by other pending proposals of higher priority"

State Legal Status

The Division of Natural Heritage uses similar abbreviations for State endangerment.
LE - Listed Endangered **LT** - Listed Threatened
SC - Special Concern - animals that merit special concern according to VDGIF (not a regulatory category)

For information on the laws pertaining to threatened or endangered species, contact:

U.S. Fish and Wildlife Service for all FEDERALLY listed species

Virginia Department of Agriculture and Consumer Services Plant Protection Bureau for STATE listed plants and insects

Virginia Department of Game and Inland Fisheries for all other STATE listed animals

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

James S. Gilmore, III
Governor

John Paul Woodley, Jr.
Secretary of Natural Resources

Street address: 629 East Main Street, Richmond, Virginia 23219
Mailing address: P.O. Box 10009, Richmond, Virginia 23240
Fax (804) 698-4500 TDD (804) 698-4021
http://www.deq.state.va.us

Dennis H. Treacy
Director

(804) 698-4000
1-800-592-5482

October 13, 1998

Mr. Robert McLeod
Harland Bartholomew & Associates, Inc.
One Park West Circle
Suite 302
Midlothian, VA

RE: Heritage Center Siting, MCB Quantico

Dear Mr. McLeod:

I have received your request for assistance in siting the Heritage Center at MCB Quantico. A real-estate file search has been performed on the zip code where you are proposing to construct the Heritage Center and is attached to this letter. Please review the listing for sites that may impact site selection for the Heritage center. If you would like more information on these sites please contact the Northern Regional Office at (703) 583-3898.

Sincerely,

Melissa S. Porterfield

Melissa S. Porterfield
Environmental Program Analyst

Attachment

Date request: 10/ 7/9

EIDSP DATABASE SEARCH

DEQ REGION: NVRO

22134

Type Identifier	Sitename Location	Contact Phone	County Zip Code	Discovery Date
S 360	QUANTICO MCB LF	PUB WORKS OFF ( )	PR WILLIAM 22134	
Description:				
S 411	QUANTICO LF RT 610	OTIS KAY (703)-640-4527	STAFFORD 22134	
Description:				
C VA1170024722	MARINE CORPS COMB QUANTICO MARINE BASE		PRINCE WILLIAM 22134	
Description:				
H VA1170024722	MARINE CORPS DEV & MARINE CORPS DEV & E	HAERBAUGH 7036402028	PRINCE WILLIAM 22134	
Description:				
H VAD023885841	CATALANO CLEANERS 512 BROADWAY	CATALANO 2155551212	PRINCE WILLIAM 22134	
Description:				
H VAD981107410	TERRYS SEWING SHOP 411 BROADWAY	BOURBONNAIS 7036407468	PRINCE WILLIAM 22134	
Description:				
H VAR000002790	QUANTICO MARINE BA BLDG 2009 ZEILIN ROAD	BLODGETT 3015174203	QUANTICO 22134	
Description:				
I RI-000067	QUANTICO PESTICIDES QUANTICO / BLDG. 689		PRINCE WILLIAM 22134	1/20/85
Description: FIRE IN ENTOMYOLOGY SHOP				
I RI-001335	QUANTICO MARINE CO QUANTICO MARINE COR	MIKE HARBEAUGH (703)-640-2020	STAFFORD 22134	4/12/90
Description: ACCIDENTAL SPILL				

Type: S=Solid Waste Management Facility, A=Active CERCLA Sites; I= Incident Reported to DEQ, C=Closed/Inactive CERCLA Sites; H= Hazardous Waste Notifier or Management Facility

DEQ Regions-Waste Contacts:
NVRO-(Northern)-John Terry, 703-583-3898
VRO-(Valley)-Ray Tesh, 540-574-7830
SWRO-(Southwest)- Dallas Sizemore, 540-676-4842
WCRO-(West Central)- Aziz Farahmand, 540-562-6872
PRO-(Piedmont)- Mohammad Habibi, 804-527-5153
TRO-(Tidewater)- Milton Johnston, 757-518-2151

Note: Contact the Regional Office to obtain details or files regarding sites identified on this list. Use Identifier Number to specify the site.

DATABASE NO.: 98-775

COMMONWEALTH of VIRGINIA

KENNETH F. WIEGAND
Director

Department of Aviation
5702 Gulfstream Road
Richmond, Virginia 23250-2422

V/TDD - (804) 236-3624
FAX - (804) 236-3635

October 7, 1998

Robert M. McLeod
Project Manager
Harland Bartholomew & Associates, Inc.
One Park West Circle, Suite 302
Midlothian, VA 23113

Re: Quantico EIS

Dear Mr. McLeod:

Thank you for the opportunity to comment on the Marine Corp Heritage Center EIS, being proposed at Quantico.

Given the information that has been presented, we have no comments to make regarding the project. However, should there be any element of the work that would pertain the use of airspace, or any redesign in airspace, we would then be interested in making a review.

Again, thank you, and should there be any questions, please free to call.

Sincerely,

Keith F. McCrea, AICP
Senior Aviation Planner

COMMONWEALTH of VIRGINIA

Department of Historic Resources

James S. Gilmore, III
Governor

John Paul Woodley, Jr.
Secretary of Natural Resources

2801 Kensington Avenue, Richmond, Virginia 23221

H. Alexander Wise, Jr.
Director

Tel: (804) 367-2323
Fax: (804) 367-2391
TDD: (804) 367-2386

November 18, 1998

Robert M. McLeod, Project Manager
Parsons Harland Bartholemew & Associates, Inc
One Park West Circle, Suite 302
Midlothian VA 23113

RE: Proposed U.S. Marine Corps Heritage Center, Marine Corps Base Quantico
Prince William County, Virginia
VDHR File No. 98-0842

Dear Mr. McLeod:

Thank you for your letter inviting our comments on the development of an Environmental Impact Statement for the proposed U.S. Marine Corps Heritage Center at the Marine Corps Base Quantico. In fulfillment of the Marine Corps' responsibilities under Section 106 of the National Historic Preservation Act of 1966, as amended, you will need to coordinate a review of any effects of this undertaking on historic resources that may be present in the project's area of potential effect. Portions of the Marine Corps Base at Quantico have been identified as eligible for listing on the National Register of Historic Places and efforts are ongoing to identify additional significant resources within the Marine Corps Base's holdings. Our department's archives contains information on the resources that have been identified to date. We look forward to working with you and the Marine Corps Base Quantico to ensure that the effects of this undertaking on historic resources are given the appropriate consideration required.

Please contact James Hill (for architecture) or Cara Metz (for archaeology) at 804-367-2323 if you have any questions.

Sincerely,

David H. Dutton
Director, Division of Project Review

c: Sally Meckle, Natural Resources and Environmental Affairs Branch, MCB Quantico
Advisory Council on Historic Preservation

RECEIVED
NOV 25 1998
Harland Bartholomew Associates, Inc.

Petersburg Office
10 Courthouse Avenue
Petersburg, VA 23803
Tel: (804) 863-1620
Fax: (804) 863-1627

Portsmouth Office
612 Court Street, 3rd Floor
Portsmouth, VA 23704
Tel: (757) 396-6707
Fax: (757) 396-6712

Roanoke Office
1030 Penmar Avenue, SE
Roanoke, VA 24013
Tel: (540) 857-7585
Fax: (540) 857-7588

Winchester Office
107 N. Kent Street, Suite 203
Winchester, VA 22601
Tel: (540) 722-3427
Fax: (540) 722-7535

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
P.O. Box 99
6669 Short Lane
Gloucester, Virginia 23061

RECEIVED
OCT 23 1998
Harland Bartholomew & Associates, Inc.

October 22, 1998

Mr. Robert M. McLeod
Parsons HBA
One Park West Circle, Suite 302
Midlothian, Virginia 23113

Re: Heritage Center at Quantico Marine Base, Prince William and Stafford Counties, Virginia

Dear Mr. McLeod:

The U.S. Fish and Wildlife Service has received your request for information on federally listed or proposed endangered and threatened species and their habitats for the referenced project. This letter is submitted in accordance with provisions of the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.).

Mainside North Site - Development of this site appears to be the least environmentally damaging and is the Service's preferred alternative. This site has been thoroughly surveyed for the small whorled pogonia (*Isotria medioloides*), federally listed threatened, with no occurrences documented. In addition, the habitat at this site has been disturbed and no other federally listed species are likely to occur here. Development of this site would not required additional section 7 consultation with the Service pursuant to the ESA.

Mainside South Site - Based on the small whorled pogonia survey for this site, the Service has the following concerns: (1) we are not familiar with the qualifications of the surveyors, (2) the surveys may not have been conducted during the appropriate time of year, and (3) it does not appear that all appropriate habitat at this site was surveyed. No other federally listed species are likely to occur here. Therefore, if additional information can be supplied to alleviate the above concerns, the Service can likely concur that development of this site is not likely to adversely affect federally listed or proposed species.

Russell Road Site - Based on the small whorled pogonia map for this site, the Service has the following concerns: (1) the pogonia colonies are in the center of the proposed project site which may make development of this site concurrent with pogonia protection difficult and (2) it does

not appear that all appropriate habitat at this site was surveyed. Development of this site is not recommended by the Service and would require additional coordination pursuant to the ESA. If this site is selected, please contact this office to determine what additional information is necessary to proceed with the informal consultation process.

If you have any questions or need further assistance, please contact Cindy Schulz of this office at (804) 693-6694, extension 127.

Sincerely,

Karen L. Mayne

Karen L. Mayne
Supervisor
Virginia Field Office

cc: Tim Stamps, Quantico Marine Base

DEPARTMENT OF THE NAVY
NAVAL HISTORICAL CENTER
WASHINGTON NAVY YARD
901 M STREET SE
WASHINGTON DC 20374-5060

IN REPLY REFER TO
5700
Ser FO/00156
15 Oct 98

Mr. Robert M. McLeod
Project Manager
Harland Bartholomew & Associates, Inc.
One Park West Circle, Suite 302
Midlothian, VA 23113

Dear Mr. McLeod:

Thank you for the opportunity to comment on the plans for the Marine Corps' Heritage Center at Quantico, Virginia. The phased implementation plan you present for the Marine Corps Heritage Center looks fine to us at the Naval Historical Center, which is located in the Washington Navy Yard in Southeast Washington, DC, immediately adjacent to the Marine Corps Historical Center. We have been pursuing expansion of our own collections management facilities through Navy military construction channels, but to this date have not had any funding programmed for those purposes. As your planning progresses, should additional justification be required for a facility of this magnitude, the opportunity to consolidate Navy and Marine Corps collections management operations in a Quantico facility is an option with which we would be pleased to be involved.

W. S. Dudley

W. S. DUDLEY
Director of Naval History

RECEIVED
OCT 19 1998
Harland Bartholomew
& Associates, Inc.

APPENDIX B:
Chopawamsic Creek Water Quality Data

Comparison of Surface Water Quality Data for the Chopawamsic Creek to Virginia Water Quality Criteria

		STORET 1ACHO003.65 Chopawamsic at Rte. 1 Bridge (Jan 97 – Dec 98)			USGS 01660110 Chopawamsic at I-95 (Jan 97 – May 98)		
Parameter	**Va WQS**	**Average**	**Maximum**	**Data points Violating WQS/Total**	**Average**	**Maximum**	**Data points ExceedingWQS/Total**
DO	4.0	8.4	5.7 (min)	0/19	11	4.2 (min)	0/16
pH	6.0-9.0	7.0	5.8 (min) 7.6 (max)	1/19	6.4	3.6 (min) 6.8 (max)	2/16
Temperature	32°C	15	24	0/19	10	21	0/16
Fecal Coliform	200	137	300	2/19	NA	NA	NA
Aluminum (total) (ug/L)	87@	ND***	ND***	0/1	784	3,400	8/8
Ammonia (mg/L)	2.5*	0.04	0.05	0/19	0.03	0.07	0/15
Antimony	4,300	ND***	ND***	0/1	22	90	0/8
Chloride (mg/L)	230	5	7	0/19	4	6	0/13
Chromium (total) (ug/L)	NA	ND***	ND***	0/1	1.1	1.6	0/8
Copper (total) (ug/L)	3.6	ND***	ND***	0/1	4	9	4/8
Iron (total) (ug/L)	1,000@	ND***	ND***	0/1	3,440	26,000	11/13
Lead (total) (ug/L)	2.3	ND***	ND***	0/1	3.2	7	3/8
Manganese	NA	ND***	ND***	0/1	965	5,100	0/13
Nickel (total) (ug/L)	6.3	ND***	ND***	0/1	12	68	1/8
Zinc (total) (ug/L)	32.7	ND***	ND***	0/1	21	90	1/8

*Estimated assuming pH of 7.5 at 25°C.
**WQS calculated using a hardness of 25 mg/L.
***Dissolved concentrations analyzed.
****No violation if based on hexavalent chromium WQS of 11 ug/L.
@EPA National Recommended WQC published in Federal Register December 10, 1998 (Va WQS does not exist)

APPENDIX C:
Wetlands
Data Forms

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: QUANTICO Applicant/Owner: MCB QUANTICO Investigator: R-CHN, B-BIDWELL	Date: County: STAFFORD State: VA
Do Normal Circumstances exist on the site? **Yes** No Is the site significantly disturbed (Atypical Situation)? Yes **No** Is the area a potential Problem Area? Yes **No** (If needed, explain on reverse.)	Community ID: Transect ID: 1 Plot ID:

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. Acer rubrum	C	FACW+	9. Lonicera japonica	V	FAC-
2. L. styraciflua	C	FAC	10. Osmunda regalis	H	OBL
3. A. rubrum	S	FACW+	11. Panicum virgatum	H	FAC
4. F. grandifolia	S	FAC+	12. Rhus radicans	H	FAC
5. Cornus ammomum	S	FACW	13. ~~P. virginiana~~		
6. Ilex opaca	S	FACW+	14. S. rotundifolia	V	FAC
7. Boehmeria cylindrica	H	FACW+	15.		
8. L. styraciflua	H	FAC	16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 90% 100%

Remarks:

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- ___ Stream, Lake, or Tide Gauge
- ___ Aerial Photographs
- ___ Other

X No Recorded Data Available

Field Observations:

Depth of Surface Water: ~~NA~~ NE (in.)

Depth to Free Water in Pit: ~~NA~~ NE (in.)

Depth to Saturated Soil: NE (in.)

Wetland Hydrology Indicators:

Primary Indicators:
- ___ Inundated
- ___ Saturated in Upper 12 Inches
- ___ Water Marks
- ___ Drift Lines
- ___ Sediment Deposits
- X Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- X Oxidized Root Channels in Upper 12 Inches
- X Water-Stained Leaves
- ___ Local Soil Survey Data
- ___ FAC-Neutral Test
- ___ Other (Explain in Remarks)

Remarks:

SOILS

Map Unit Name
(Series and Phase): Tetotum / Bibb

Drainage Class: _____

Field Observations
Confirm Mapped Type? Yes No

Taxonomy (Subgroup): hydic fluvaquent

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-2	A	Organic matter			Leaves, debris, etc.
2-4	B	10YR 5/2	7.5YR 5/6	20%	SAND
4-10	B	5Y 6/1	7.5YR 5/6	20%	SAND/SILT

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Aquic Moisture Regime
- X Reducing Conditions
- ___ Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	Yes	No (Circle)
Wetland Hydrology Present?	Yes	No
Hydric Soils Present?	Yes	No

(Circle)
Is this Sampling Point Within a Wetland? Yes No

Remarks: WETLAND 1

Approved by HQUSACE 2/92

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: QUANTICO Applicant/Owner: MCB QUANTICO Investigator: R. CAN B. BIDWELL	Date: County: STAFFORD State: VA
Do Normal Circumstances exist on the site? **Yes** No Is the site significantly disturbed (Atypical Situation)? Yes **No** Is the area a potential Problem Area? Yes **No** (If needed, explain on reverse.)	Community ID: Transect ID: 2 Plot ID:

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. Q. falcata	C	FACU-	9. L. tulipifera	S	FACU
2. Q coccinea	C		10.		
3. Q alba	C	FACU-	11.		
4. P. virginiana	C	I	12.		
5. P. taeda	C	FAC-	13.		
6. Liriodendron tulipifera	C	FACU	14.		
7 L. styraciflua	C	FAC	15.		
8. Q alba	S	FACU-	16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 10%

Remarks:

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- ___ Stream, Lake, or Tide Gauge
- ___ Aerial Photographs
- ___ Other

X No Recorded Data Available

Field Observations:

Depth of Surface Water: NE (in.)

Depth to Free Water in Pit: NE (in.)

Depth to Saturated Soil: NE (in.)

Wetland Hydrology Indicators:

Primary Indicators:
- ___ Inundated
- ___ Saturated in Upper 12 Inches
- ___ Water Marks
- ___ Drift Lines
- ___ Sediment Deposits
- ___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ___ Oxidized Root Channels in Upper 12 Inches
- ___ Water-Stained Leaves
- ___ Local Soil Survey Data
- ___ FAC-Neutral Test
- ___ Other (Explain in Remarks)

Remarks:

SOILS

Map Unit Name
(Series and Phase): _____ Drainage Class: _____
Field Observations
Taxonomy (Subgroup): _____ Confirm Mapped Type? Yes No

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-1	A	Organic Matter			LEAVES DEBRIS
1-10	B	10YR 5/4	NE		SAND
10-12	B	10YR 5/6	NE		SAND

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Aquic Moisture Regime
- ___ Reducing Conditions
- ___ Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? Yes (No) (Circle)
Wetland Hydrology Present? Yes (No)
Hydric Soils Present? Yes (No)

(Circle)
Is this Sampling Point Within a Wetland? Yes (No)

Remarks: UPLAND CHARACTERIZATION

Approved by HQUSACE 2/92

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Mainside South, Quantico Applicant/Owner: Marine Corps Quantico Investigator: Parsons Engineering Science, Inc. Whitney Wagamon	Date: 6/2/99 County: Stafford Co. State: VA
Do Normal Circumstances exist on the site? **Yes** No Is the site significantly disturbed (Atypical Situation)? **Yes** No Is the area a potential Problem Area? Yes **No** (If needed, explain on reverse.)	Community ID: ____ Transect ID: ____ Plot ID: MS-1

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. Acer rubrum	S	FAC	9.		
2. Osmunda cinnamomea	H	FACW	10.		
3. Vitis labrusca	H	FACU	11.		
4. Sphagnum sp.	H	not listed	12.		
5. Juncus effusus	H	FACW+	13.		
6. Symplocarpus foetidus	H	OBL	14.		
7. Carex sp.	H	FACW	15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 83 %

Remarks: The hydrophytic vegetation criterion is satisfied.

HYDROLOGY

__ Recorded Data (Describe in Remarks):
- __ Stream, Lake, or Tide Gauge
- ✓ Aerial Photographs
- __ Other

✓ No Recorded Data Available

Field Observations:

Depth of Surface Water: at surface (in.)

Depth to Free Water in Pit: — (in.)

Depth to Saturated Soil: — (in.)

Wetland Hydrology Indicators:

Primary Indicators:
- ✓ Inundated
- ✓ Saturated in Upper 12 Inches
- __ Water Marks
- __ Drift Lines
- __ Sediment Deposits
- __ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- __ Oxidized Root Channels in Upper 12 Inches
- __ Water-Stained Leaves
- __ Local Soil Survey Data
- __ FAC-Neutral Test
- __ Other (Explain in Remarks)

Remarks: The wetland hydrology criterion is satisfied.

SOILS

Map Unit Name (Series and Phase): Iuka fine sandy loam

Drainage Class: Moderately well drained

Taxonomy (Subgroup): Aquic Udifluvents

Field Observations Confirm Mapped Type? (Yes) No

Profile Description:

Depth (Inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Aquic Moisture Regime
- ___ Reducing Conditions
- ___ Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Remarks)

Remarks: Hydric Soil is assumed to be present, since wetland hydrology is present and does not appear to have been recently altered.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? (Yes) No
Hydric Soils Present? (Yes) No

(Circle)
Is this Samplig Point Within a Wetland? (Yes) No

Remarks: This area satisfies all three criteria for the wetland determination.

Approved by HQUSACE 3/92

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Mainside South, Quantico Applicant/Owner: Marine Corps, Quantico Investigator: Parsons ES, Whitney/Bagamon	Date: 6/2/99 County: Stafford Co. State: VA
Do Normal Circumstances exist on the site? (Yes) No Is the site significantly disturbed (Atypical Situation)? (Yes) No Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Community ID: _____ Transect ID: _____ Plot ID: MS-2

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. Dryopteris neveboracensis	H	not listed	9.		
2. Boehmeria cylindrica	H	FACW+	10.		
3. Symplocarpus foetidus	H	OBL	11.		
4. Nyssa sylvatica	T	FAC	12.		
5. Magnolia virginiana	T	FACW+	13.		
6. Acer rubrum	T	FAC	14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 100%

Remarks: The hydrophytic vegetation criterion is satisfied.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
___ Stream, Lake, or Tide Gauge
___ Aerial Photographs
___ Other
✓ No Recorded Data Available

Field Observations:

Depth of Surface Water: N/A (in.)

Depth to Free Water in Pit: 8 (in.)

Depth to Saturated Soil: Surface (in.)

Wetland Hydrology Indicators:
Primary Indicators:
___ Inundated
✓ Saturated in Upper 12 Inches
___ Water Marks
✓ Drift Lines
✓ Sediment Deposits
✓ Drainage Patterns in Wetlands
Secondary Indicators (2 or more required):
___ Oxidized Root Channels in Upper 12 Inches
___ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC-Neutral Test
___ Other (Explain in Remarks)

Remarks: The wetland hydrology criterion is satisfied.

SOILS

Map Unit Name (Series and Phase): Tuka fine sandy loam

Drainage Class: Moderately well-drained

Field Observations Confirm Mapped Type? (Yes) No

Taxonomy (Subgroup): Aquic Udifluvents

Profile Description:

Depth (Inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
0-1"	A	7.5YR 3/4	N/A	N/A	fine sandy loam
2-6"	B_1	5Y 4/1	7.5YR 5/8	f/d/m	fine sandy loam
6+"	B_2	5YR 5/1	7.5YR 5/8	m/d/m	fine sandy loam

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ✓ Aquic Moisture Regime
- ✓ Reducing Conditions
- ✓ Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present? (Yes) No (Circle)
Wetland Hydrology Present? (Yes) No
Hydric Soils Present? (Yes) No

(Circle)
Is this Samplig Point Within a Wetland? (Yes) No

Remarks:

All three criteria for wetland determination were met.

Approved by HQUSACE 3/92

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Locust Shade Park Applicant/Owner: Investigator: Whitney Hagemann	Date: 5/25/99 County: PWC State: VA
Do Normal Circumstances exist on the site? (Yes) No Is the site significantly disturbed (Atypical Situation)? Yes (No) Is the area a potential Problem Area? Yes (No) (If needed, explain on reverse.)	Community ID: Transect ID: Plot ID: LSP-1

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. Sweetgum	T	FAC	9.		
2. Red maple	T	FAC	10.		
3. Virginia pine	T	FACU	11.		
4. Vitis labrusca	V	FACU	12.		
5.			13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 50%

Remarks: Sweetgum and red maple were by far the dominant trees in the area, so the FAC species are clearly dominant.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
___ Stream, Lake, or Tide Gauge
___ Aerial Photographs
___ Other
✓ No Recorded Data Available

Field Observations:

Depth of Surface Water: — (in.)

Depth to Free Water in Pit: — (in.)

Depth to Saturated Soil: — (in.)

Wetland Hydrology Indicators:
Primary Indicators:
___ Inundated
___ Saturated in Upper 12 Inches
___ Water Marks
✓ Drift Lines
___ Sediment Deposits
✓ Drainage Patterns in Wetlands
Secondary Indicators (2 or more required):
___ Oxidized Root Channels in Upper 12 Inches
✓ Water-Stained Leaves
___ Local Soil Survey Data
___ FAC-Neutral Test
___ Other (Explain in Remarks)

Remarks: The observed indicators of wetland hydrology satisfy the hydrology criterion.

SOILS

Map Unit Name (Series and Phase): Hyattsville sandy loam

Drainage Class: _____

Field Observations Confirm Mapped Type? (Yes) No

Taxonomy (Subgroup): _____

Profile Description:

Depth (Inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
+0-0.5	O	N/A	N/A	N/A	leaf litter
0-5	A	7.5YR 3/1	—	—	organic layer
5-12	B	7.5YR 6/2	7.5YR 5/8	m/f/d	clayey loam
12/18	?	?	?		

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Aquic Moisture Regime
- ___ Reducing Conditions
- ✓ Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Remarks)

Remarks:

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	(Yes) No	(Circle)
Wetland Hydrology Present?	(Yes) No	
Hydric Soils Present?	(Yes) No	

(Circle)

Is this Samplig Point Within a Wetland? (Yes) No

Remarks:

Approved by HQUSACE 3/92

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site: Locust Shoals Park Applicant/Owner: ____ Investigator: Whitney Wagoner	Date: 5/25/99 County: ____ State: ____
Do Normal Circumstances exist on the site? Yes No Is the site significantly disturbed (Atypical Situation)? Yes No Is the area a potential Problem Area? Yes No (If needed, explain on reverse.)	Community ID: ____ Transect ID: ____ Plot ID: LSP-2

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. Cornus florida	T	FACU	9.		
2. Fagus grandifolia	T	FACU	10.		
3. Sweetgum	T/Sap	FAC	11.		
4. Quercus alba	T	FACU-	12.		
5. Virginia Pine	T	FACU	13.		
6.			14.		
7.			15.		
8.			16.		

Percent of Dominant Species that are OBL, FACW or FAC (excluding FAC-). 20%

Remarks: Wetland vegetation criterion not satisfied.

HYDROLOGY

___ Recorded Data (Describe in Remarks):
- ___ Stream, Lake, or Tide Gauge
- ___ Aerial Photographs
- ___ Other

___ No Recorded Data Available

Field Observations:

Depth of Surface Water: ___ (in.)

Depth to Free Water in Pit: ___ (in.)

Depth to Saturated Soil: ___ (in.)

Wetland Hydrology Indicators:

Primary Indicators:
- ___ Inundated
- ___ Saturated in Upper 12 Inches
- ___ Water Marks
- ___ Drift Lines
- ___ Sediment Deposits
- ___ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ___ Oxidized Root Channels in Upper 12 Inches
- ___ Water-Stained Leaves
- ___ Local Soil Survey Data
- ___ FAC-Neutral Test
- ___ Other (Explain in Remarks)

Remarks: No wetland hydrology indicators present.

SOILS

Map Unit Name (Series and Phase): Hyattsville Sandy Loam

Drainage Class: _____

Field Observations Confirm Mapped Type? (Yes) No

Taxonomy (Subgroup): _____

Profile Description:

Depth (Inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/ Size/Contrast	Texture, Concretions, Structure, etc.
+1-1	O				Leaf litter
0-2	A	7.5YR3/2	—	—	Sandy loam
2-12	B	7.5YR6/6	—	—	Sandy loam

Hydric Soil Indicators:

- ___ Histosol
- ___ Histic Epipedon
- ___ Sulfidic Odor
- ___ Aquic Moisture Regime
- ___ Reducing Conditions
- ___ Gleyed or Low-Chroma Colors
- ___ Concretions
- ___ High Organic Content in Surface Layer in Sandy Soils
- ___ Organic Streaking in Sandy Soils
- ___ Listed on Local Hydric Soils List
- ___ Listed on National Hydric Soils List
- ___ Other (Explain in Remarks)

Remarks: Hydric soil criterion not satisfied

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	Yes (No) (Circle)	
Wetland Hydrology Present?	Yes (No)	
Hydric Soils Present?	Yes (No)	
Is this Samplig Point Within a Wetland?	Yes (No)	(Circle)

Remarks:

Approved by HQUSACE 3/92

APPENDIX D: Threatened and Endangered Species Correspondence

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Ecological Services
P.O. Box 99
6669 Short Lane
Gloucester, Virginia 23061

March 11, 1999

Mr. Tim Stamps
NREA Branch (BO46)
3040 McCawley Avenue Suite 2
Quantico Marine Base
Quantico, Virginia 22134-5053

Re: Quantico's Russell Road Small Whorled Pogonia Site, Prince William County, Virginia

Dear Mr. Stamps:

This responds to your February 9, 1999, meeting with Cindy Schulz of this office regarding the referenced site at Quantico Marine Base. This letter is submitted in accordance with provisions of the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.).

During the meeting, you requested that the U.S. Fish and Wildlife Service provide information regarding the portion of the Russell Road site that could be developed without adversely affecting the small whorled pogonia (*Isotria medeoloides*), a federally listed threatened species. As discussed at the meeting, the Service recommends that a small whorled pogonia survey be conducted within all appropriate habitat at the Russell Road site between June 1 and July 20, 1999. Please send us the results of this survey and, if needed, we will revise the buffer to protected any new pogonia sites.

During the meeting, we discussed the buffer that must remain intact to protect the pogonia at this site. The buffer must, at a minimum, provide appropriate canopy cover and protection from changes in hydrology (both surface and sub-surface). The Service has determined that the buffer drawn at the meeting (see attached map) is appropriate. The Service discussed the buffer with the Virginia Department of Conservation and Recreation, Division of Natural Heritage, and they concur that it is appropriate.

At the present time, any activity conducted outside of the buffer will not require consultation with the Service. However, any activity (e.g., training, vegetation removal, construction) proposed within the buffer must be coordinated with the Service to determine if formal consultation pursuant to the ESA will be necessary.

Mr. Tim Stamps

If you have any questions or need further assistance, contact Cindy Schulz at (804) 693-6694, extension 127.

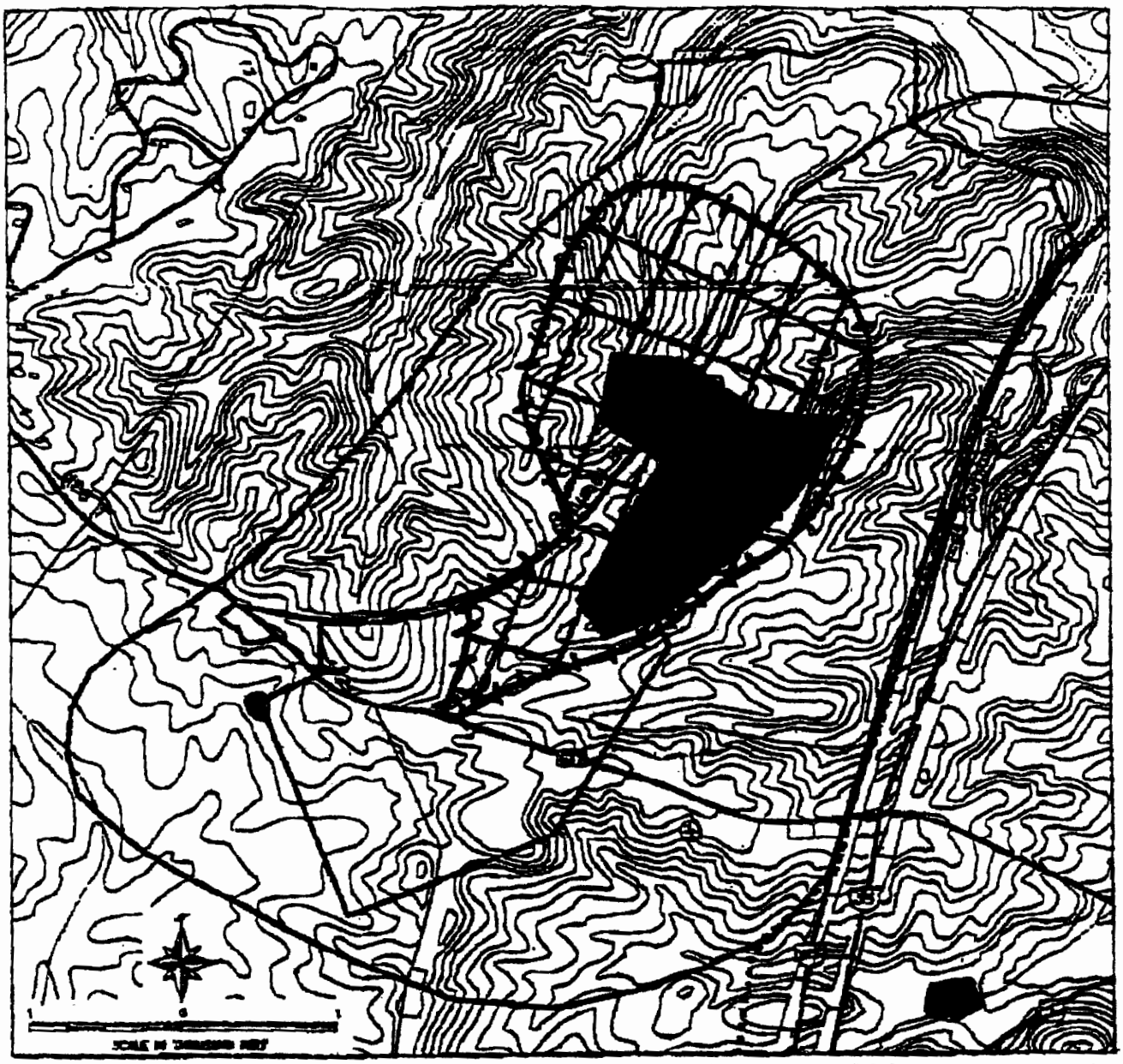
Sincerely,

Karen L. Mayne

Karen L. Mayne
Supervisor
Virginia Field Office

Enclosure

cc: Nancy van Alstine, VDNH



Legend
Heritage Center Development Site
Small Whorled Pogonia Colony

Marine Corps Heritage Center
MCB, Quantico, VA
Environmental Impact Statement

Buffer to Protect the Small Whorled Pogonia at the Russell Road Site, Quantico Marine Base, Prince William County, Virginia.

3/11/99

James S. Gilmore, III
Governor

John Paul Woodley, Jr.
Secretary of Natural Resources

David G. Brickley
Director

COMMONWEALTH of VIRGINIA

DEPARTMENT OF CONSERVATION AND RECREATION

217 Governor Street, 3rd Floor
TDD (804) 786-2121 Richmond, Virginia 23219 (804) 786-7951 FAX (804) 371-2674
http://www.state.va.us/~dcr/vaher.html

Andrea Bedell
Parsons Engineering Science, Inc.
10521 Rosehave Street
Fairfax, VA 22030

5 April 1999

Re: Marine Corps Heritage Center

Dear Ms Bedell:

The Department of Conservation and Recreation's Division of Natural Heritage (DCR) has searched its Biological and Conservation Data System (BCD) for occurrences of natural heritage resources from the area outlined on the submitted map. Natural heritage resources are defined as the habitat of rare, threatened, or endangered plant and animal species, unique or exemplary natural communities, and significant geologic formations.

According to the information currently in our files, small whorled pogonia (*Isotria medeoloides*, G2G3/S2/LT/LE) has been documented in the project area and may occur at the project site if suitable habitat exists. Small whorled pogonia grows in a variety of woodland habitats in Virginia, but tends to favor mid-aged woodland habitats on gently north or northeast facing slopes often within small draws. It is quite natural for plants of this species to remain dormant in the soil for long periods of time. Direct destruction as well as habitat loss and alteration are principle reasons for the species' decline (Ware, 1991). Please note that small whorled pogonia is currently classified as threatened by the United States Fish and Wildlife Service (USFWS) and as endangered by the Virginia Department of Agriculture and Consumer Services (VDACS).

Due to the potential for this site to support occurrences of small whorled pogonia, DCR recommends an inventory of suitable habitat in the study area. With the survey results we could more accurately evaluate potential impacts to natural heritage resources and offer specific protection recommendations for minimizing impacts to any documented resources. DCR further recommmends coordinating with the USFWS and VDACS.

DCR-Division of Natural Heritage biologists are qualified and available to conduct inventories for rare, threatened, and endangered species. Please contact J. Christopher Ludwig, Natural Heritage Inventory Manager, at (804) 786-7951 to discuss arrangements for field work. A list of other individuals who are qualified to conduct inventories may be obtained from the United States Fish and Wildlife Service (USFWS).

Any absence of data may indicate that the project area has not been surveyed, rather than confirm that the area lacks additional natural heritage resources. New and updated information is continually added to BCD. Please contact DCR for an update on this natural heritage information if a significant amount of time passes before it is utilized.

A fee of $65.00 has been assessed for the service of providing this information. Please find enclosed an invoice for that amount. Please return one copy of the invoice along with your remittance made payable to the Treasurer of Virginia, Department of Conservation and Recreation, 203 Governor Street, Suite 402, Richmond, VA 23219, ATTN: Cashier. Payment is due within thirty days of the invoice date.

Should you have any questions or concerns, feel free to contact me at 804-371-2708. Thank you for the opportunity to comment on this project.

Sincerely,

Lesa S. Berlinghoff

Lesa S. Berlinghoff
Project Review Coordinator

cc Cindy Shulz, USFWS
John Tate, VDACS

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Ecological Services
P.O. Box 99
6669 Short Lane
Gloucester, Virginia 23061

April 6, 1999

Ms. Andrea L. Bedell
Parsons Engineering Science, Inc.
10521 Rosehaven Street
Fairfax, Virginia 22030

Greetings:

The U.S. Fish and Wildlife Service has received your request to review the attached project for potential impacts to federally listed or proposed endangered and threatened species and designated critical habitat in Virginia pursuant to the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.). Attached are lists of species with federal status and species of concern that have been documented or may occur in the county(s) where your project is located. These lists were prepared by this office and are based on information obtained from previous surveys for rare and endangered species.

Due to the limited staff in this office, we are unable to review projects in a timely manner. Therefore, we request that you send the attached project to the following state agencies for review:

Plant Protection
Virginia Department of Agriculture and Consumer Services
P.O. Box 1163
Richmond, VA 23218
(804) 786-3515

Virginia Department of Game and Inland Fisheries
Environmental Services Section
P.O. Box 11104
Richmond, VA 23230
(804) 367-1000

Virginia Department of Conservation and Recreation
Division of Natural Heritage
217 Governor Street, 3rd.Floor
Richmond, VA 23219
(804) 786-7951

It is recommended that all of the agencies named above review the project because each maintains a different database and has differing expertise and/or regulatory responsibility. **IF ANY OF THESE AGENCIES DETERMINES THAT YOUR PROJECT MAY IMPACT A FEDERALLY LISTED, PROPOSED, OR CANDIDATE SPECIES OR CRITICAL HABITAT, PLEASE CONTACT THIS OFFICE; OTHERWISE, FURTHER CONTACT WITH THIS OFFICE IS NOT NECESSARY.**

If you have any questions or need further assistance, please contact Cindy Schulz of this office at (804) 693-6694, extension 127.

Sincerely,

Karen L. Mayne

Karen L. Mayne
Supervisor
Virginia Field Office

Enclosures

James S. Gilmore, III
Governor
John Paul Woodley, Jr.
Secretary of Natural Resources

COMMONWEALTH *of* VIRGINIA

Department of Game and Inland Fisheries

William L. Woodfin, Jr.
Director

April 27, 1999

Andrea L. Bedell
Parsons Engineering Science, Inc.
10521 Rosehaven Street
Fairfax, VA 22030

RE: Marine Corps Base Quantico, ESS# 12331

Dear Ms. Bedell:

This letter is in response to your request for information on the presence of threatened or endangered species in the vicinity of Triangle, Virginia. Information about fish and wildlife species was generated from our agency's computerized Fish and Wildlife Information Online Service, which describes animals that are known or may occur in a particular geographic area. Field surveys may be necessary to determine the presence or absence of some of these species on or near the proposed area. Also, additional sensitive animal species may be present, but their presence has not been documented in our information system.

The search criterion for listed species was performed for a 1.5 mile radius around Triangle, Virginia. **The results indicate that the federal threatened bald eagle (*Haliaeetus leucocephalus leucocephalus*) has been documented within a 1.5 mile radius of the search area and may occur at the project site if appropriate habitat exists.**

Endangered plants and insects are under the jurisdiction of the Virginia Department of Agriculture and Consumer Services, Bureau of Plant Protection. Questions concerning sensitive plant and insect species, which may be found at the project site, should be directed to John Tate at (804) 786-3515. Please note that this response does not address any other environmental concerns. These issues are analyzed by our Environmental Services Section, in conjunction with interagency review of applications for state and federal permits. If you have any questions in this regard, please contact Ray Fernald at (804) 367-8999.

There is a processing charge of $25.00 for our response. Please remit a check, made payable to **TREASURER OF VIRGINIA**, within 30 days to MaryBeth Murr at the address listed on the first page. Include a copy of this letter with your payment to ensure that your account is properly credited.

The Fish and Wildlife Information Service, the system of databases used to provide the information in this letter, can now be accessed via the Internet! The Service currently provided access to current and comprehensive information about all of Virginia's fish and wildlife resources, including those listed as threatened, endangered, or special concern; colonial birds; waterfowl; trout streams; and all wildlife. Users can choose a geographic location and generate a report of species known or likely to occur around that point. From our main web page, at www.dgif.state.va.us, choose the hyperlink to " Wildlife Information Online". For more information, please contact Kathy Quindlen, Online Service Coordinator, at (804) 367-9717.

Thank you for your interest in the wildlife resources of Virginia.

Sincerely,

Karen Reay

Karen Reay
Research Specialist, Sr.

cc: R.T. Fernald, Manager - Environmental Services Section
Karen Mayne, USFWS

J. Carlton Courter, III
Commissioner

COMMONWEALTH *of* VIRGINIA

Department of Agriculture and Consumer Services
Division of Consumer Protection
Office of Plant & Pest Services
PO Box 1163, Richmond, Virginia 23218
Phone: 804/786-3515 • Fax: 804/371-7793 • Hearing Impaired: 800/828-1120
http://www.state.va.us/~vdacs/vdacs.htm

August 5, 1999

Ms. Andrea L. Bedell
Parsons Engineering Science, Inc.
10521 Rosehaven Street
Fairfax, VA 22030

RE: Quantico Marine Base

Dear Ms. Bedell:

This letter is in response to your request for information on listed threatened or endangered plant or insect species in the vicinity of the proposed location for the Marine Corps Heritage Center Locust Shade Park on Quantico Marine Base in Prince William County, Virginia. To date, Virginia Department of Agriculture and Consumer Services records indicate that no threatened or endangered plant or insect species have been documented in the area outlined on the map that you provided. The small whorled pogonia has been documented in the Quantico Marine Base and Prince William Forest Park area and could occur in the project area if appropriate habitat is present.

The Virginia Department of Agriculture and Consumer Services has jurisdiction over listed plant and insect species only. The Virginia Department of Game and Inland Fisheries has jurisdiction over all other listed threatened or endangered species. Additional information on unique geologic formations, rare or critical habitat, rare and candidate species can be obtained from the Virginia Department of Conservation and Recreation, Division of Natural Heritage.

Thank you for your interest in the endangered or threatened plant and insect species in Virginia. If you have any questions or need any additional information, please contact me.

Sincerely,

John R. Tate
Endangered Species Coordinator

APPENDIX E: Applicability Analysis

RECORD OF NON-APPLICABILITY

MARINE CORPS HERITAGE CENTER
MARINE CORPS BASE
QUANTICO, VIRGINIA

This Record of Non-Applicability (RONA) is prepared in accordance with Navy Policy, to demonstrate compliance with the Conformity provisions of the Clean Air Act. The RONA is based on the findings of the attached Applicability Analysis, which provides detailed information on project related air emissions.

The Conformity Regulations were formulated as a process to insure that emissions from proposed Federal actions do not interfere with a state's mandated achievement of National Ambient Air Quality Standards. The Environmental Protection Agency has established threshold levels of specific pollutants within the Conformity regulations as a guide for triggering the initiation of a formal coordination process with the affected state. Federal actions with projected emissions below this level would be considered "Nonapplicable" to the Conformity regulations.

The results of the Applicability Analysis show that annual emissions from construction or operation of the project components associated with the Marine Corps Heritage Center are below the established threshold levels making this action "Nonapplicable" to the Conformity requirements.

_____

APPLICABILITY ANALYSIS
HERITAGE CENTER EIS - MCB QUANTICO, VIRGINIA

A general discussion of air quality in the counties of Stafford and Prince William and surrounding areas is presented in this section to characterize the air quality in the study area.

1.0 EXISTING CONDITIONS

Meteorology/Climate

The following meteorological data for the project area was collected by the Quantico Weather Service located on the base. This data is considered to be representative of the meteorological conditions at the proposed sites.

Winds. Data collected by the Weather Service indicate that prevailing winds are predominantly north-west with a mean speed of 6 knots (approximately 6.9 miles [11 kilometers] per hour).

Temperatures. Temperatures at MCBQ are normally 2 to 3 degrees Fahrenheit (1.1 to 1.7 degrees Celsius [^{o}C]) higher than outlying areas due to the influence of the Potomac River. Summers are generally warm and humid and winters are mild. The coldest weather occurs during January and February, while the warmest weather occurs in late July and early August. The annual mean temperature is 57 degrees Fahrenheit (12°C). Mean relative humidity is approximately 70 percent.

Precipitation. Rainfall is relatively moderate, averaging approximately 38 inches (97 centimeters) annually and 3.2 inches (8 centimeters) monthly. There is no dry or moist season, but the month of October has the lowest average of 2.5 inches (6 centimeters), while August has the highest average of 4.3 inches (11 centimeters). Mean annual snowfall at MCBQ is approximately 16 inches (41 centimeters), but rapid melt-off results in small accumulations. More than 10 inch (25 centimeter) accumulations are rare. The mean snowfall for the months of

December through March (when 92% of snowfall occurs) is 3 inches (8 centimeters), 4 inches (10 centimeters), 4 inches (10 centimeters), and 3 inches (8 centimeters), respectively.

2.0 CURRENT AIR QUALITY CONDITIONS

Marine Corps Base Quantico (MCBQ) straddles the border between the counties of Prince William and Stafford; however, the site selected for Heritage Center construction would be located entirely within Stafford County or Prince William County, depending on which alternative site is chosen. Stafford and Prince William Counties and MCBQ are all located in the metropolitan Washington Ozone Nonattainment Area, which is classified as being in serious nonattainment. Volatile Organic Compounds (VOCs) and nitrous oxides (NO_x) are the main precursors of ozone.

Review of ozone monitoring data measured by Virginia's Department of Environmental Quality (VDEQ) for calendar years 1987 through 1997 indicates that Prince William County exceeded the federal ozone standard of 0.124 parts per million (ppm) twice during 1995. In 1998, Prince William County exceeded the eight hour average maximum ozone concentration thirteen times. Stafford County exceeded the eight hour average ten times in 1998.

In order to achieve attainment with the NAAQS, Virginia has submitted to the EPA a State Implementation Plan (SIP) with yearly updates that details air pollution control measures. The control measures include three categories: (1) stationary and non-highway source controls, (2) vehicle inspection and maintenance programs, and (3) transportation control.

2.1 AIR POLLUTION SOURCES

Ozone is a secondary pollutant, meaning that it is formed in the atmosphere by the reaction of VOCs and NO_x in sunlight. In the Quantico/Prince William/Stafford area, 28 percent of the VOC compounds that form ozone come from mobile sources. About one-third of this "mobile source" pollution is attributed to commuting traffic and the rest comes from the trips throughout the day, such as business travel or truck deliveries. Large industrial facilities such as

power plants and factories cause only a small portion (about 3 percent) of the VOC emissions in the Quantico/Prince William/Stafford areas. The remainder VOC portion comes from a multitude of small sources, including: printers, service stations, construction contractors, paints and cleaning solvents.

The other pollutant of concern is CO. The main source of CO in the region is automobile exhaust. Localized high concentrations of CO may occur at heavily traveled intersections and along the Interstate 95 (I-95) and U.S. Route 1 corridors. The highest levels of CO generally occur during the winter months when traffic is high, average speeds are generally low and atmospheric conditions (temperature inversions) trap pollutants near ground level. Other major sources of CO include stationary land uses. Generally, these emissions are discharged and dispersed from tall stacks which affect ground-level concentrations to a lesser extent than mobile source emissions that are discharged near or at ground level.

3.0 APPLICABILITY ANALYSIS

The Environmental Protection Agency (EPA) has promulgated numerous regulations designed to implement the provisions of the Clean Air Act (CAA). A key initiative of the implementation program is the requirement for State Implementation Plans (SIPs), in which each state establishes goals to achieve clean air standards within a given time frame. The SIP approach more effectively recognizes localized conditions and integrates community development plans with local regulations to achieve CAA goals. To assess the degree to which Federal project will affect the attainment of SIP objectives, the EPA established the General Conformity Regulations (40 CFR, Parts 51 and 93). For each proposed action that a Federal agency is supporting, licensing, permitting, or approving in an area that is in nonattainment of the NAAQS, that agency must determine whether or not the proposed action would interfere with the clean air goals in the SIP.

This Applicability Analysis has been prepared to identify project-related emissions and determine whether the Conformity regulations are applicable to the project.

3.1 PROJECT DESCRIPTION

The Marine Corps has proposed the development of a Heritage Center complex at or adjacent to the Marine Corps Base (MCB) Quantico for Marines, their families and the general public. The Marine Corps Heritage Center (MCHC) would consolidate existing and interpretive and curatorial functions that are located at MCB Quantico, the Washington Navy Yard, and from other installations. The MCHC would consist of facilities suitable to store, curate, and display Marine Corps artifacts to enhance the presentation of Marine Corps history, promote military and educational opportunities, and accommodate unique military events and conferences. The MCHC would provide enhanced facilities to curate and exhibit existing Marine artifacts. Proximity to MCB Quantico will allow for collaboration with the Marine Corps University and will support educational programs for other students.

Initial studies identified three potential on-base sites, two off-base sites and one combined site for construction of the MCHC. One of the off-base sites was eliminated as a candidate due to a lack of access and cost of acquisition. The remaining five potential sites for the proposed construction are:

- The Russell Road Site is located on-base, west of Interstate 95 near the intersection of MCB-1 and Russell Road. Constructing on this site may involve a minor amount of existing building demolition and road relocation.
- The Mainside South Site is located on-base, east of U.S. Route 1 and Telegraph Road (VA-637). This site is primarily forested.
- The Mainside North Site is located on-base, east of US-1 and south of VA-619 (Fuller Road on-base). Construction on this site may involve relocation or demolition of existing housing.
- The Locust Shade Park Site is located off-base, west of US-1 and south of VA-619. This site is currently owned by Prince William County and used for passive recreation.
- The Northern Combined Site consists of the Locust Shade Park Site and the Mainside North Site. Public-oriented MCHC facilities would be located on the off-base Locust Shade Park Site while administration and storage would be concentrated at the on-base Mainside North Site.

Construction of the MCHC is anticipated to occur in three separate phases, with the majority of the construction occurring during the second phase. In addition to construction of the MCHC buildings, a parade ground, road and parking lot system, and various other outdoor amenities are anticipated. Total visitorship is expected to be approximately 400,000 people per year, although a percentage of these visitors are not expected to be new to MCB Quantico.

3.2 AIR QUALITY REGULATIONS

The EPA defines ambient air in 40 CFR 50 as "that portion of the atmosphere, external to buildings, to which the general public has access." In response to the Clean Air Act (CAA) of 1970 and the Clean Air Act Amendments (CAAA) of 1997 and 1990, the US Environmental Protection Agency (EPA) has established the National Ambient Air Quality Standards (NAAQS) for the protection of human health and welfare. The NAAQS include standards for the most common air pollutants: carbon monoxide (CO), ozone (O_3), particulate matter (PM), nitrogen dioxide (NO_2), sulfur oxides (SO_x), and lead (Pb). The current NAAQS are presented in Table 1 below. The EPA assesses the status of compliance with the NAAQS for geographic regions specified throughout the United States. Regions which meet the NAAQS are called, "attainment areas," while regions which do not meet the NAAQS are called "nonattainment areas."

There are two types of air quality standards: Primary and Secondary. Primary standards are designed to protect sensitive segments of the populations from adverse health effects which may result from exposure to criteria pollutants. Secondary standards are designed to protect human health and welfare, and in some cases, are more stringent than the primary standards. Human welfare is considered to include the natural environment (vegetation) and the man-made environment (physical structures).

Under the CAA and CAAA, state and local air pollution control agencies have the authority to adopt and enforce ambient air quality standards (AAQS) more stringent than the NAAQS. Although the EPA has the ultimate responsibility for protecting ambient air quality, each state and local government has the primary responsibility for air pollution prevention and control. The CAA requires that each state submit a State Implementation Plan (SIP) which describes how the state will attain and maintain air quality standards in nonattainment areas. The SIP must be approved by EPA for each nonattainment criteria pollutant. Virginia

developed a SIP and in order for projects to comply with the CAA and CAAA and they must conform with attainment plans documented in the SIP.

3.3 CONFORMITY APPLICABILITY ANALYSES

This applicability analysis was conducted in order to identify the potential increases in criteria air pollutant emissions associated with the project and to determine if the proposed action is subject to the General Conformity Rule established in 40 CFR, Part 93, entitled: "Determining Conformity of Federal Actions to State or Federal Implementation Plans" (the rule). The rule applies to those federal actions which are located in areas of nonattainment of the NAAQS.

Since this federal action is located within an area designated by EPA as a nonattainment area for ozone, a General Conformity rule applicability analysis is warranted. The analysis estimated potential increases in emissions of ozone precursor pollutants; volatile organic compounds (VOCs) and nitrogen oxides (NO_x) associated with action. The estimated emissions were compared to the *de minimis* levels of 50 tpy for each of these pollutants. If the estimated emissions for the action are below *de minimis* thresholds, the action is assumed to conform with the SIP and would not be applicable to the Conformity regulations. If the action exceeded the *de minimis* threshold, however, MCBQ would be required to prepare and coordinate a formal Conformity Determination with state regulators, potentially resulting in a total offset of project-generated emissions or incorporation of the project by the state into its SIP.

As a Federal action, the proposed MCHC construction must adhere to the requirements of the General Conformity Rule. While the rule does not include thresholds for short-term impacts (i.e. less than annual) actions below the annual thresholds are presumed to comply with the SIP's plans to achieve the NAAQS through annual emissions reductions. It is also noted that the action is not anticipated to generate emissions, either hourly or daily, at levels significant enough to have any significant effects on ambient air.

Table 1

National Ambient Air Quality Standards (NAAQS)

Pollutant	Primary (Health Related)		Secondary (Welfare Related)	
	Type of Average	**Standard Level Concentration** (a)	**Type of Average** (a)	**Standard Level Concentration**
CO	8-hour	9 ppm (10 µg/m^3)	No Secondary	Standard
	1-hour	35 ppm (40 µg/m^3) (b)	No Secondary	Standard
NO_2	Annual Arithmetic Mean	0.053 (100 µg/m^3)	Same as Primary	Standard
O_3	Maximum Daily 8-hr. Average	0.08 ppm (235 µg/m^3) (c)	Same as Primary	Standard
Pb	Maximum Quarterly Average	1.5 µg/m^3	Same as Primary	Standard
PM-2.5	Annual Arithmetic Mean	15 mg/m^3	Same as Primary	Standard
	24-hour	65 mg/m^3	Same as Primary	Standard
PM-10	Annual Arithmetic Mean	50 µg/m^3 (d)	Same as Primary	Standard
	24-hour	150 µg/m^3 (d)	Same as Primary	Standard
SO_2	Annual Arithmetic Mean	80 µg/m^3 (0.03 ppm)	3-hour (0.50 ppm) (b)	1,300 µg/m^3
	24-hour	365 µg/m^3 (b)		

a Parenthetical value is an approximately equivalent concentration.

b Not to be exceeded more than once per year.

c The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is equal to or less than 1, as determined as per the Ozone NAAQS.

d Particle standards use PM-10 (particles less than 10 µ in diameter) as the indicator pollutant. The annual standard is attained when the expected annual arithmetic mean concentration is less than or equal to 50 µg/m^3; the 24-hour standard is attained when the expected number of days per calendar year above 150 µg/m^3 is equal to or less than 1; as determined per the PM NAAQS.

Source: The US EPA

3.3.1 CONSTRUCTION EMISSIONS

Construction emissions for this action would result from operation of heavy equipment and delivery vehicles. Emissions would also occur from the application of paint to building surfaces.

Demolition Emissions

A minor amount of building demolition is anticipated prior to construction of MCHC structures if the Russell Road site is the selected alternative. Demolition activities will increase particulate matter emissions in the short term, but are not expected to contribute to longer-term emission increases for any of the criteria pollutants. Therefore, emissions estimates were not prepared for demolition activities associated with the proposed project, except to the extent that the totals for heavy equipment include an allowance for demolition.

Heavy Equipment Emissions

Heavy equipment emissions were estimated using emissions rates from the EPA document *Compilation of Air Pollutant Emission Factors Volume II: Mobile Sources (AP-42).* Emissions in pounds per hour of equipment use were averaged for several classes of construction diesel equipment, multiplied by an assumed amount of equipment in use at the site and subsequently by an assumed number of operating hours per year. Emissions factors from AP-42 are presented in Table 2 below for the various types of equipment anticipated for use on the project. Assumptions regarding the number of construction days and numbers of equipment pieces used during construction are provided below the table. An example calculation is provided . Annual emissions attributable to each construction equipment piece are summarized in the table. A total of 1.62 tons (1,470 kilograms) per year of VOCs and 24.74 tons (22,444 kilograms) per year of NO_x are estimated for heavy construction equipment. Delivery vehicle emissions are included under "trucks" in Table 2 below. It was assumed that construction equipment emissions would be the same for all proposed construction sites.

Table 2

	Emissions Factors (lbs/hr/piece of equipment)		Annual Emissions (tpy)	
Equipment	**VOC**	**NO_x**	**VOC**	**NO_x**
Bulldozers (2)	0.192	4.166	0.369	7.999
Loaders (2)	0.25	1.89	0.480	3.629
Excavator (1)	0.152	1.691	0.146	1.623
Scrapers (1)	0.282	3.640	0.271	3.494
Trucks (2)	0.093	2.083	0.179	3.999
Cranes (2)	0.095	2.083	0.179	3.999
Total			1.624	24.743

Assumptions: construction will take 240 days, 8 hours per day (1,920 hrs total)

2 bulldozers, 2 loaders, 1 excavator, 1 scraper, 2 trucks, and 2 cranes.

Example calculation for NO_x emissions from loaders:

(2 loaders)(1.89 lb/hr)(1,2920 hrs/yr)(1 ton/2,000 lbs) = 3.63 tpy (1,647 kilograms) NO_x

Painting Emissions

VOC emissions from construction paint were estimated for both office and garage space. The amount of VOC emissions was very conservatively calculated based on the estimated amount of paint necessary to cover available wall and ceiling space, and to paint vehicle parking space lines. Total buildout for the MCHC construction is estimated to be 460,000 square feet (42,735 square meters). It is estimated that the total paintable wall space will be approximately

115,000 square feet (10,684 square meters). This amount is assumed to be the same for all three alternative proposed construction sites.

The total paintable wall space was divided by a paint coverage in gallons per square feet (gal/ft^2) to get gallons of paint. The assumed VOC content per gallon of paint was then multiplied by the number of gallons used to produce the estimated amount of VOC emissions from painting. For calculation purposes, it was assumed that three coats of paint would be used (one primer and two finish), that water-based latex paint with a VOC content of 3 pounds per gallon would be used, and that one gallon of paint would cover 400 square feet. This calculation provides an estimate of painting VOC emissions attributable to construction activities of 6.90 tons (5,525 kilograms) of VOC over the duration of the building finishing (assumed to be 1 year for calculation purposes).

Paint use for parking space striping was estimated to be 0.05 tpy based on one 4" wide stripes for each of 400 parking spaces.

Asphalt Emissions

Air emissions expected to result from the application of asphalt would be negligible because emulsified asphalt would be used. The emissions of VOC from asphalt paving equipment is included under the totals for heavy equipment.

Pollutant	Heavy Equipment TPY	Painting TPY	Total TPY
VOC	1.624	6.95	8.574
NOx	24.743	N/A	24.743

3.3.2 OPERATIONS EMISSIONS

Operation emissions can be broadly defined to fall within two categories: direct emissions (such as boilers, generators, and heaters) and indirect emissions (such as employee, delivery and visitor vehicles). Direct emissions from facility operations are considered to be those emitted by the facility as part of its normal daily activities, primarily from the operation of facility boilers. Indirect emissions are considered to be those emissions generated by employee vehicle trips and facility delivery vehicles traveling on the site. It is assumed that operating emissions will be common to all proposed alternatives.

3.3.2.1 DIRECT EMISSIONS

Emissions estimates for natural gas fired boilers and heaters can be derived from the maximum annual consumption of natural gas anticipated for the MCHC. The heat energy demand of approximately 33,220 million Btu per year projected for full build-out and AP-42 emissions factors used for estimating.

Approximately 12 operational demonstrations would occur per year with each event involving about one to two hours of vehicle/aircraft operation. This level of operation would amount to approximately 24 hours per year. Emissions generated by these activities were based on an event involving three V-22 aircraft. The annual emissions generated by these events are estimated at 0.10 tpy of VOCs and 0.69 tpy of NOx.

3.3.2.2 INDIRECT EMISSIONS

Daily vehicle emissions during operation were estimated for employee vehicle trips, on-site delivery vehicle travel, and on-site visitor vehicle travel. The vehicle emissions rates used were based on rates calculated by using a combination of the MOBILE5 air modeling program which estimates emissions per vehicle mile traveled. This estimate uses a number of parameters like age distribution, average speed, distribution of vehicle types, etc. to produce average factors that can be applied to overall traffic data.

MOBILE5B was used with input files supplied by Metropolitan Washington Council of Governments (MWCOG) for Stafford County for year 2015 with an assumed average trip speed

of 25 miles (40 kilometers) per hour and the standard (FTP) operating mode fractions. The annual average daily maximum and minimum temperatures and average annual temperature based on on-site data from Quantico were used as follows:

annual average temperature: 57° F (12° C)

annual average daily maximum temperature: 67° F (20° C)

The results of the modeling are that the average fleet emission factors for VOC, NO_x, and CO are:

VOC	0.68 grams/mile (0.42 grams/kilometer)
NO_x	1.00 grams/mile (0.62 grams/kilometer)
CO	7.23 grams/mile (4.49 grams/kilometer)

3.3.2.3 ESTIMATION OF NET EMISSIONS INCREASE

To estimate the traffic increase resulting from the project, the transportation data were divided into three components (museum visitors [not including conference center attendees], employees, conference center attendees) and vehicle miles calculated as follows:

(1) Museum Visitors

Projected future museum visitors (total): 417,000 per year

Of this total, 5,000 visitors per year are attributed to conference attendees and are treated elsewhere.

Visitors to existing museum: 30,000 per year

Net increase: (417,000 - 5,000 - 30,000) = 382,000 visitors per year

Market survey of museum visitors indicates most visitors travel in small groups:

6% with 1 person per vehicle
55% with 2 people per vehicle
14% with 3 people per vehicle
19% with 4 people per vehicle
6% with between 5 and 40 people per vehicle (average of 10 people per vehicle)

Assume the future distribution of visitors remains the same.

382,000 people x 0.06 = 2,920 people x (vehicle/1 person) = 22,920 vehicles
382,000 people x 0.55 = 210,000 people x (vehicle/2 people) = 105,050 vehicles
382,000 people x 0.14 = 53,480 people x (vehicle/3 people) = 17,827 vehicles
382,000 people x 0.19 = 72,580 people x (vehicle/4 people) = 18,145 vehicles
382,000 people x 0.06 = 22,920 people x (vehicle/10 people) = 2,292 vehicles

This is a net increase of 166,234 vehicles per year due to museum visitors.

The market survey of museum visitors provides some information on where the current visitors traveled from to reach the museum. This information suggests an average travel distance (one-way) on the order of 25 miles (or about 50 miles round-trip).

166,234 vehicles/yr x 50 miles/vehicle = 8.31 x 10^6 miles/yr (net increase)

VOC: 0.68 g/mi x 8.31 x 10^6 mi/yr x (lb/453.59 g) x (ton/2000 lb) = 6.23 TPY
NO_x: 1.00 g/mi x 8.31 x 10^6 mi/yr x (lb/453.59 g) x (ton/ 2000 lb) = 9.16 TPY
CO: 7.23 g/mi x 8.31 x 10^6 mi/yr x (lb/453.59 g) x (ton/ 2000 lb) = 66.23 TPY

(**2**) **Employees**

The museum is expected to result in a net increase of 73 employees and will be open 6 days per week. New employees are expected to have a similar residency pattern as existing and would drive alone (net increase of 73 vehicles per day).

County of Residence	State	% of Employees	Avg. Distance from Base (miles)
Prince William	VA	55	7
Stafford	VA	25	15
Spotsylvania	VA	13	30
Other	VA/MD	7	40

73 vehicles x 0.55 x 2 trips/(vehicle-day) x 7 miles/trip = 562.1 miles/day
73 vehicles x 0.25 x 2 trips/(vehicle-day) x 15 miles/trip = 547.5 miles/day
73 vehicles x 0.13 x 2 trips/(vehicle-day) x 30 miles/trip = 569.4 miles/day
73 vehicles x 0.07 x 2 trips/(vehicle-day) x 40 miles/trip = 408.8 miles/day

Net increase is 2087.8 miles/day x 6 x 52 = 651,394 miles/yr

VOC: 0.68 g/mile x 653,183 miles/yr x (lb/453.59 g) x (ton/2000 lb) = 0.49 TPY
NO_x: 1.00 g/mile x 653,183 miles/yr x (lb/453.59 g) x (ton/2000 lb) = 0.72 TPY
CO: 7.23 g/mile x 653,183 miles/yr x (lb/453.59 g) x (ton/2000 lb) = 5.21 TPY

(**3**) **Conference Center Visitors**

A marketing survey prepared for the project estimates 5,000 museum visits by people attending conferences.
This is based on an estimate of museum visits by 20% of conference attendees.
This translates to an estimate of 25,000 conference attendees per year (all new trips).
Assume each conference attendee has a vehicle.
Assume an average driving distance of 25 miles to and from Quantico for each conference attendee.
Conference attendees will likely stay on the base or at nearby hotels.
Assume an additional 50 miles of driving per person per conference.
This yields a total of 100 miles per vehicle for conference attendees.
25,000 vehicles/yr x 100 miles/vehicle = 2,500,000 miles/yr
VOC: 0.68 g/mile x 2.5 x 10^6 miles x (lb/453.59 g) x (ton/2000 lb) = 1.87 TPY
NO_x: 1.00 g/mile x 2.5 x 10^6 miles x (lb/453.59 g) x (ton/2000 lb) = 2.76 TPY
CO: 7.23 g/mile x 2.5 x 10^6 miles x (lb/453.59 g) x (ton/2000 lb) = 19.92 TPY

Other emissions resulting from operation of heating and cooling plants, and operational demonstrations at the complex were calculated as follows:

(4) Heating and Cooling Plant

VOC: 0.0058 lb/10^6 Btu x 33,220 ÷ 2,000 lbs = 0.096 TPY
NO_x: 0.1 lb/10^6 Btu x 33,220 ÷ 2,000 lbs = 1.661 TPY
CO: 0.021 lb/10^6 Btu x 33,220 ÷ 2,000 lbs = 0.349 TPY

(5) Operational Demonstrations (V-22 aircraft)

AIRCRAFT V-22

			FUEL EMISSION FACTOR						EMISSIONS				
OPS	TIME/HRS	RATE	CO	NOX	VOC	PM10	SO2	# ENG	CO	NOX	VOC	PM10	SO2
IDLE	0.333	640	0.0034	0.0035	0.0019	0.0134	0.0004	6	0.0021738	0.0022378	0.0012148	0.00856742	0.0002557
DEPT	0.167	1709	0.0017	0.009	0.0008	0.00955	0.0004	6	0.0014556	0.0077059	0.000685	0.0081768	0.0003425
ARR	0.167	1275	0.00213	0.00736	0.00112	0.01055	0.0004	6	0.0013606	0.0047014	0.0007154	0.00673908	0.0002555
T&G	0	1536.6667	0.0018767	0.0083633	0.0009333	0.0098833	0.0004	6	0	0	0	0	0
PATTERN	0	1536.6667	0.0018767	0.0083633	0.0009333	0.0098833	0.0004	6	0	0	0	0	0
LOW	0.333	1626	0.0018	0.00873	0.00088	0.00955	0.0004	6	0.0029239	0.0141808	0.0014294	0.01551277	0.0006497
						TOTAL			0.0079138	0.0288258	0.0040446	0.03899607	0.0015035
TOTAL	1					RUNS PER EVENT			2	2	2	2	2
						TOTAL PER EVENT			0.0158277	0.0576516	0.0080893	0.07799214	0.003007
						EVENTS PER YEAR			12	12	12	12	12
						TPY			0.19	0.69	0.10	0.94	0.04

total event events	1 hour per run	flight time		
3	idle	20 min		
2	depart	10 min		
2	low work	20 min	* = 6 =	2 engines,
2	arrival	10 min		3 aircraft
	TOTAL	1 HOUR		

Summary of Net Annual Emissions Increase

Pollutant	Museum Visitors (TPY)	Employees (TPY)	Conference Attendees (TPY)	Heating / Cooling (TPY)	Operational Demonstrations (TPY)	Total (TPY)
VOC	6.23	0.49	1.87	0.096	0.10	8.79
NO_x	9.16	0.72	2.76	1.66	0.69	14.99
CO	66.23	5.21	19.92	0.349	0.19	91.89

3.3.2.4 CARBON MONOXIDE HOT SPOTS ANALYSIS

The most significant source of CO emissions attributable to the proposed project is the exhaust from motor vehicles traveling to and from the MCHC. Ambient concentrations of CO in urbanized areas tend to be highest in areas where vehicles accumulate, slow down, and idle (such as intersections). An intersection approach was taken to analyze potential CO impacts in

order to estimate maximum ambient impacts associated with the project. Calendar year 2015 was selected for the calculation of future ambient impacts from the proposed project.

Intersection Selection

The results of a traffic assessment for calendar year 2015 were reviewed to identify intersections that would be most impacted by the proposed project. The traffic assessment suggested that some intersections in the area would be congested in the background (i.e., without development of the MCHC) configuration and concluded that some traffic mitigation measures would be needed in the future even without the proposed project. For this reason, the intersection selection task focused on those intersections that would be most effected by the proposed project. These intersections were identified either on the basis of the projected change in level of service (LOS) category or by the increase in traffic associated with the project.

Each of the three proposed project sites were considered separately to identify the most effected intersection. The intersections selected for analysis are listed below.

Project Site	Selected Intersection	Future LOS AM	Future LOS PM
Russell Road	Russell Road and VA-637	A	A
Mainside South	US-1 and VA-637	C	D
Mainside North	US-1 and VA-619 / Fuller Road	D	D
Locust Shade Park	US-1 and VA-619 / Fuller Road	D	D
Northern Combined	US-1 and VA-619 / Fuller Road	D	D

Although there were intersections in the area with higher traffic volumes and more severe levels of service, these intersections were generally not significantly impacted by traffic that would be generated by or associated with the proposed MCHC.

The selected intersections were modeled using peak hourly AM and PM traffic. The Russell Road intersection is not signalized but has a stop sign at the intersection for westbound traffic on VA-637. The other two intersections listed are signalized.

Background CO Levels

Background CO concentrations were estimated based on available monitoring CO data from sites in Virginia. The "Virginia Ambient Air Monitoring 1997 Data Report" was reviewed to identify current CO monitoring locations within the commonwealth. The Alexandria monitoring location (station no. L-126-C) was selected as most representative for conditions in the vicinity of the proposed project locations.

The highest second-highest 1-hour and 8-hour monitored concentrations in 1997 at the Alexandria station (4.8 ppm and 3.3 ppm, respectively) were selected as conservative background values for use in the ambient impact analysis.

Model Description

Two USEPA recommended models were used in the analysis to predict ambient impacts of mobile source CO emissions. MOBILE5b was used to estimate vehicle tailpipe emissions of CO. CAL3QHC Version 2.0 was used to calculate CO concentrations based on the dispersion of emissions from line sources used to represent roadway segments. Emission rates generated by MOBILE5b were used in CAL3QHC to predict CO concentrations at specified receptors selected near the modeled intersections.

MOBILE5b: The USEPA MOBILE5b model was used to develop composite CO vehicle emission factors in grams per vehicle-mile for free flow roadway segments and idle emission factors in grams per vehicle-hour for use with queue segments.

Emission factors are a function of fleet mix, operating mode distributions, mobile source emission control programs, travel speeds, and ambient temperature. MOBILE5b input files for Stafford County were obtained from the Metropolitan Washington Council of Governments (MWCOG). These input files were modified to specify the calculation year (2015), to select the standard FTP operating mode distributions, and to reflect typical January temperatures for the area.

Climatological data from on-site observations at Quantico were used to identify the following temperatures:

Average January temperature:	36° F (3° C)
Average daily January maximum temperature:	45° F (7° C)
Average daily January minimum temperature:	27° F (-3° C)

Results for vehicle speeds of 30 miles (48 kilometers) per hour for Class II arterials and 25 miles (40 kilometers) per hour for Class III arterials were used to determine the emission factors used later in the modeling with CAL3QHC. These speeds are the lower bounds of the default range for these classes of roads.

CAL3QHC Free flow and queue links were defined in accordance with standard guidance and input to the model. All modeled links were at-grade segments. Projected future (2015) peak AM and PM hourly traffic volumes were used to define the modeled traffic volumes.

US-1 was treated as a Class II arterial; all other modeled roads were treated as Class III arterials. The selected CO emission factors were based on average free flow vehicle speeds of 30 miles (48 kilometers) per hour and 25 miles (40 kilometers) per hour for Class II and Class III arterials, respectively.

The modeling analysis used conditions reflecting for an urban dispersion environment. A surface roughness of 70 inches (175 centimeters) was specified to reflect typical values for city/office land use. A wind speed of 3.3 feet (1 meter) per second with stability class D and a mixing height of 3,280 feet (1000 meters) was modeled. Wind directions were modeled in 10° increments.

Modeling receptors were selected in accordance with guidance in USEPA's "Guideline for Modeling Carbon Monoxide From Roadway Intersections." Modeling receptors were selected beyond the mixing zone associated with free flow links. In the model, receptors were "placed" near the modeled intersection corners and along the approach and departure roadway right-of-way at distances of 82 feet (25 meters) and 164 feet (50 meters). A receptor height of 6 feet (1.8 meters) was specified to represent a typical breathing zone height.

ANALYSIS FINDINGS

The results of the CO hot spots modeling analyses are summarized in tables 3 through 8, attached.

The maximum predicted 1-hour CO concentration at each receptor was identified and added to the selected conservative 1-hour background value to yield a total predicted 1-hour concentration. The predicted total concentrations are all well below the corresponding 1-hour National Ambient Air Quality Standard (NAAQS) of 35 ppm.

The maximum predicted 1-hour CO concentration at each receptor was multiplied by the standard conversion factor of 0.7 to estimate a conservative 8-hour predicted impact from the modeled mobile source emissions. The resulting value is conservative because it is based on peak *hourly* traffic data instead of average traffic volumes over the peak 8-hour period. The predicted 8-hour impact was added to the selected 8-hour background value to yield a total predicted 8-hour concentration. The predicted total concentrations are all below the corresponding 8-hour NAAQS of 9 ppm.

The CO hot spots modeling analysis demonstrates that future (2015) CO concentrations near those intersections most likely to be impacted by the proposed project will be below the corresponding ambient standards.

3.4 CONCLUSIONS

During the first three years, emissions are expected to be from construction activities. As the project nears completion, construction-related emissions will diminish and operations emissions will gradually increase. While the full amount of both construction and operations-related emissions could not occur in the same year, the total of both is still below *de minimis* levels.

The primary source of emissions for the action during operations will be motor vehicle exhaust. The emissions from these vehicle trips could potentially impact nearby areas/housing as vehicles travel past or idle in front of these areas. The emissions attributable to the proposed action, however, would be relatively insignificant in comparison to the total amount of emissions from other sources in the project area.

Construction emissions are related to the operation of heavy equipment, delivery vehicles, site preparation, asphalt application, and paints. Based on procedures established in the Conformity regulations and other EPA and Navy guidance, it is estimated that no more than 8.57 tons (7,775 kilograms) of VOC and 24.73 tons (22,447 kilograms) of NO_x per year will be generated by construction related activities associated with the proposed action.

Operations emissions associated with the MCHC would be generated by the heating/cooling plant, employee vehicle trips, operational demonstrations, delivery vehicle travel, and visitor vehicle travel. These emissions were identified as 8.79 tons (7,884 kilograms) per

year of VOC and 14.99 tons (12.973 kilograms) per year of NO_x. These emissions are based on an average distance traveled and number of vehicles used.

As a commitment towards further reducing emissions of pollutants from motor vehicles, the Navy promotes van and car pools, as well as other means to reduce the number of individual vehicle trips to the project location. In addition, all new sources of fuel combustion installed as part of the action will use clean-burning fuels such as natural gas whenever possible. These emissions units will also meet all applicable pollution control measures for such devices as stipulated in the SIP and air pollution control regulations.

The hot spots modeling results indicate that the highest 8-hour CO value of 6.2 ppm (8.9 ppm 1-hour) will occur at the intersection of US-1 and VA-619/Fuller road during peak AM traffic in the 2015. There were no predicted CO concentrations which exceeded either the 1-hour NAAQS of 35 ppm or 8-hour NAAQS of 9 ppm respectively in the year 2015.

Table 3
CO Modeling Results Summary

Proposed Site: Mainside North
Intersection: US1 and VA 619 / Fuller Road
Peak 1-hour AM Traffic Volumes - 2015

1-hour CO Background: 4.8 ppm
8-hour CO Background: 3.3 ppm

Receptor	1-hr Impact ppm	8-hr Impact ppm	1-hr Total ppm	8-hr Total ppm
1	4.1	2.9	8.9	6.2
2	2.3	1.6	7.1	4.9
3	2.2	1.5	7.0	4.8
4	2.8	2.0	7.6	5.3
5	3.0	2.1	7.8	5.4
6	1.9	1.3	6.7	4.6
7	1.9	1.3	6.7	4.6
8	1.7	1.2	6.5	4.5
9	2.9	2.0	7.7	5.3
10	1.8	1.3	6.6	4.6
11	1.3	0.9	6.1	4.2
12	1.9	1.3	6.7	4.6
13	1.9	1.3	6.7	4.6
14	3.2	2.2	8.0	5.5
15	3.2	2.2	8.0	5.5
16	2.5	1.8	7.3	5.1
17	1.8	1.3	6.6	4.6
18	1.3	0.9	6.1	4.2
19	2.2	1.5	7.0	4.8
20	1.5	1.1	6.3	4.4

Table 4
CO Modeling Results Summary

Proposed Site: Mainside North
Intersection: US1 and VA 619 / Fuller Road
Peak 1-hour PM Traffic Volumes - 2015

1-hour CO Background: 4.8 ppm
8-hour CO Background: 3.3 ppm

Receptor	1-hr Impact ppm	8-hr Impact ppm	1-hr Total ppm	8-hr Total ppm
1	3.6	2.5	8.4	5.8
2	2.3	1.6	7.1	4.9
3	2.3	1.6	7.1	4.9
4	3.8	2.7	8.6	6.0
5	3.8	2.7	8.6	6.0
6	3.8	2.7	8.6	6.0
7	2.4	1.7	7.2	5.0
8	2.0	1.4	6.8	4.7
9	4.6	3.2	9.4	6.5
10	3.0	2.1	7.8	5.4
11	2.0	1.4	6.8	4.7
12	2.8	2.0	7.6	5.3
13	2.3	1.6	7.1	4.9
14	3.1	2.2	7.9	5.5
15	2.8	2.0	7.6	5.3
16	2.7	1.9	7.5	5.2
17	2.3	1.6	7.1	4.9
18	1.8	1.3	6.6	4.6
19	2.1	1.5	6.9	4.8
20	1.6	1.1	6.4	4.4

Table 5
CO Modeling Results Summary

Proposed Site: Mainside South
Intersection: US1 and VA 637
Peak 1-hour AM Traffic Volumes - 2015

1-hour CO Background: 4.8 ppm
8-hour CO Background: 3.3 ppm

Receptor	1-hr Impact ppm	8-hr Impact ppm	1-hr Total ppm	8-hr Total ppm
1	2.2	1.5	7.0	4.8
2	1.2	0.8	6.0	4.1
3	0.8	0.6	5.6	3.9
4	2.4	1.7	7.2	5.0
5	1.2	0.8	6.0	4.1
6	0.8	0.6	5.6	3.9
7	1.3	0.9	6.1	4.2
8	1.3	0.9	6.1	4.2
9	1.5	1.1	6.3	4.4
10	1.2	0.8	6.0	4.1
11	1.1	0.8	5.9	4.1
12	0.8	0.6	5.6	3.9
13	0.3	0.2	5.1	3.5
14	1.4	1.0	6.2	4.3
15	0.8	0.6	5.6	3.9
16	0.3	0.2	5.1	3.5
17	1.3	0.9	6.1	4.2
18	1.1	0.8	5.9	4.1
19	1.7	1.2	6.5	4.5
20	1.6	1.1	6.4	4.4

Table 6
CO Modeling Results Summary

Proposed Site: Mainside South
Intersection: US1 and VA 637
Peak 1-hour PM Traffic Volumes - 2015

1-hour CO Background: 4.8 ppm
8-hour CO Background: 3.3 ppm

Receptor	1-hr Impact ppm	8-hr Impact ppm	1-hr Total ppm	8-hr Total ppm
1	2.2	1.5	7.0	4.8
2	1.6	1.1	6.4	4.4
3	1.3	0.9	6.1	4.2
4	2.1	1.5	6.9	4.8
5	1.6	1.1	6.4	4.4
6	1.6	1.1	6.4	4.4
7	1.4	1.0	6.2	4.3
8	1.2	0.8	6.0	4.1
9	2.2	1.5	7.0	4.8
10	2.1	1.5	6.9	4.8
11	1.8	1.3	6.6	4.6
12	1.2	0.8	6.0	4.1
13	0.9	0.6	5.7	3.9
14	2.5	1.8	7.3	5.1
15	1.2	0.8	6.0	4.1
16	0.9	0.6	5.7	3.9
17	1.6	1.1	6.4	4.4
18	1.3	0.9	6.1	4.2
19	1.6	1.1	6.4	4.4
20	1.2	0.8	6.0	4.1

Table 7
CO Modeling Results Summary

Proposed Site: Russell Road
Intersection: Russell Road and VA 637
Peak 1-hour AM Traffic Volumes - 2015

1-hour CO Background: 4.8 ppm
8-hour CO Background: 3.3 ppm

Receptor	1-hr Impact ppm	8-hr Impact ppm	1-hr Total ppm	8-hr Total ppm
1	1.1	0.8	5.9	4.1
2	1.0	0.7	5.8	4.0
3	1.0	0.7	5.8	4.0
4	0.7	0.5	5.5	3.8
5	0.7	0.5	5.5	3.8
6	0.7	0.5	5.5	3.8
7	0.7	0.5	5.5	3.8
8	0.7	0.5	5.5	3.8
9	0.3	0.2	5.1	3.5
10	0.3	0.2	5.1	3.5
11	0.8	0.6	5.6	3.9
12	0.3	0.2	5.1	3.5
13	0.4	0.3	5.2	3.6
14	0.6	0.4	5.4	3.7
15	0.5	0.4	5.3	3.7

Table 8
CO Modeling Results Summary

Proposed Site: Russell Road
Intersection: Russell Road and VA 637
Peak 1-hour PM Traffic Volumes - 2015

1-hour CO Background: 4.8 ppm
8-hour CO Background: 3.3 ppm

Receptor	1-hr Impact ppm	8-hr Impact ppm	1-hr Total ppm	8-hr Total ppm
1	0.5	0.4	5.3	3.7
2	0.8	0.6	5.6	3.9
3	1.1	0.8	5.9	4.1
4	0.7	0.5	5.5	3.8
5	0.5	0.4	5.3	3.7
6	0.5	0.4	5.3	3.7
7	0.6	0.4	5.4	3.7
8	1.1	0.8	5.9	4.1
9	0.8	0.6	5.6	3.9
10	0.8	0.6	5.6	3.9
11	1.1	0.8	5.9	4.1
12	1.1	0.8	5.9	4.1
13	1.1	0.8	5.9	4.1
14	0.6	0.4	5.4	3.7
15	0.6	0.4	5.4	3.7

APPENDIX F: Transportation Assessment

Transportation Assessment

for the

Heritage Center Draft EIS

located at the

Marine Corps Base
Quantico, Virginia

June 25, 1999

Revised November 15, 1999

Prepared By:

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INTRODUCTION

The Marine Corps is proposing to consolidate existing interpretive and curatorial functions into a facility known as the Heritage Center. These functions are currently located at various facilities at the Marine Corps Base (MCB) in Quantico, Virginia, as well as other locations. The proposed Heritage Center includes: a museum, and associated uses (such a museum store and restaurant); an IMAX theater; a parade field; and a conference center. The facility is expected to attract approximately 400,000 annual visitors and will have approximately 95 employees. The Heritage Center, as currently envisioned, will consist of 20 buildings upon completion. It will be developed in phases with initial facilities opening in year 2000 and is anticipated to be complete by year 2015 or as funding permits.

The purpose of this transportation assessment is to analyze the affect of traffic generated by the proposed Heritage Center. It evaluates the capacity of the transportation system in the area of the proposed action and documents the existing, background and the traffic condition for the alternative sites of the Heritage Center. This transportation assessment also provides recommendations for roadway improvements, where necessary, to accommodate the traffic generated by the proposed Heritage Center and the traffic that is anticipated to be utilizing the roadways at the time the Heritage Center will be complete.

There are five alternative sites for the proposed action. They are shown on Figure 1 are described below:

- Russell Road Site is located on the eastern side of Russell Road, just east of the Russell Road and MCB-1 intersection.
- Mainside South Site is located north of Telegraph Road (VA 637), just east of the VA 637 intersection with US 1.
- Mainside North Site is located on the eastern side of US 1, just south of the US 1 intersection with Joplin (VA 619) and Fuller Roads.
- Locust Shade Park Site is located on the western side of US 1, just south of the US 1 intersection with Joplin (VA 619) and Fuller Roads.
- Northern Combined Site assumes the public attractions are located at the Locust Shade Park Site and the administrative and military functions are located at the Mainside North Site.

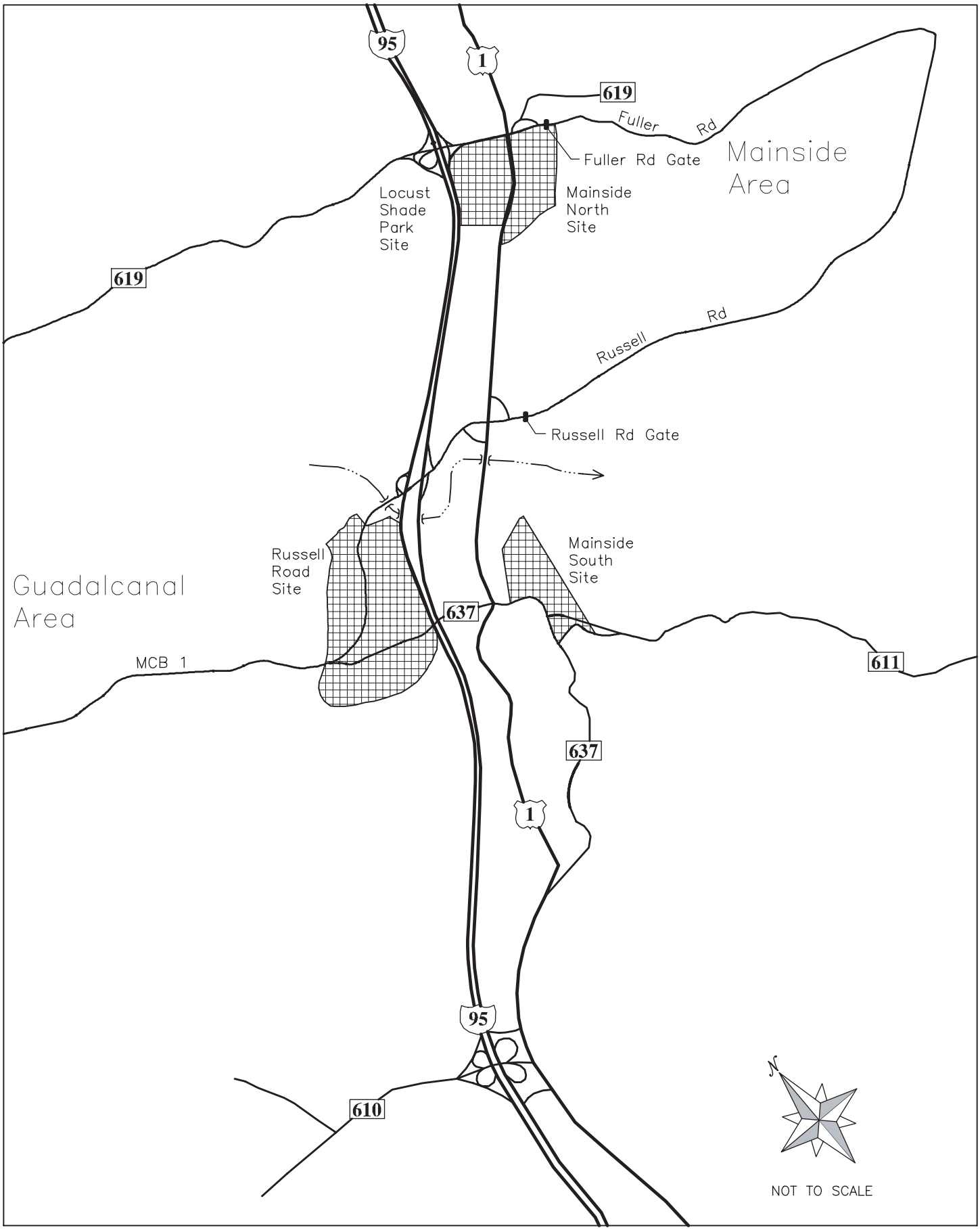
METHODOLOGY

The methodology used for this study is consistent with traffic engineering industry practices. Data was collected to determine existing and future conditions of the transportation system in the area of influence. This information was then analyzed using "Highway Capacity Manual[1]" methodology. The results of the analysis provide a performance measure to compare the various traffic conditions.

Three traffic conditions were analyzed to determine the affect of the proposed action. They are:

- The *existing traffic condition* analysis determines the ability of the roadway to accommodate current traffic volumes (year 1998 for this assessment). It is determined by evaluating existing traffic volumes and characteristics of the existing roadway infrastructure.

[1] Highway Capacity Manual, Special Report 209, Transportation Research Board, Washington, DC, 1994



Heritage Center EIS
Study Area
Figure 1

- The *background traffic condition* analysis determines the roadways' ability to accommodate the traffic volumes anticipated in the year the proposed action is expected to be complete. The traffic volumes used for this condition are determined by adding the existing traffic volume to traffic generated by imminent developments and the increase anticipated from regional growth. This traffic condition considers roadway improvements that are expected to be in-place at the time the proposed action is anticipated to be complete (year 2015 for this assessment).
- The *alternative traffic condition* evaluates the roadways' ability to accommodate the additional traffic generated by the proposed action. It is determined by adding the anticipated site generated traffic to the background traffic volumes. These volumes are evaluated with roadway improvements that are considered for the background conditions. The comparison of the background and alternative traffic conditions determines the net affect of the proposed action.

The ability of a roadway intersection to accommodate traffic is expressed by Level of Service (LOS). The service levels are represented by a range of "A" to "F" with LOS A being the highest level and LOS E representing capacity or saturation levels. Level of service D is generally the lowest acceptable level of service for state highways and is considered to be the lowest acceptable for this assessment. The definitions for levels of service are located in Appendix A.

EXISTING TRANSPORTATION CONDITIONS

The primary elements that affect the capacity of a roadway intersection are the traffic generating characteristics of the surrounding land use and the characteristics of the roadway infrastructure. The existing characteristics are described below:

Existing Traffic Generating Land Uses

Quantico Marine Corps Base is characterized by two distinctive areas. They are:

- The Mainside area is located east of US 1, south of VA 619 and north of VA 637. The area is fully developed and almost all of the employment, visitor attractions, retail services and living quarters are located in the Mainside area.

- The Guadacanal area is located west of I-95, south of VA 619 and north of Aquia Creek. The area is predominately used for training exercises or ammunition facilities although, some parcels are occupied by federal tenants and others are used for recreation purposes.

The US 1 corridor, in the vicinity of Quantico is characterized as follows:

- From VA 619 to the North, the land use along US 1 consists of many commercial and retail parcels that have uncontrolled access to US 1.

- Between VA 619 to south of Russell Road, there are almost no traffic generating access roads. Locust Shade Park and Fritter Park abut US 1 to the west and Quantico MCB property abuts it to the East.

- From south of Russell Road to VA 610, there are a few state roads that provide to access smaller communities and the Guadacanal area of the MCB. There are also a few areas of commercial activity that have access to this segment of US 1.

- From VA 610 to the South, the land use along US 1 consists of newer commercial and retail parcels that have semi-controlled points of access.

- US 1 in the vicinity of the study area parallels I-95 and serves as an alternative route for through traffic.

The land use along VA 619, west of I-95 and along VA 611, east of VA 637 consists of rural residential development. The land use along VA 610, west of US 1 consists of newer commercial and retail parcels that have semi-controlled points of access.

Existing Roadway Infrastructure

The existing roadways in the vicinity of the proposed Heritage Center sites are: VA 619, Russell Road, MCB-1, VA 637, VA 611, US1 and I-95. The lane use configurations at the major intersections in the assessment area are shown in Figure 2.

Existing Traffic Volumes

Traffic counts were performed during the week of October 4, 1998, (on Tuesday and Wednesday) at all critical locations except at the intersection Russell Road and MCB-1[2]. The schedule of events for the MCB was confirmed so that the counts represented a typical day[3]. Two-hour turning movement counts were performed at the intersections to determine the morning and afternoon peak hour volumes and 24-hour machine counts were conducted at ramp locations. The traffic operations along the Russell and Fuller Road corridors were observed to determine how the operation of the intersections and gates influence each other.

The count information indicates that the roadway system peaks between 6:45 AM and 7:45 AM in the morning and 4:15 PM and 5:15 PM in the afternoon. The morning and afternoon peak hour volumes are shown on Figure 3. The traffic count summaries are contained in Appendix B. The observations made are shown in Appendix C and are discussed in the next section.

Existing Traffic Analysis Results

The existing capacity analysis results are shown in Table 1. It appears that most of the intersections operate at acceptable levels of service. The exceptions are:

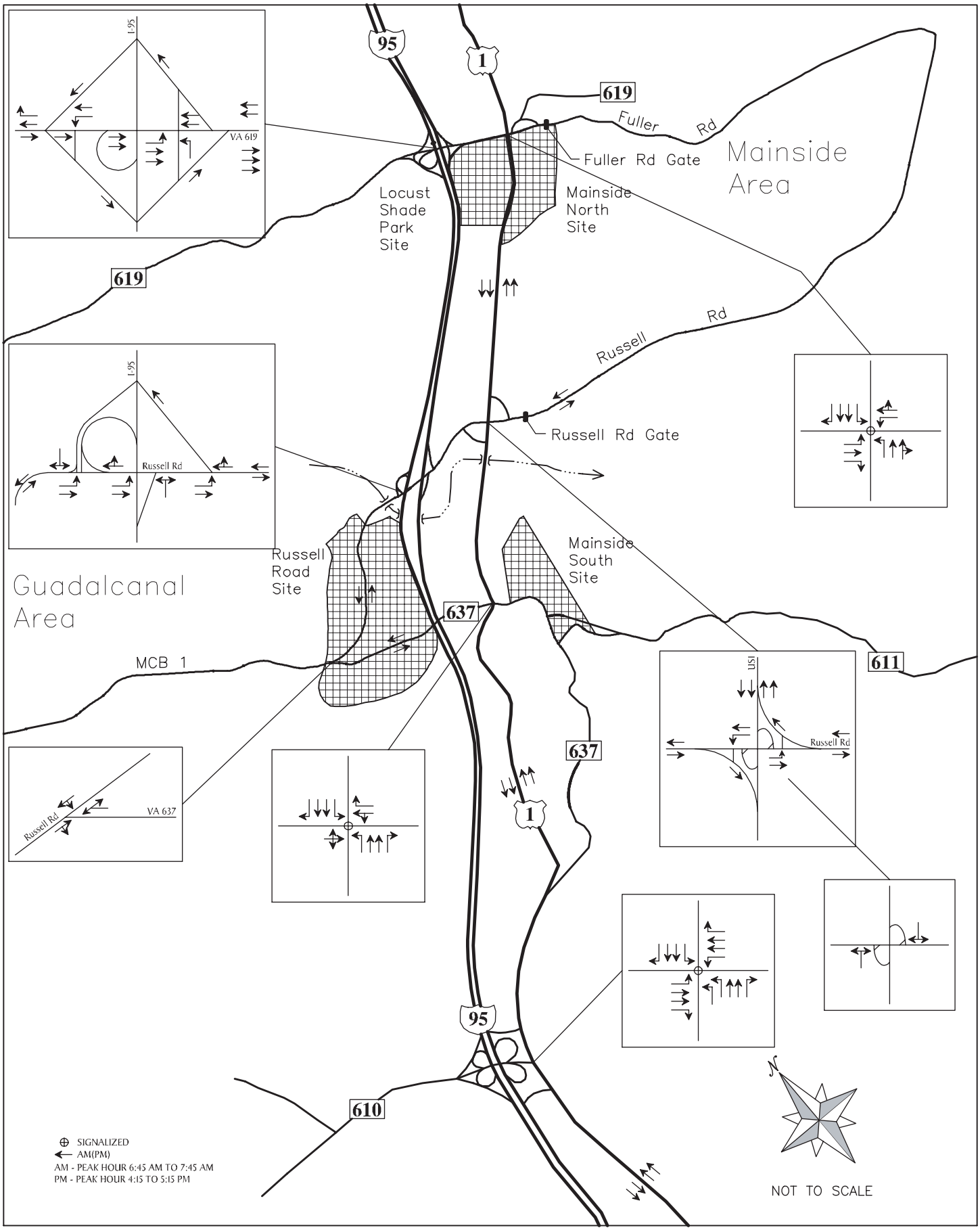
- The I-95 northbound off-ramp intersection with Russell Road.

- The US 1 off- and on-ramp intersection with Russell Road.

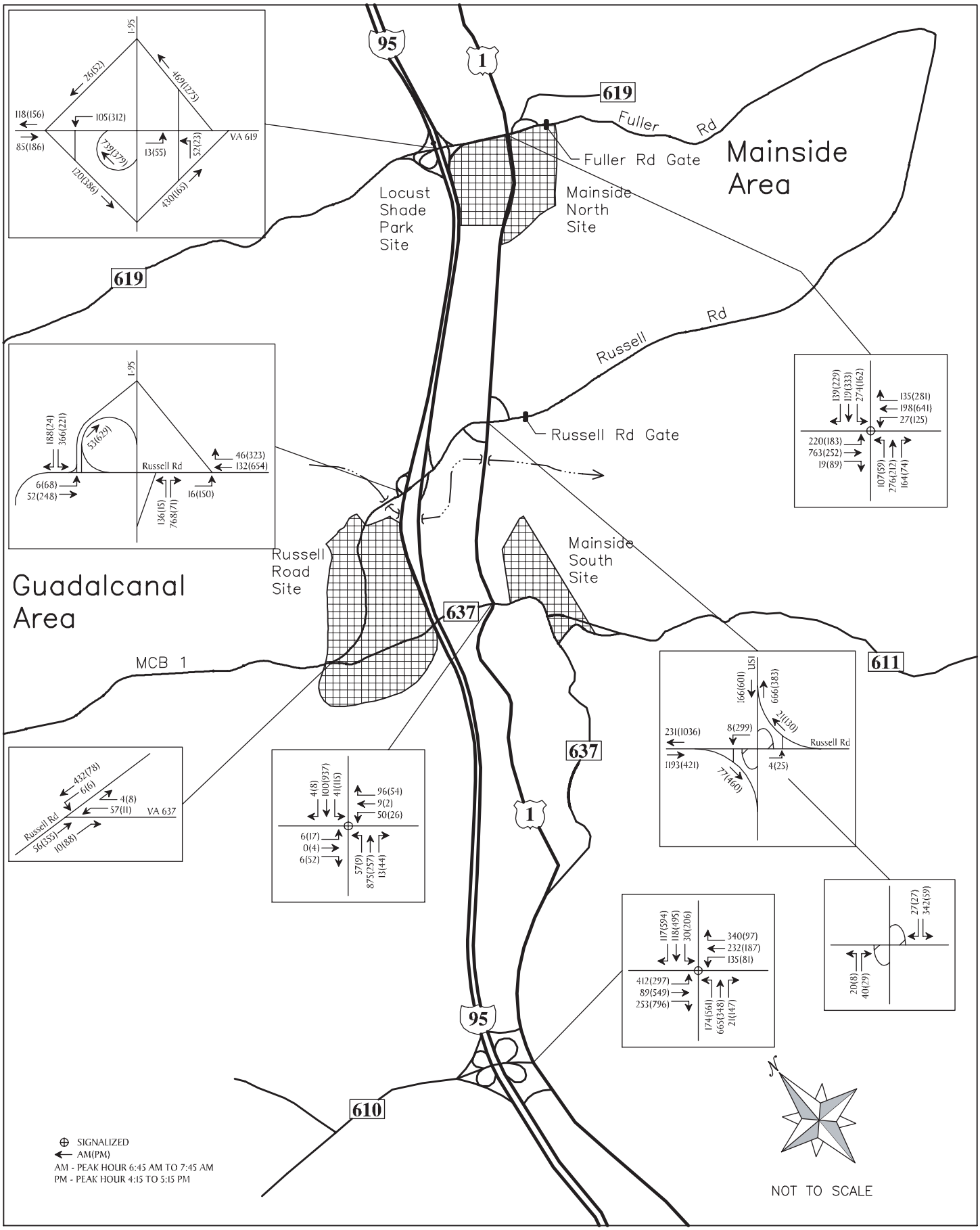
The field observations confirm that the intersections along VA 619 and US 1 operate at acceptable levels of service for both the commuter peak hour periods. However, major delays were observed during the morning peak period, at all the intersections along the Russell Road corridor, between the I-95 southbound ramps and the Russell Road gate. The delays in the Russell Road corridor are a result of the relationships between

[2] Conducted November 13, 1996.

[3] The MCB schedule of events was reviewed to confirm the traffic counts used in this study were not skewed by a special event or a combination of events. Special events such as, graduations at the University or Academy currently occur on a periodic basis. Special training exercises or conferences also occur frequently. These and other events attract additional traffic to the Base that will increase the existing volumes shown in this report.



Heritage Center EIS
Existing Lane Uses
Figure 2



Heritage Center EIS
Existing Peak Hour Volumes (1998)
Figure 3

Table 1- Summary of Existing Condition Capacity Analyses

Intersection	AM Peak Hour LOS & DELAY	PM Peak Hour LOS & DELAY
1. VA 619 at I-95 SB On-Ramp (U)	A 1.0	A 1.9
2. VA 619 at I-95 NB On-Ramp and Off-Ramp (U)	A 0.7	A 0.3
3. Russell Road at I-95 SB On-Ramp and Off- Ramp (U)	C 12.2	A 2.2
4. Russell Road at I-95 NB Off-Ramp (U)	F 122.6	A 0.6
5. Russell Road at I-95 NB On-Ramp (U)	A 0.0	A 0.9
6. Russell Road and VA 637 and MCB-1 (U)	A 0.9	A 0.2
7. Russell Road at US 1 SB On-Ramp and Off-Ramp (U)	A 0.7	A 0.9
8. Russell Road at US 1 NB On-Ramp and Off-Ramp (U)	F 148.0	A 1.1
9. US 1 and VA 619 and Fuller Road (S)	D 34.3	C 17.5
10. US 1 and VA 637 (S)	B 6.8	B 6.0
11. US 1 and VA 610 (S)	A 0.7	A 0.8

Table Legend

(S) - Signalized
(U) - Unsignalized
A - Level of service
0.7 - Average Total Vehicle Delay (seconds/vehicle) for unsignalized intersections
0.8 - Average Stopped-Time Delay (seconds) for signalized intersections

the individual intersections and the inadequate capacity of the two-lane Russell Road segment to accommodate the traffic.

In the past year, MCB has modified security check procedures at the gate. This minimizes stoppage during the morning peak period. Four traffic control officers are also used along Russell Road, during the morning peak hour to reduce the delays. Still, the corridor experienced "gridlock" conditions during the day of the counts. Between 6:50 AM and 7:50 AM vehicles were queued on the I-95 northbound and US 1 northbound mainlines and were sometimes queued on the I-95 southbound mainline. This gridlock creates an unsafe condition on both I-95 and US 1.

Other Transportation Conditions

The public transportation in the area of the proposed sites for the Heritage Center consists of:

- Bus service - The closest public transportation is located approximately four to five miles away in the town of Quantico. It consists of the Omni-Link bus service provided by and Potomac and Rappahannock Transportation Commission (PRTC) in Prince William County.

- Train service - The Virginia Rail Express (VRE) and Amtrak provides service between Richmond and Fredericksburg to south and Washington, DC to the North. The combined VRE and Amtrak weekday service schedule provide:

  - Eight northbound trains and one southbound train between the hours of 5:00 AM and 9:00 AM.

  - Three southbound trains and one northbound train between 3:00 PM and 6:00 PM.

  Current ridership that is oriented to the Quantico area during the morning or from Quantico during the afternoon is negligible.

- Pedestrian or bicycle trails or routes - There are no designated pedestrian or bicycle trails or routes in the vicinity of the proposed sites. Current travel by this mode is difficult due to remote nature of the surroundings.

- Park and ride facilities - A park and ride lot located in the northwest corner of VA 619 and US 1. The current parking capacity is 29 and the actual usage is 36.

- The USMC provides a shuttle bus service between its facilities in the Mainside area at Quantico and the USMC Headquarters in Alexandria, Virginia. This service is provided to transport staff between facilities to conduct business.

- In November 1996, the USMC began providing a Base Motor Transport shuttle for military personnel. The shuttle has nine destinations in the Mainside area. The service consists of one northbound and one southbound shuttle that operates on fifteen minute headways during weekdays between 9:00 AM and 3:00 PM.

BACKGROUND TRANSPORTATION CONDITION

The analysis for the background condition assesses the roadway system in year 2015 without the proposed Heritage Center.

Background Traffic Generating Land Uses

The following developments are anticipated to be complete by year 2015 and will generate traffic that affects the roadway capacities in the Quantico area:

- The Manpower Center is located on Russell Road in the Mainside area. It consists of a 151,000 square foot building and will have a total of 900 new employees upon completion. It officially opened in August of 1998 and was two-thirds occupied at the time the traffic counts were performed for the Heritage Center assessment. The trip generation and distribution of traffic volumes for this development were taken from the "Manpower Center Traffic Study[4]".

- The Justice Training Center is being constructed in the Guadacanal area of the MCB. While most of the staff and students currently work in the area, an additional 100 students and staff of 36 are expected by the year 2000. The additional traffic from this proposed development was distributed and assigned to the roadway system as documented in the "Transportation Assessment of the FBI Laboratory Relocation[5]".

- The FBI Laboratory is planning to relocate to the FBI Academy in the Guadacanal area by the year 2000. The traffic anticipated to be generated by the 800 employees was distributed and assigned to the roadway system as documented in the assessment mentioned above.

A four-percent per year regional growth rate was applied to traffic on US 1 and a one-percent per year regional growth rate was applied to all other roadways in the area. These values were derived from the "US 1 Corridor Study[6]" and from the evaluation of historical traffic counts. The values represent an increase in traffic created by through traffic movements and by nearby developments that may occur but were not "approved" at the time this report was prepared.

Background Roadway Infrastructure

There are several proposed roadway improvements that will affect the capacity of the roadways in the study area. They are:

- The US 1 Corridor Study proposes the widening of US 1 to a six-lane divided cross section, from the Stafford County line to north of the assessment area. The cross section includes a ten-foot trail on the west side. The proposed improvements include: a separate northbound right lane at the US 1 intersection at VA 619; intersection improvement or relocation of the VA 619 (Fuller Heights Road) intersection with Fuller Road; and the redesign of the US 1 and Russell Road ramps to incorporate two through lanes in each direction on Russell Road and free-flowing movements from northbound to eastbound, northbound to westbound, southbound to eastbound; and eastbound to southbound. The proposed improvements are included in the Virginia Department of Transportation Long Range Plan and are anticipated to be in-place by year 2015. (Similar improvements are being considered for US 1,

[4] Prepared by TAMS Consultants, Inc., December 9, 1994.
[5] Prepared by Barton-Aschman Associates Inc., March 1997.
[6] Prepared by TransCore, November 1997.

from the Stafford County line to south of the assessment area. The improvements for the US 1 improvements in Stafford County were not included in this assessment because funding for design and construction of this section of improvements is currently uncertain.)

- The MCB proposes to build an 800-foot acceleration lane on Russell Road at the I-95 northbound off-ramp. The construction is anticipated to begin in 1999.

The year 2015 anticipated lane use configurations in the assessment area are shown in Figure 4.

Background Traffic Volumes

The background traffic volumes are determined by adding the existing traffic volumes to the traffic generated by the imminent developments and the traffic generated by regional growth. They represent the traffic volumes anticipated in the year 2015 if the Heritage Center would not be built. The morning and afternoon peak hour volumes for this condition are shown on Figure 5.

Background Traffic Analysis Results

The background capacity analysis results are shown in Table 2. Most of the intersections operate at acceptable levels of service. The exceptions are:

- The Russell Road and I-95 northbound off-ramp intersection continues to experience severe delay during the morning peak hour, as it does currently.

- The Russell Road and I-95 southbound on- and off-ramp intersection experiences severe delay in the morning peak hour due to the increase in traffic created by imminent developments and regional growth.

- The VA 610 and US1 intersection experiences unacceptable levels of service due to the increase in traffic created by imminent developments and regional growth.

Other Background Transportation Conditions

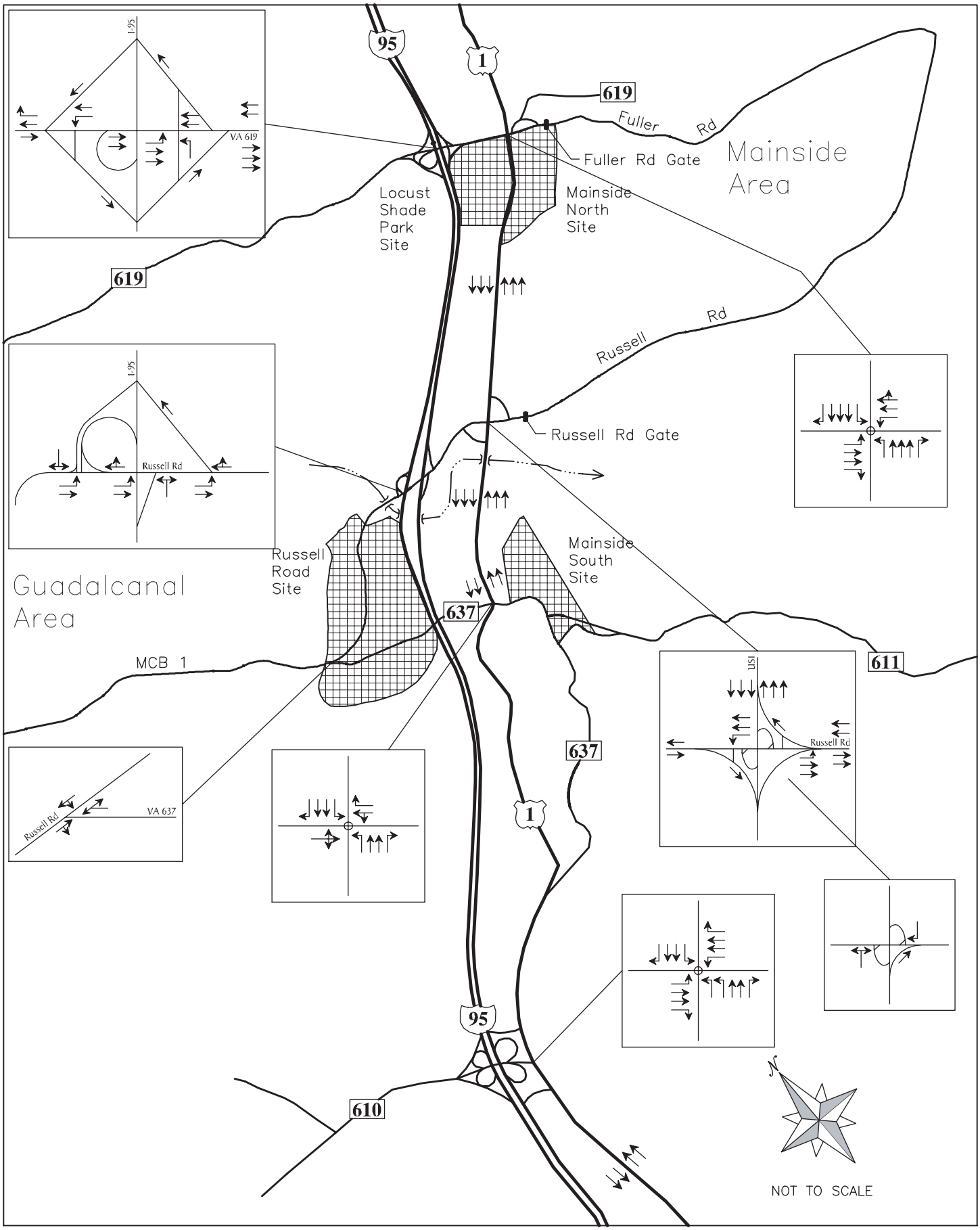
Some improvements to the public transportation system are expected by the year 2015. They include:

- The widening of the railroad bridges to accommodate two tracks and larger vehicles will increase capacity and frequency of the train service in the Quantico area.

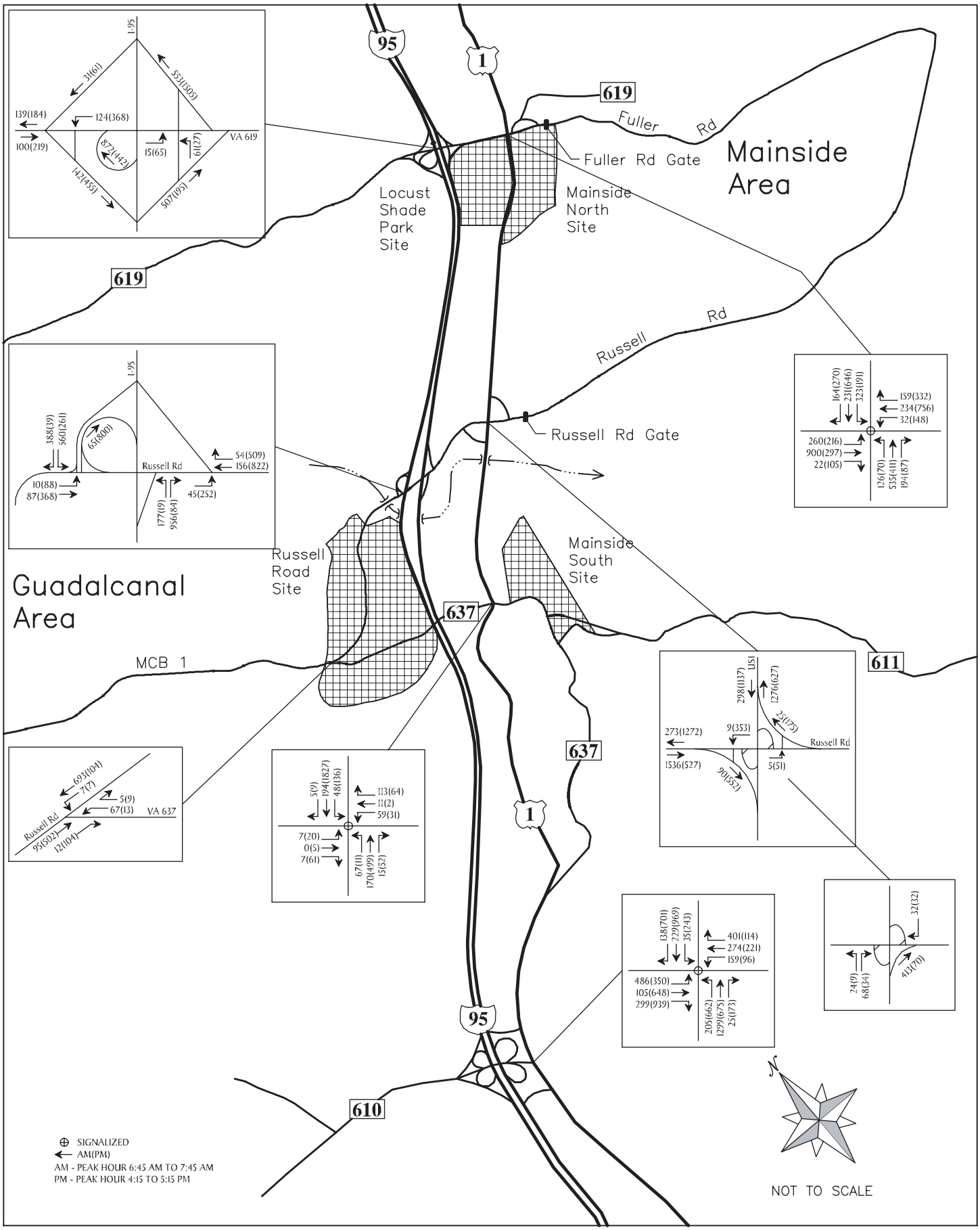
- The addition of a trail or bikeway along the US 1 corridor from the Stafford County line to north of the assessment area will increase the potential use of this mode of transportation.

- Increased bus service and the expansion of the park and ride facilities.

These improvements primarily focus on improving peak hour service from the Quantico area in the morning and to the Quantico area in the afternoon. Therefore, no adjustments have been made to the background traffic analyses for these improvements.



Heritage Center EIS
Background Lane Uses
Figure 4



Heritage Center EIS
Background Peak Hour Volumes (2015)
Figure 5

Table 2 - Summary of Background Condition Capacity Analyses Results

Intersection	AM Peak Hour LOS & DELAY	PM Peak Hour LOS & DELAY
1. VA 619 at I-95 SB On-Ramp (U)	A 1.0	A 2.0
2. VA 619 at I-95 NB On-Ramp and Off-Ramp (U)	A 1.1	A 0.3
3. Russell Road at I-95 SB On-Ramp and Off-Ramp (U)	F 165.1	A 3.8
4. Russell Road at I-95 NB Off-Ramp (U)	F 189.5	A 0.7
5. Russell Road at I-95 NB On-Ramp (U)	A 0.1	A 0.1
6. Russell Road and VA 637 and MCB-1 (U)	A 1.1	A 0.3
7. Russell Road at US 1 SB On-Ramp and Off-Ramp (U)	A 1.6	A 1.2
8. Russell Road at US 1 NB On-Ramp and Off-Ramp (U)	A 0.1	A 0.7
9. US 1 and VA 619 and Fuller Road (S)	D 28.2	D 31.9
10. US 1 and VA 637 (S)	B 9.8	B 7.6
11. US 1 and VA 610 (S)	D 33.1	*

Table Legend

(S)	-	Signalized
(U)	-	Unsignalized
A	-	Level of service
0.7	-	Average Total Vehicle Delay (seconds/vehicle) for unsignalized intersections
0.8	-	Average Stopped-Time Delay (seconds) for signalized intersections
*	-	Connote excessive delays

Alternative Transportation Condition

This analysis documents the roadway system condition in year 2015 assuming the proposed Heritage Center is built. There are five alternative sites proposed for the Heritage Center. They are:

- Russell Road Site is located on the eastern side of Russell Road, just east of the Russell Road and MCB-1intersection.
- Mainside South Site is located north of Telegraph Road (VA 637), just east of the VA 637 intersection with US 1.
- Mainside North Site is located on the eastern side of US 1, just south of the US 1 intersection with Joplin (VA 619) and Fuller Roads.
- Locust Shade Park Site is located on the western side of US 1, just south of the US 1 intersection with Joplin (VA 619) and Fuller Roads.
- Northern Combined Site assumes the public attractions are located at the Locust Shade Park Site and the administrative and military functions are located at the Mainside North Site.

Site Traffic Generating Characteristics

The volume of peak hour traffic created by the Heritage Center is based the three primary sources: museum visitors, employees and conference center attendees. The rationale used to determine the number of site generated vehicles and their direction of approach during the peak hour was based on market research and other known characteristics of the Heritage Center. This is discussed in detail in Appendix D. The resulting site generated traffic is shown in Table 3 and the direction of approach is shown in Table 4.

Table 3 - Site Generated Trips

Type	AM Peak Hour	PM Peak Hour
Employees	73	73
Museum Visitors	0	57[7]
Conference Center Visitors	250	250
Total Trips	323	380

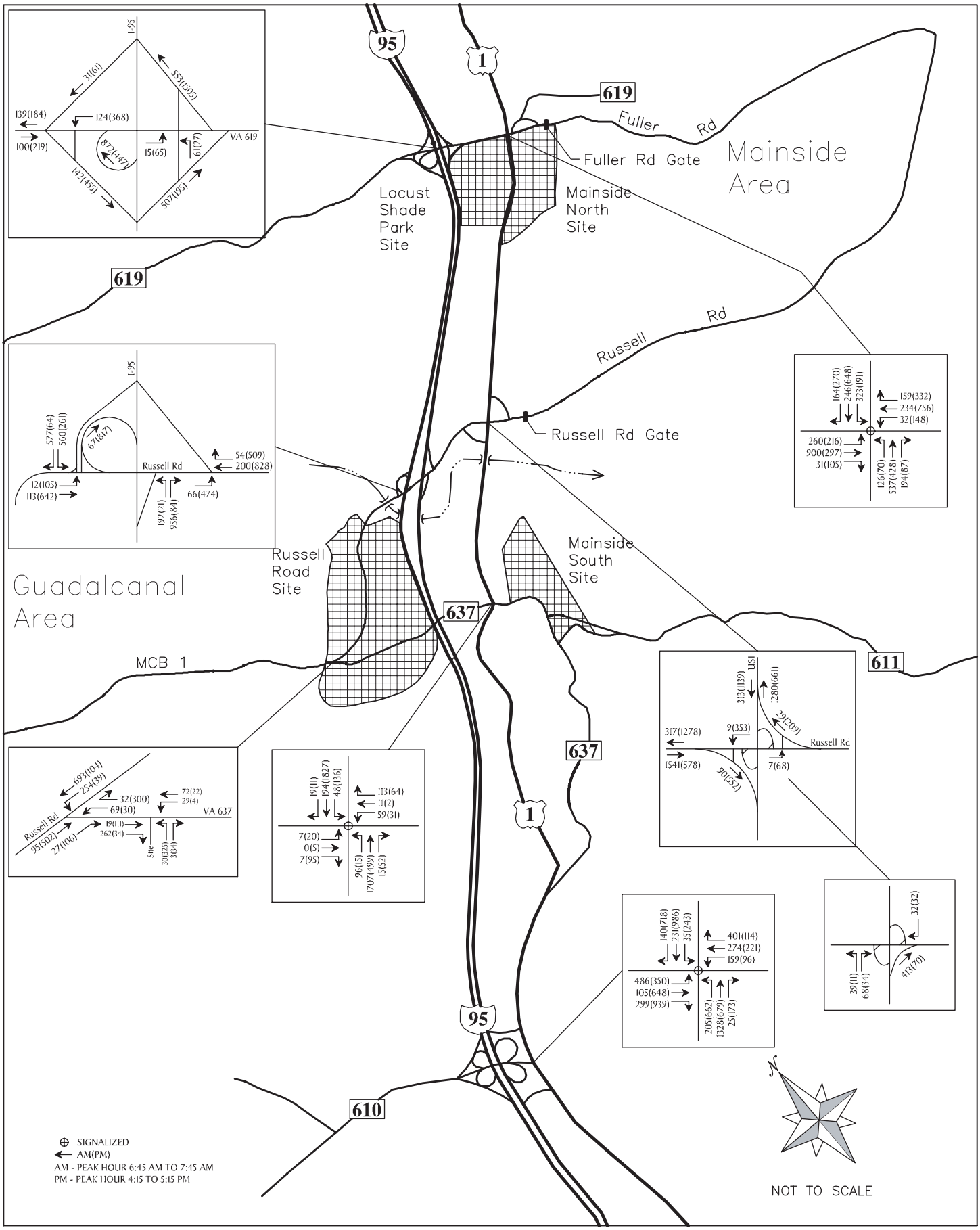
Table 4 - Direction of Approach for Site Generated Trips

To/From	Percent
Quantico	10% (5% on Fuller, 5% on Russell)
Manassas	5% (3% on VA 619, 2% on VA 610)
Richmond	15% (10% on I-95, 5% on US 1)
Washington, DC	70% (65% on I-95, 5% on US 1)

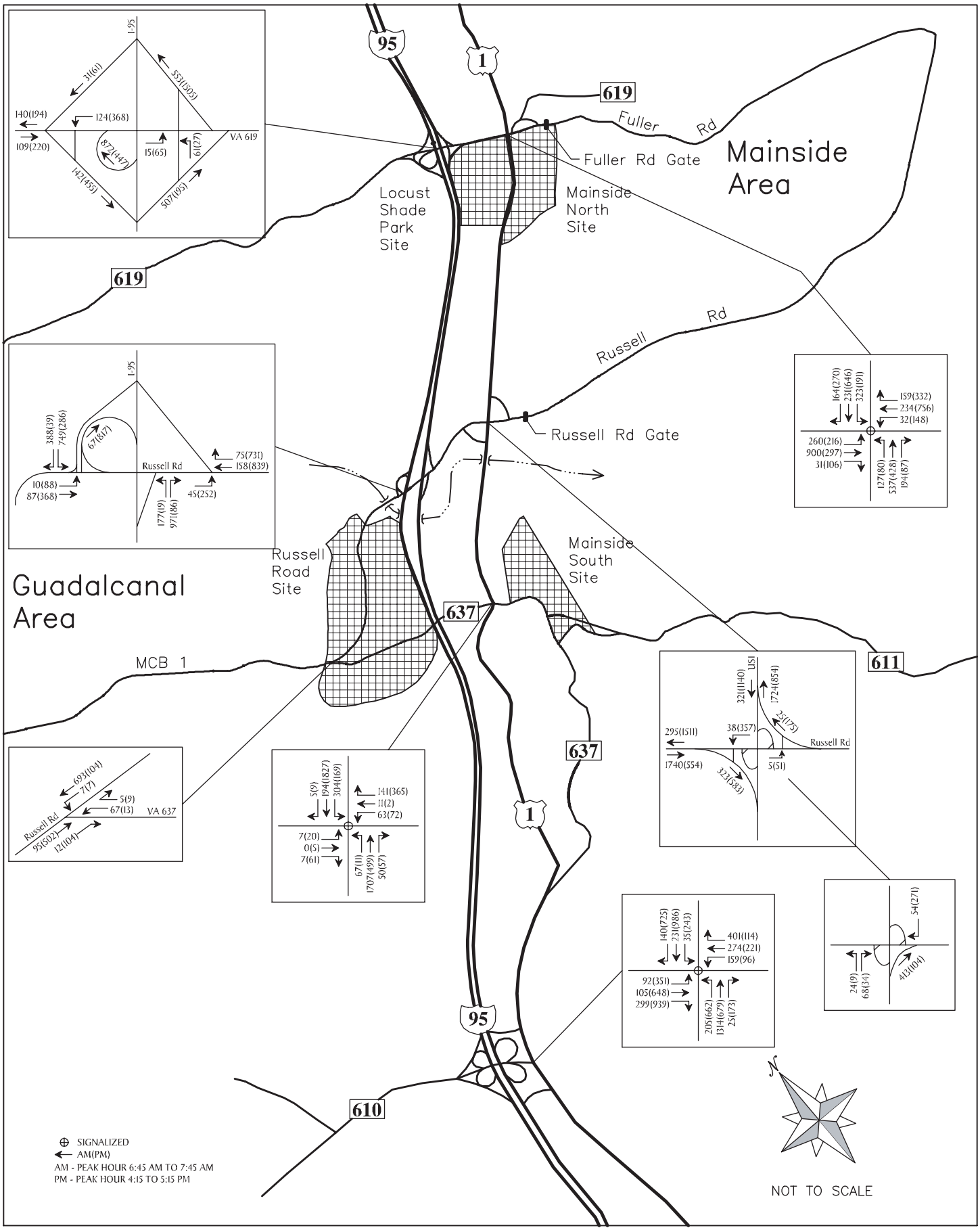
[7] 56-2 buses + (1.5 Passenger Car Equivalents per bus*2)=57

Alternative Traffic Volumes

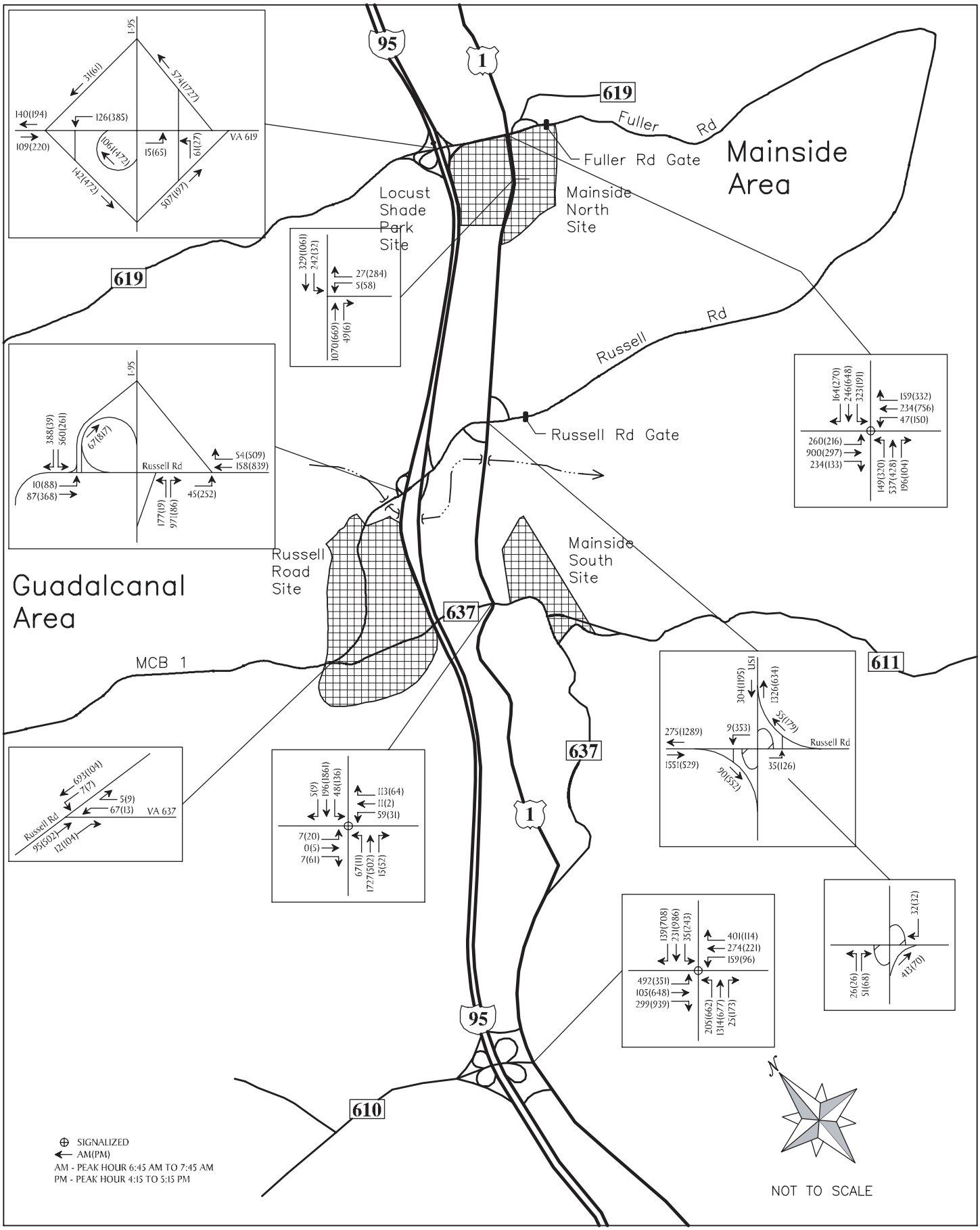
The site-generated trips are distributed to the roadway system for each proposed alternative based on the direction of approach. These volumes are added to morning and afternoon peak hour volumes to determine the alternative traffic condition. The volumes for each of the five alternative sites are shown in Figures 6 through 10.



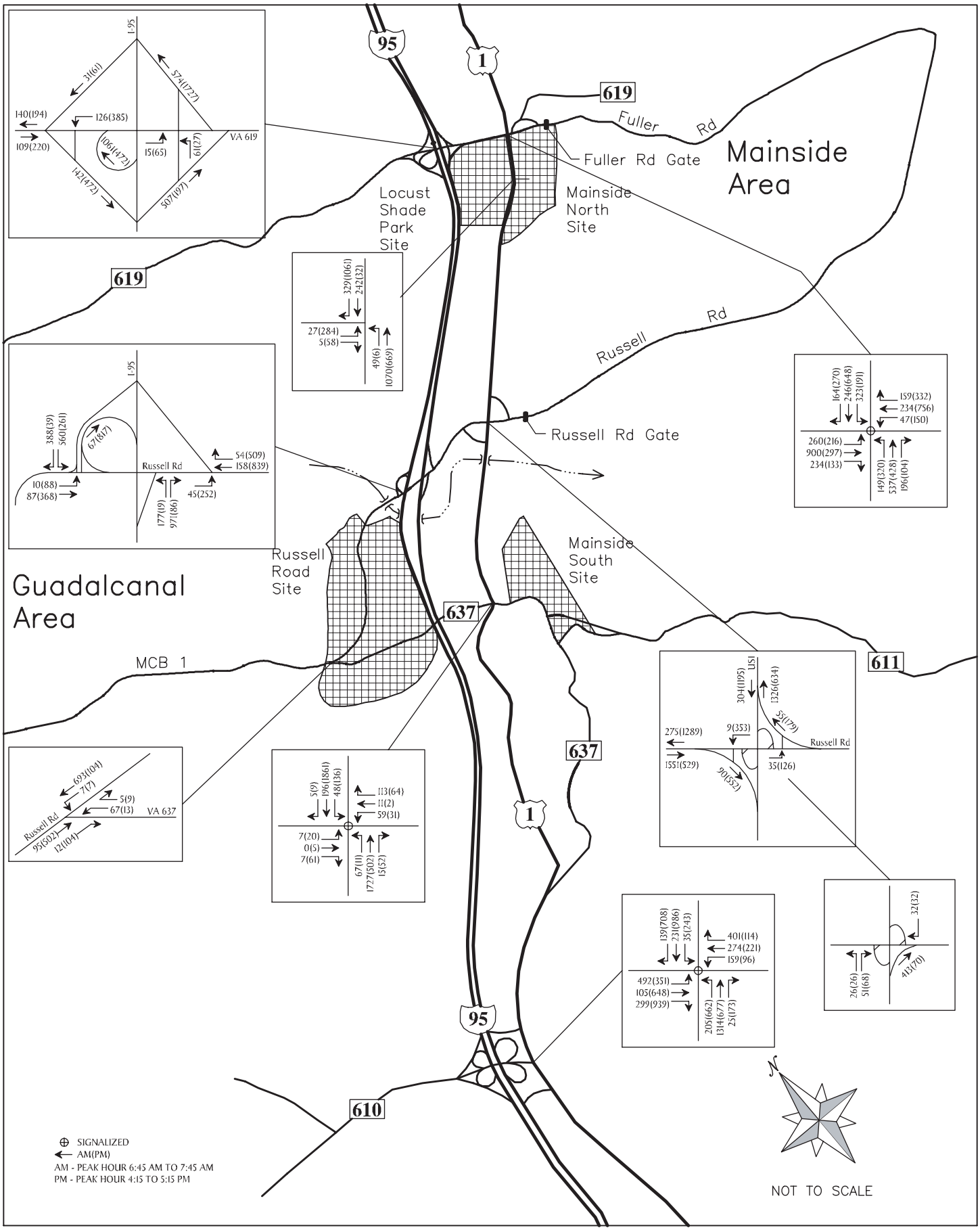
Heritage Center EIS
Russell Road Site
Total Peak Hour Volume (2015)
Figure 6



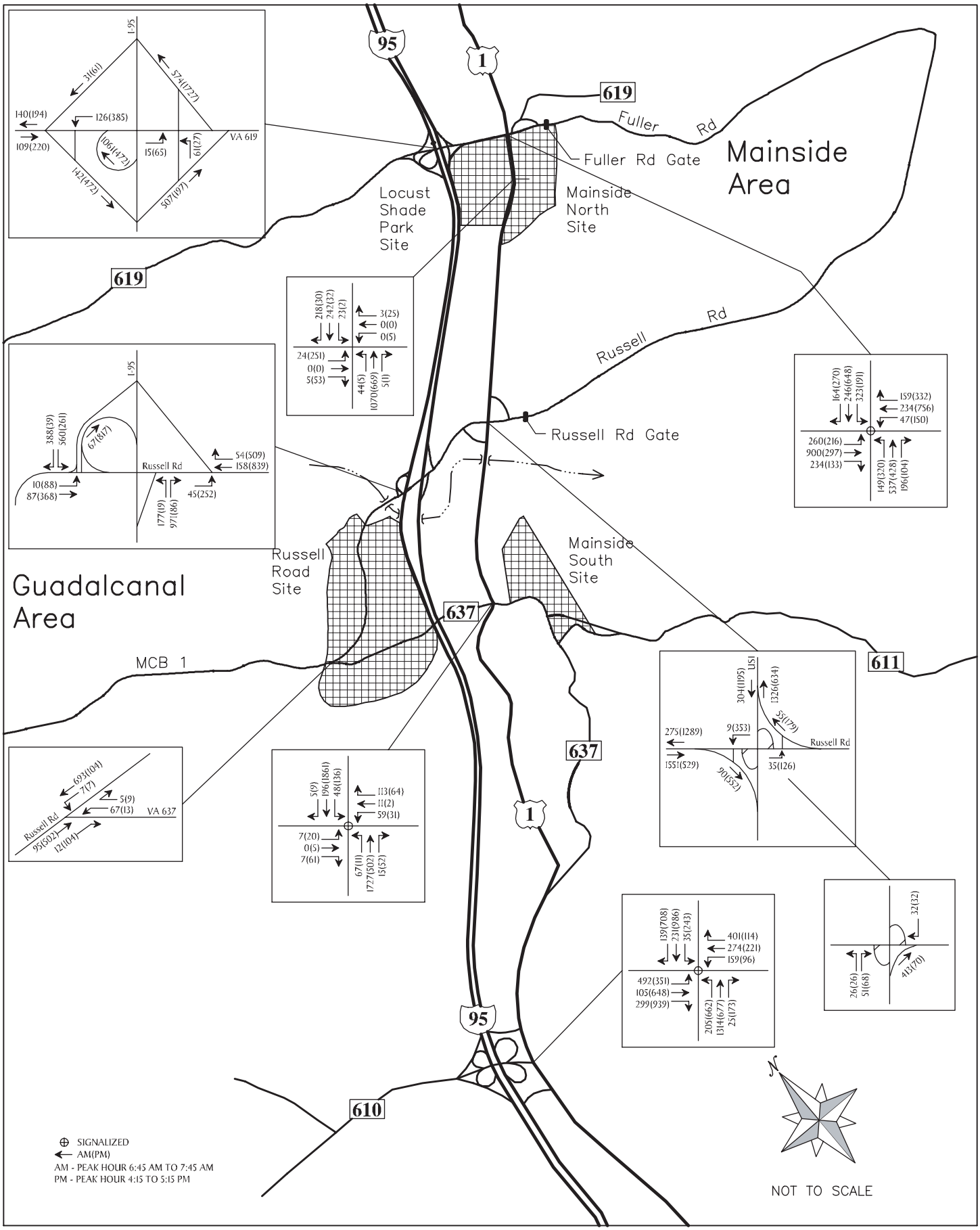
Heritage Center EIS
Mainside South Site
Peak Hour Volume (2015)
Figure 7



Heritage Center EIS
Mainside North Site
Total Peak Hour Volumes (2015)
Figure 8



Heritage Center EIS
Locust Shade Park Site
Total Peak Hour Volumes (2015)
Figure 9



Heritage Center EIS
Northern Combined Site
Total Peak Hour Volumes (2015)
Figure 10

Alternative Traffic Analysis Results

The capacity analysis results for the alternative traffic conditions are shown in Table 5. The entrance intersections have also been analyzed assuming the entrances are built to current Virginia of Transportation standards for commercial entrances. The results indicate that most of the intersections operate at acceptable levels of service. The exceptions are:

- The Russell Road and I-95 northbound off-ramp intersection continues to experience severe delay during the morning peak hour for all five sites.

- The Russell Road and I-95 southbound on- and off-ramp intersection experiences severe delay during the morning peak hour, for all five alternatives, as it does for the background condition.

- The VA 610 and US 1 intersection experiences severe delay during the afternoon peak hour, for all five alternatives, as it does for the background condition.

- The Russell Road and I-95 northbound on-ramp intersection experiences severe delay during the afternoon peak hour for the Russell Road Alternative.

Other Alternative Transportation Conditions

The planned public transportation improvements anticipated by the year 2015 primarily focus on improving peak hour service from the Quantico area in the morning and to the Quantico area in the afternoon. Therefore, no adjustments have been made to the alternative traffic analyses for these improvements.

Table 5- Summary of Alternative Condition Capacity Analyses Results

Intersection	Russell Road		Mainside South		Mainside North		Locust Shade Park		Northern Combined	
	AM Peak Hour LOS & Delay	PM Peak Hour LOS & Delay	AM Peak Hour LOS & Delay	PM Peak Hour LOS & Delay	AM Peak Hour LOS & Delay	PM Peak Hour LOS & Delay	AM Peak Hour LOS & Delay	PM Peak Hour LOS & Delay	AM Peak Hour LOS & Delay	PM Peak Hour LOS & Delay
1. VA 619 at I-95 SB On-Ramp (U)	A 1.0	A 2.0	A 1.0	A 2.0	A 1.0	A 2.1	A 1.0	A 2.1	A 1.0	A 2.1
2. VA 619 at I-95 NB On-Ramp and Off-Ramp (U)	A 1.1	A 0.3	A 1.0	A 0.4	A 1.7	A 0.3	A 1.7	A 0.3	A 1.7	A 0.3
3. Russell Road at I-95 SB On-Ramp and Off-Ramp (U)	F 293.0	C 14.1	F 286.8	A 4.7	F 164.8	A 3.8	F 164.8	A 3.8	F 164.8	A 3.8
4. Russell Road at I-95 NB Off-Ramp (U)	F 188.2	A 1.0	F 271.2	A 1.0	F 189.5	A 0.7	F 189.5	A 0.7	F 189.5	A 0.7
5. Russell Road at I-95 NB On-Ramp (U)	A 0.1	F 53.0	A 0.1	C 11.0	A 4.7	A 5.0	A 4.7	B 5.0	A 4.7	B 5.0
6. Russell Road and VA 637 and MCB-1 (U)	A 3.6	A 4.2	A 1.1	A 0.3	A 1.1	A 0.3	A 1.1	A 0.3	A 1.1	A 0.3
7. Russell Road at US 1 SB On-Ramp and Off-Ramp (U)	A 2.4	A 1.5	A 1.8	A 1.3	A 1.7	A 2.9	A 1.7	A 2.9	A 1.7	A 2.9
8. Russell Road at US 1 NB On-Ramp and Off-Ramp (U)	A 0.1	A 0.9	A 0.1	A 2.4	A 0.1	A 0.7	A 0.1	A 0.7	A 0.1	A 0.7
9. US 1 and VA 619 and Fuller Road (S)	D 28.3	C 21.3	D 28.2	C 21.9	D 29.5	D 33.3	D 29.5	D 33.3	D 29.5	D 33.3
10. US 1 and VA 637 (S)	B 10.0	B 6.80	C 19.2	D 27.0	B 10.2	B 10.5	B 10.2	B 10.5	B 10.2	B 10.5
11. US 1 and VA 610 (S)	D 34.5	*	D 34.0	*	D 34.0	*	D 34.0	*	D 34.0	*
12. Entrance to Mainside North Site (along US 1) (S)	-	-	-	-	A 4.5	A 7.5	-	-	-	-
13. Entrance to Mainside South Site (along VA 637) (U)	-	-	A 2.5	A 2.3	-	-	-	-	-	-
14. Entrance to Russell Road Site (along VA 637) (U)	A 0.5	A 4.6	-	-	-	-	-	-	-	-
15. Entrance to Locust Shade Park Site (along US 1 (S)	-	-	-	-	-	-	B 8.6	B 14.4	-	-
16. Entrance to Northern Combined Site (along US 1 (S)	-	-	-	-	-	-	-	-	B 8.4	B 14.9

Table Legend

(S) - Signalized
(U) - Unsignalized
A - Level of service
0.7 - Average Total Vehicle Delay (seconds/vehicle) for unsignalized intersections
0.8 - Average Stopped-Time Delay (seconds) for signalized intersections
* - Denotes excessive delays

Findings and Mitigation

Year 1998 (Without the Proposed Action)

The analysis indicates that in 1998 the intersections in the study operate at or above acceptable levels of service except:

1. Russell Road at the I-95 northbound off-ramp; and
2. Russell Road at the US 1 northbound on- and off-ramps.

Year 2015 (Without the Proposed Action)

The analysis indicates that in year 2015, when planned developments, regional growth and planned roadway improvements are considered *without the proposed Heritage Center,* the following intersections will have unacceptable levels of service:

1. Russell Road at the I-95 southbound on- and off-ramp;
2. Russell Road at the I-95 northbound off-ramp; and
3. US 1 and VA 610.

Year 2015 (With the Proposed Action)

Russell Road Site

The analysis also indicates that in year 2015, when planned developments, regional growth, planned roadway improvements are considered *and the proposed action is implemented at the Russell Road Site*, the following intersections will have unacceptable levels of service:

1. Russell Road at the I-95 southbound on- and off-ramp;
2. Russell Road at the I-95 northbound off-ramp;
3. US 1 and VA 610;
4. Russell Road at the I-95 northbound on-ramp.

Mainside South Site

The analysis indicates that in year 2015, when planned developments, regional growth, planned roadway improvements are considered *and the proposed action is implemented at the Mainside South Site*, the following intersections will have unacceptable levels of service:

1. Russell Road at the I-95 southbound on- and off-ramp;
2. Russell Road at the I-95 northbound off-ramp; and
3. US 1 and VA 610.

Mainside North Site

The analysis indicates that in 2015, when planned developments, regional growth, planned roadway improvements are considered *and the proposed action is implemented at the Mainside North Site*, the following intersections will have unacceptable levels of service:

1. Russell Road at the I-95 southbound on- and off-ramp;
2. Russell Road at the I-95 northbound off-ramp; and
3. US 1 and VA 610.

Locust Shade Park Site

The analysis indicates that in year 2015, when planned developments, regional growth, planned roadway improvements are considered *and the proposed action is implemented at the Locust Shade Park Site*, the following intersections will have unacceptable levels of service:

1. Russell Road at the I-95 southbound on- and off-ramp;
2. Russell Road at the I-95 northbound off-ramp; and
3. US 1 and VA 610.

Northern Combined Site

The analysis indicates that in year 2015, when planned developments, regional growth, planned roadway improvements are considered *and the proposed action is implemented at the Locust Shade Park Site*, the following intersections will have unacceptable levels of service:

1. Russell Road at the I-95 southbound on- and off-ramp;
2. Russell Road at the I-95 northbound off-ramp; and
3. US 1 and VA 610.

Improvements Anticipated by Year 2015 (Without the Proposed Action)

The analysis for the background traffic condition assumed the following roadway improvements would be in place by year 2015:

- US 1 is widened to 6-lanes from the Stafford County line to north of study area. (As proposed in VDOT's US 1 Corridor Study)

- The Fuller Heights Road (VA 619) and Fuller Road (VA 619) intersection is relocated or improved. (As proposed in VDOT's US 1 Corridor Study)

- The interchange at US 1and Russell Road is redesigned to incorporate two through lanes on Russell Road and free-flowing movements from northbound to eastbound, northbound to westbound, southbound to eastbound and eastbound to southbound. (As proposed in VDOT's US 1 Corridor Study)

- An 800-foot acceleration lane on Russell Road from the I-95 northbound off ramp. (As proposed by MCB-Quantico)

The following additional improvements are necessary to upgrade the roadways within the limits of this study, to an acceptable level of service for the *background traffic condition*:

- The intersection of VA 610 and US 1 will require signal timing modification, the eastbound through lane to be changed to a shared left/through lane and the construction of an acceptance lane for the eastbound right turn movement (to allow for right-turns-on-red).

- Russell Road requires two through lanes in each direction between the existing I-95 southbound on-ramp through the Russell Road entrance gate.

- The I-95 and Russell ramp configuration should be redesign to a cloverleaf configuration. At a minimum, free-flowing movements from northbound to eastbound, northbound to westbound, southbound to westbound and westbound to northbound and eastbound to northbound are required. The existing westbound to southbound and eastbound to southbound ramp is sufficient to accommodate background and alternative conditions.

These improvements are necessary to improve the congestion that is anticipated by year 2015, *without the proposed action*. The improvements stated above will increase the level of service of the Russell Road corridor intersections to attain acceptable levels of service. These improvements, if completed by year 2015 will also accommodate the traffic generated by the Heritage Center, as analyzed in this document.

The aforementioned improvements will provide adequate traffic capacity along the Russell Road corridor up to the Russell Road gate entrance. The MCB should consider relocating the gate to the east to allow additional distance between the US 1 off-ramps. The preferred distance could be determined by performing studies, during various levels of THREATCON, to determine the average length of time it takes to secure vehicles and the anticipated queue lengths for the prevailing conditions. This could also help determine if a pull-off area and a building facility designed to issue permits would be beneficial. The study should be conducted concurrently at both gates, so the results are not skewed.

Improvements Anticipated by Year 2015 (With the Proposed Action)

Additional improvements that are necessary for the individual sites are summarized below:

Russell Road Site

1. Re-alignment of the MCB-1 and Russell Road intersection to improve sight distance would be beneficial. The improvement would incorporate a southbound left turn lane, a northbound right turn lane and westbound separate left and right turn lanes to accommodate traffic generated by the proposed Heritage Center.

2. This report assumed the Russell Road Site would have a driveway at an unsignalized intersection on MCB-1, east of its intersection with Russell Road. The intersection would have a deceleration and acceleration lanes and separate outbound lanes to meet design standards. A review of the traffic volumes indicates that if a driveway is located on Russell Road, rather than MCB-1, a unsignalized intersection would be sufficient, but a left turn lane into the site would be necessary.

3. The addition of an eastbound right turn lane at the intersection of US 1 and VA 637 would be beneficial but is not necessary to maintain an acceptable level of service.

4. Safety improvements to upgrade VA 637, between US 1 and MCB-1 to meet current design standards would be beneficial.

5. Russell Road provides access to military ammunition facilities and is used to transport other explosives. The design of the public access areas and the roadways should adhere to the United States Department of Transportation requirements for routes used to transport explosives.

Mainside South Site

1. The Mainside South Site would have access at an unsignalized intersection on VA 637, east of the US 1 and VA 637 intersection. An eastbound left lane and westbound deceleration and acceleration lanes would be required to meet design standards.

2. Re-alignment of the eastern approach of the US 1 and VA 637 intersection to improve angle of approach and the right turn movement is an improvement that would be beneficial.

3. VA 637, between US 1and the proposed driveway, is a narrow winding road with no shoulders. Safety modifications to improve the roadway to meet current design standards would be beneficial. (This improvement is currently funded for in VDOT's capital improvement/maintenance program.)

Mainside North Site

1. The Mainside North Site would require a signalized intersection on US 1 with separate left and right turning lanes.

2. A full access driveway at Fuller Road between US 1 and the MBC gate is not recommended without a study of the proposed relocation of the VA 619 intersection. A driveway at this location may impede anticipated traffic flow along Fuller Road. A partial eastbound, right-in/right-out driveway may be acceptable.

Locust Shade Park Site

1. The Locust Shade Park Site would require a signalized intersection on US 1 with separate left and right turning lanes.

2. Access to the Locust Shade Park Site along VA 619 is not recommended without additional study of the weave movements and distances between adjacent intersections and exit ramps.

Northern Combined Site

1. The Northern Combined Site would require a signalized intersection on US 1 with separate left and right turning lanes.

2. Access to the Locust Shade Park Site along VA 619 is not recommended without additional study of the weave movements and distances between adjacent intersections and exit ramps.

3. A full access driveway at Fuller Road between US 1 and the MBC gate is not recommended without a study of the proposed relocation of the VA 619 intersection. A driveway at this location may impede anticipated traffic flow along Fuller Road. A partial eastbound, right-in/right-out driveway may be acceptable.

Improvements required for an acceptable level of service in year 2015 for traffic conditions with and without the proposed action are shown in Table 6.

Other Transportation Considerations

The public transportation improvements anticipated by the year 2015 are primarily focused on improving commuter peak hour service (towards Washington D.C. in the morning and towards the Quantico area in the afternoon). No adjustments have been made to the traffic analyses for these improvements since the site-oriented traffic is primarily in the non-peak direction. However, it could be beneficial to work with public transportation agencies to provide service to the proposed Heritage Center. Market studies performed for other museums indicate improved public transit increases the attendance at national museums. Some considerations for improving public transit are:

- Coordinate with the Virginia Rail Express, Amtrak, and Potomac and Rappahannock Transportation Commission (PRTC) Omni-Link to provide service during the peak arrivals and departures. On-call service to and from local hotels could be a viable option.

- Incorporate a pedestrian and bicycle trail along the length of US 1 at the Mainside North Site to parallel the proposed trail on the west side of US 1. Provide a similar trail along the length of Russell Road.

- Incorporate a park and ride lot into the site to promote public transit to the site and advertise the site to local commuters.

- Expand the USMC shuttle bus service between Quantico and the USMC Headquarters in Alexandria to the site and encourage military conference attendees to use the provided services.

- Expand the Base Motor Transport shuttle to provide service between the site and the MCB lodging facilities.

Conclusions

The analysis indicates that major improvements will be required to obtain or maintain an acceptable level of service by the year 2015. These improvements will be required even if the proposed action is not implemented. The analysis indicates that if the improvements are made they will be able to maintain an acceptable level of service if the proposed action is implement.

The analysis also indicates that certain site-related roadway improvements will be required at all of the sites. These improvements include acceleration, deceleration and left, inbound turn lanes. The Mainside North, Locust Shade Park and Northern Combined Sites would require signalized intersections at their entrance driveway on US 1. The Russell Road Site would benefit from the re-alignment of the Russell Road and MCB-1 intersection and the addition of a right turn lane at the US 1 and VA 637 intersection. The Mainside South Site would operate more efficiently with improvements to VA 637 and its westbound approach at the intersection with US 1.

Table 6- Summary of Roadway Improvements Required for Acceptable LOS by for Year 2015 Traffic Conditions

Improvement	No Action	Alternative Sites				
		Russell Road	Mainside South	Mainside North	Locust Shade Park	Northern Combined
US 1 - improved to 6-lanes from Stafford County Line to north[1]	Yes	Yes	Yes	Yes	Yes	Yes
US 1 and Russell Road Interchange - re-design[1]	Yes	Yes	Yes	Yes	Yes	Yes
US 1 and VA 619 - addition of NB right lane[1]	Yes	Yes	Yes	Yes	Yes	Yes
US 1 and VA 610 - construction of acceptance lane for right-turn on-red from eastbound approach, lane re-configurations and signal timing changes	Yes	Yes	Yes	Yes	Yes	Yes
Russell Road - widened to two through lanes in each direction[1]	Yes	Yes	Yes	Yes	Yes	Yes
I-95 and Russell Road Interchange - re-design	Yes	Yes	Yes	Yes	Yes	Yes
Signalized driveway on US 1	No	No	No	Yes	Yes	Yes
Acceleration/Deceleration lanes at driveway	No	Yes	Yes	Yes	Yes	Yes
Left turn lane entering driveway	No	Yes	Yes	Yes	Yes	Yes
Re-align MCB-1 and Russell Road Intersection	No	Yes	No	No	No	No
VA 637 safety upgrades (between driveway and US1) and possible re-alignment of westbound approach	No	No[2]	No[2]	No	No	No
VA 637 and US 1 addition of EB right turn lane	No	No[2]	No[2]	No	No	No

[1] As proposed by VDOT in US 1 Corridor Study
[2] Not required for acceptable LOS but is highly recommended to mitigate potential safety hazards and traffic conflicts.

Appendix A- Definitions

Level of Service

The ability of a street system to accommodate traffic is expressed in terms of "level of service" at critical locations (usually intersections). The service levels are represented by a range characterized from by the letters "A" through "F". The various service levels are defined below.

"A" Conditions of free unobstructed flow, no delays and siganal phases are sufficient in duration clear all approaching vehicles.

"B" Conditions of stable flow, very little delay, a few phases are unable to handle all approaching vehicles.

"C" Conditions of stable flow, delays are low to moderate, full use of peak direction signal phase(s) is experienced.

"D" Conditions approaching unstable flow, delays are moderate to heavy, significant signal time deficiencies are experienced for short durations during the peak traffic period.

"E" Conditions of unstable flow, delays are significant, signal phase timing is generally insufficient, congestion exists for extended duration throughout the peak period. (Level of service "E" represents the theoretical maximum number of vehicles that can pass through an intersection during a given time period).

"F" Conditions are jammed, full utilization of the intersection approach is prevented due to back-ups from locations downstream.

Level of Service Ranges - Unsignalized Intersections

Level of Service	Average Total Delay (Seconds/Vehicle)
A	5.0
B	5.1 to 10.0
C	10.1 to 20.0
D	25.1 to 30.0
E	30.1 to 45.0
F	45.0

Source: Highway Capacity Manual, 1994, Special Report 209, (Washington, DC: Transportation Research Board), page 10-12

Level of Service Ranges - Signalized Intersections

Level of Service	Stopped Delay per Vehicle (Seconds)
A	5.0
B	5.1 to 15.0
C	15.1 to 25.0
D	25.1 to 40.0
E	40.1 to 60.0
F	60.0

Source: Highway Capacity Manual, 1994, Special Report 209, (Washington, DC: Transportation Research Board), page 9-6

Appendix B - Traffic Counts

DATA COLLECTION SUMMARY

QUANTICO MARINE BASE AREA,

PRINCE WILLIAM & STAFFORD COUNTIES, VIRGINIA

OCTOBER, 1998

Prepared for:

PARSONS TRANSPORTATION GROUP, INC.
2 North Charles Street
Baltimore, MD 21201

Prepared by:

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Transportation Planning & Engineering Consultants
1738 Elton Road, Suite 321
Silver Spring, Maryland 20903
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October, 1998

MANUAL COUNTS

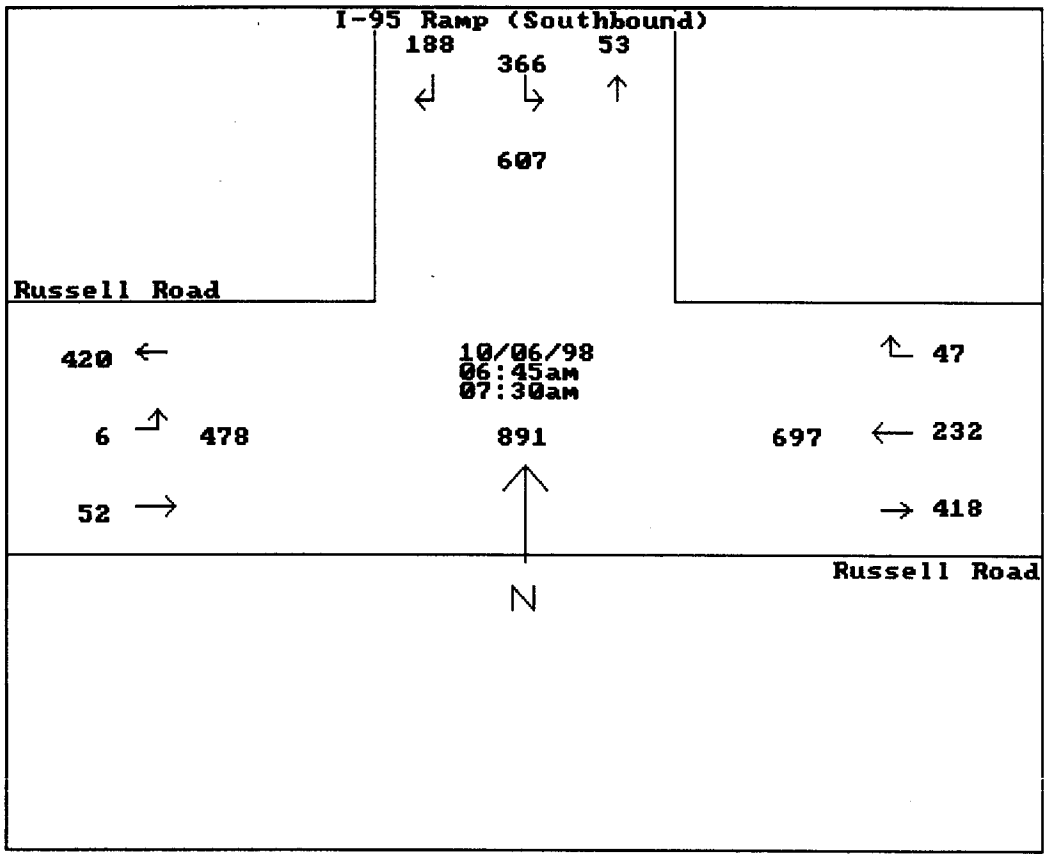
O.R. George & Associates, Inc.
1738 Elton Rd., Suite 321
Silver Spring, MD 20903
Tel: (301)439-7722 Fax: (301)439-7759

Counted by :ORGA-JAA
Board :D1-0933
City/County:Quantico/Prince William
Weather :Warm/Cloudy/Dry

Study Name: RUS@I95S
Site Code : 01080933
Start Date: 10/06/98
Page : 2

Total Traffic

End Time	I-95 Ramp (Southbound) From North Left	Rght	Apprch. Total	Russell Road From East Thru	Rght	Apprch. Total	Russell Road From West Left	Thru	Apprch. Total	Intrvl. Total
Peak Hour Analysis By Entire Intersection for the Period: 06:30 on 10/06/98 to 08:15 on 10/06/98										
Time	06:45			06:45			06:45			
Vol.	366	188	06	232	47		6	52		
Pct.	66.0	33.9		83.1	16.8		10.3	89.6		
Total	554			279			58			
High	07:00			07:00			07:00			
Vol.	99	52		60	17		2	14		
Total	151			77			16			
PHF	0.917			0.905			0.906			



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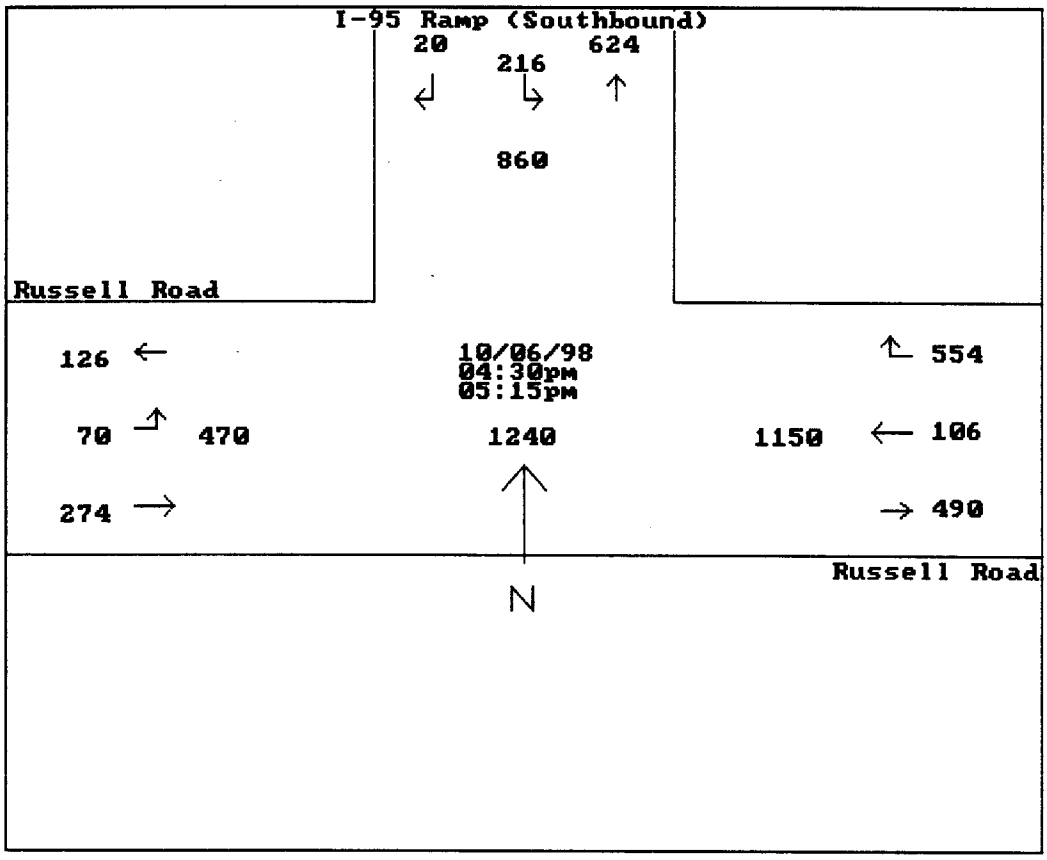
Silver Spring, MD 20903
Tel: (301)439-7722 Fax: (301)439-7759

Counted by :ORGA-JAA
Board :D1-0933
City/County:Quantico/Prince William
Weather :Warm/Cloudy/Dry

Study Name: RUS@I95S
Site Code : 01080933
Start Date: 10/06/98
Page : 3

Total Traffic

End Time	I-95 Ramp (Southbound) From North Left	Rght	Apprch. Total	Russell Road From East Thru	Rght	Apprch. Total	Russell Road From West Left	Thru	Apprch. Total	Intrvl. Total
Peak Hour Analysis By Entire Intersection for the Period: 15:30 on 10/06/98 to 17:15 on 10/06/98										
Time	16:30			16:30			16:30			
Vol.	216	20	16	106	554		70	274		
Pct.	91.5	8.4		16.0	83.9		20.3	79.6		
Total	236			660			344			
High	16:30			17:00			16:30			
Vol.	69	4		37	144		23	83		
Total	73			181			106			
PHF	0.808			0.911			0.811			



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Counted by :ORGA-JAA
Board :D1-0933
City/County:Quantico/Prince William
Weather :Warm/Cloudy/Dry

Study Name: RUS@I95S
Site Code : 01080933
Start Date: 10/06/98
Page : 1

Total Traffic

End Time	I-95 Ramp (Southbound) From North Left	Rght	Apprch. Total	Russell Road From East Thru	Rght	Apprch. Total	Russell Road From West Left	Thru	Apprch. Total	Intrvl. Total
10/06/98										
06:45	74	43	117	45	7	52	0	12	12	181
07:00	98	43	141	61	6	67	1	13	14	222
Hour	172	86	258	106	13	119	1	25	26	403
07:15	99	52	151	60	17	77	2	14	16	244
07:30	105	46	151	59	9	68	1	11	12	231
07:45	64	47	111	52	15	67	2	14	16	194
08:00	60	50	110	45	5	50	0	19	19	179
Hour	328	195	523	216	46	262	5	58	63	848
08:15	41	32	73	26	7	33	4	15	19	125
08:30	37	19	56	29	10	39	1	25	26	121
[BREAK]										
Hour	78	51	129	55	17	72	5	40	45	246
[BREAK]										
15:45	52	13	65	28	93	121	30	50	80	266
16:00	47	10	57	32	88	120	14	28	42	219
Hour	99	23	122	60	181	241	44	78	122	485
16:15	58	5	63	25	117	142	13	62	75	280
16:30	57	10	67	30	123	153	15	48	63	283
16:45	69	4	73	27	153	180	23	83	106	359
17:00	49	5	54	18	141	159	16	73	89	302
Hour	233	24	257	100	534	634	67	266	333	1224
17:15	46	5	51	37	144	181	14	44	58	290
17:30	52	6	58	24	116	140	17	74	91	289
Total	1008	390	1398	598	1051	1649	153	585	738	3785
% Apr.	72.1	27.8	-	36.2	63.7	-	20.7	79.2	-	-
% Int.	26.6	10.3	-	15.7	27.7	-	4.0	15.4	-	-

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Counted by :ORGA-AA
Board :D1-0931
City/County:Quantico/Prince Williams
Weather :Warm/Cloudy/Dry

Study Name: RUS@I95N
Site Code : 01172931
Start Date: 10/06/98
Page : 1

Total Traffic

End Time	Russell Road From East Thru	Apprch. Total	I-95 Off-Ramp (NB) From South Left	Right	Apprch. Total	Russell Road From West Thru	Apprch. Total	Intrvl. Total
10/06/98								
06:45	28	28	23	147	170	86	86	284
07:00	34	34	37	208	245	95	95	374
Hour	62	62	60	355	415	181	181	658
07:15	43	43	34	192	226	102	102	371
07:30	46	46	25	184	209	136	136	391
07:45	27	27	40	184	224	91	91	342
08:00	21	21	33	134	167	80	80	268
Hour	137	137	132	694	826	409	409	1372
08:15	17	17	16	68	84	59	59	160
08:30	21	21	20	55	75	62	62	158
[BREAK]								
Hour	38	38	36	123	159	121	121	318
[BREAK]								
15:45	119	119	4	32	36	107	107	262
16:00	114	114	6	31	37	77	77	228
Hour	233	233	10	63	73	184	184	490
16:15	137	137	4	21	25	114	114	276
16:30	151	151	1	19	20	119	119	290
16:45	165	165	2	18	20	135	135	320
17:00	156	156	2	22	24	128	128	308
Hour	609	609	9	80	89	496	496	1194
17:15	167	167	10	12	22	98	98	287
17:30	136	136	5	26	31	116	116	283
Total	1382	1382	262	1353	1615	1605	1605	4602
% Apr.	100.0	-	16.2	83.7	-	100.0	-	-
% Int.	30.0	-	5.6	29.4	-	34.8	-	-

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Board :D1-0931
City/County:Quantico/Prince Williams
Weather :Warm/Cloudy/Dry

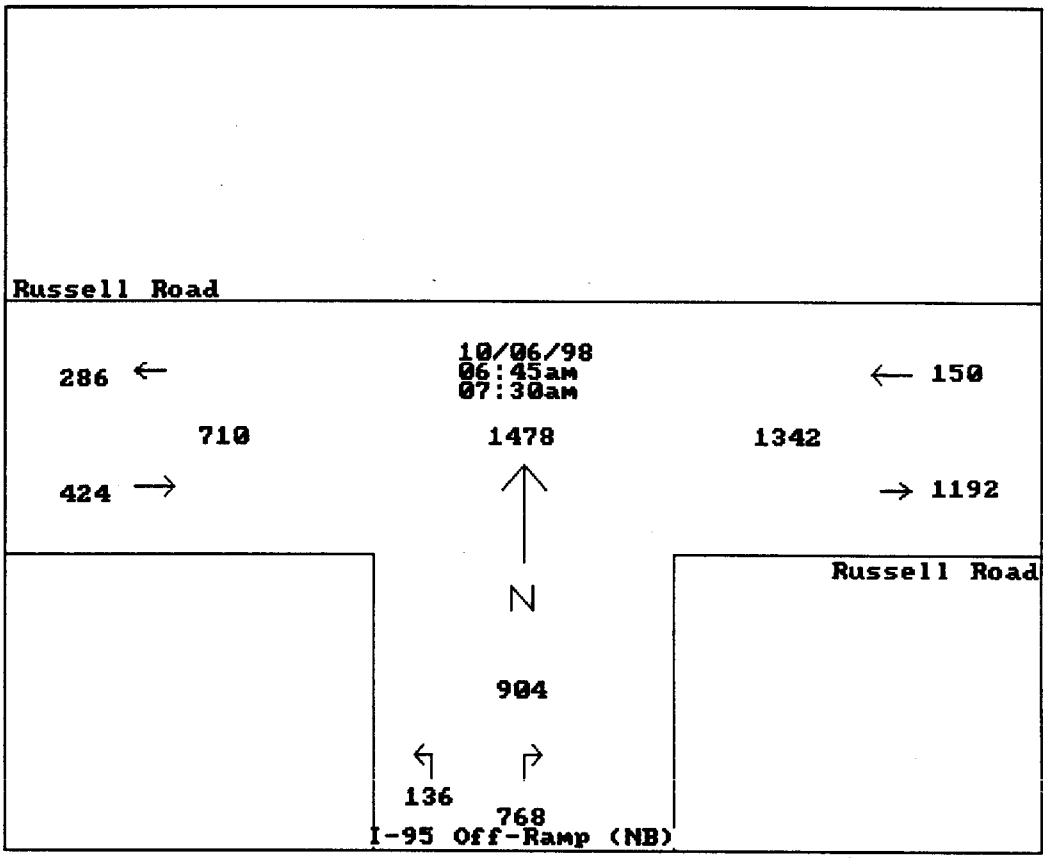
Study Name: RUS@I95N
Site Code : 01172931
Start Date: 10/06/98
Page : 2

Total Traffic

End Time	Russell Road From East Thru	Apprch. Total	I-95 Off-Ramp (NB) From South Left	Right	Apprch. Total	Russell Road From West Thru	Apprch. Total	Intrvl. Total

Peak Hour Analysis By Entire Intersection for the Period: 06:30 on 10/06/98 to 08:15 on 10/06/98

Time	06:45		06:45			06:45	
Vol.	150		136	768		424	
Pct.	100.0		15.0	84.9		100.0	
Total	150		904			424	
High	07:15		06:45			07:15	
Vol.	46		37	208		136	
Total	46		245			136	
PHF	0.815		0.922			0.779	



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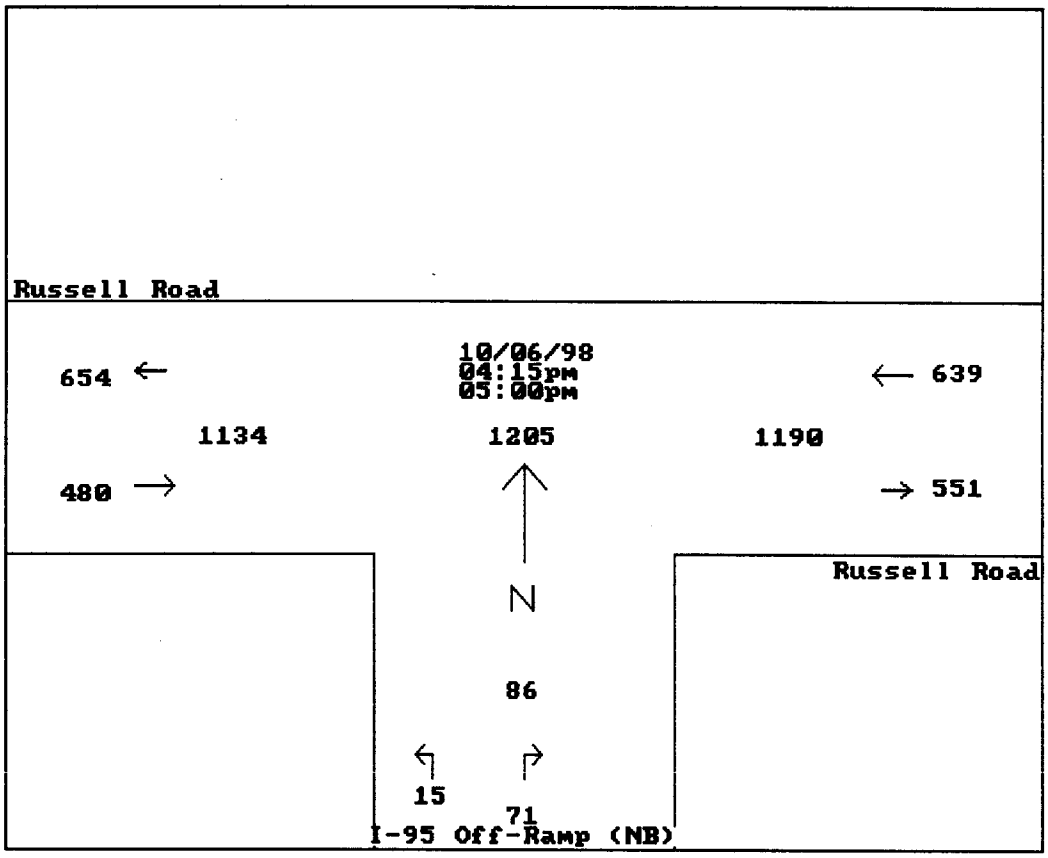
Counted by :ORGA-AA
Board :D1-0931
City/County:Quantico/Prince Williams
Weather :Warm/Cloudy/Dry

Study Name: RUS@I95N
Site Code : 01172931
Start Date: 10/06/98

Total Traffic

End Time	Russell Road From East Thru	Russell Road From East Apprch. Total	I-95 Off-Ramp (NB) From South Left	I-95 Off-Ramp (NB) From South Right	I-95 Off-Ramp (NB) From South Apprch. Total	Russell Road From West Thru	Russell Road From West Apprch. Total	Intrvl. Total
Peak Hour Analysis By Entire Intersection for the Period: 15:30 on 10/06/98 to 17:15 on 10/06/98								
Time	16:15		16:15			16:15		
Vol.	639		15	71		480		
Pct.	100.0		17.4	82.5		100.0		
Total	639		86			480		
High	17:00		16:45			16:30		
Vol.	167		2	22		135		
Total	167		24			135		
PHF	0.956		0.895			0.888		



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Counted by :ORGA-PR
Board :D1-0932
City/County:Quantico/Prince William
Weather :Warm/Cloudy/Dry

Study Name: RUS@I95E
Site Code : 01410932
Start Date: 10/06/98
Page : 1

Total Traffic

End Time	Russell Road From East Thru	Right	Apprch. Total	Russell Road From West Left	Thru	Apprch. Total	Intrvl. Total
10/06/98							
06:45	29	27	56	6	222	228	284
07:00	33	15	48	1	294	295	343
Hour	62	42	104	7	516	523	627
07:15	38	10	48	3	270	273	321
07:30	35	9	44	6	308	314	358
07:45	26	12	38	6	270	276	314
08:00	21	17	38	6	200	206	244
Hour	120	48	168	21	1048	1069	1237
08:15	17	12	29	0	124	124	153
08:30	18	15	33	1	100	101	134
[BREAK]							
Hour	35	27	62	1	224	225	287
[BREAK]							
15:45	121	37	158	27	111	138	296
16:00	115	41	156	21	92	113	269
Hour	236	78	314	48	203	251	565
16:15	136	64	200	36	99	135	335
16:30	156	72	228	31	105	136	364
16:45	169	82	251	45	120	165	416
17:00	159	93	252	40	113	153	405
Hour	620	311	931	152	437	589	1520
17:15	170	76	246	34	81	115	361
17:30	137	95	232	32	114	146	378
Total	1380	677	2057	295	2623	2918	4975
% Apr.	67.0	32.9	-	10.1	89.8	-	-
% Int.	27.7	13.6	-	5.9	52.7	-	-

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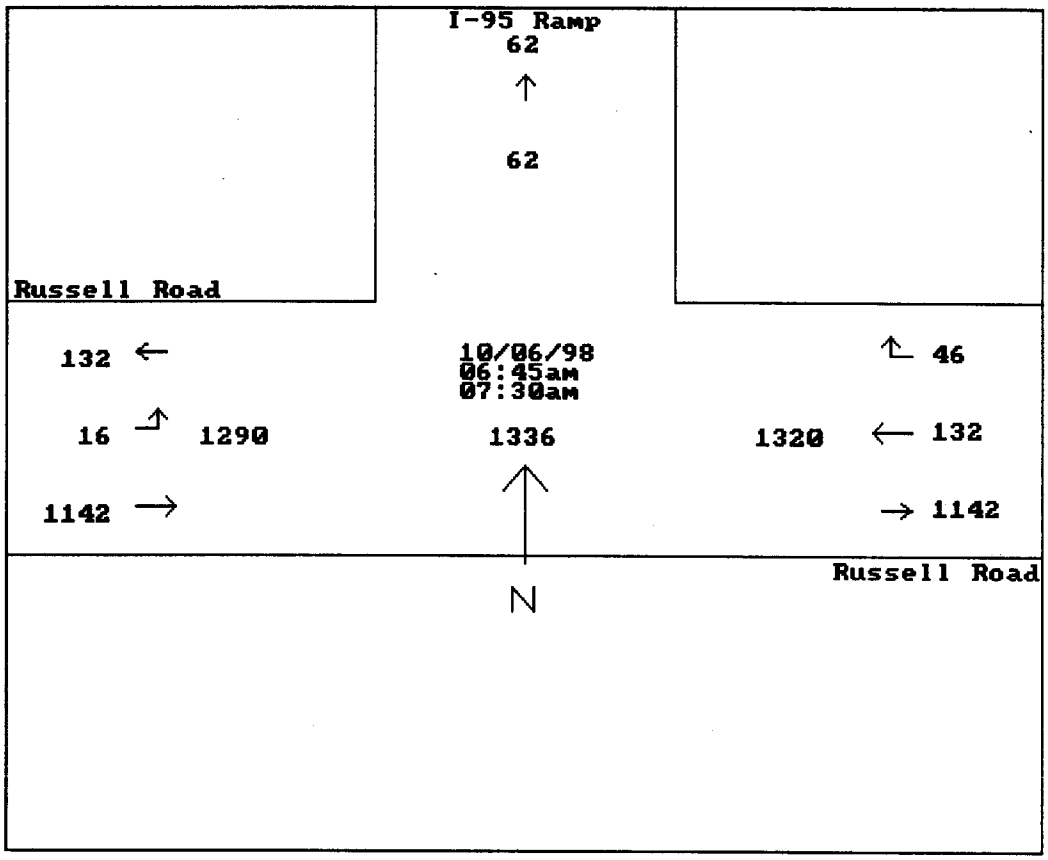
Board :D1-0932
City/County:Quantico/Prince William
Weather :Warm/Cloudy/Dry

Study Name: RUS@I95E
Site Code : 01410932
Start Date: 10/06/98

Total Traffic

End Time	Russell Road From East Thru	Right	Apprch. Total	Russell Road From West Left	Thru	Apprch. Total	Intrvl. Total
Peak Hour Analysis By Entire Intersection for the Period: 06:30 on 10/06/98 to 08:15 on 10/06/98							
Time	06:45			06:45			
Vol.	132	46	06	16	1142		
Pct.	74.1	25.8		1.3	98.6		
Total	178			1158			
High	06:45			07:15			
Vol.	33	15		6	308		
Total	48			314			
PHF	0.927			0.921			



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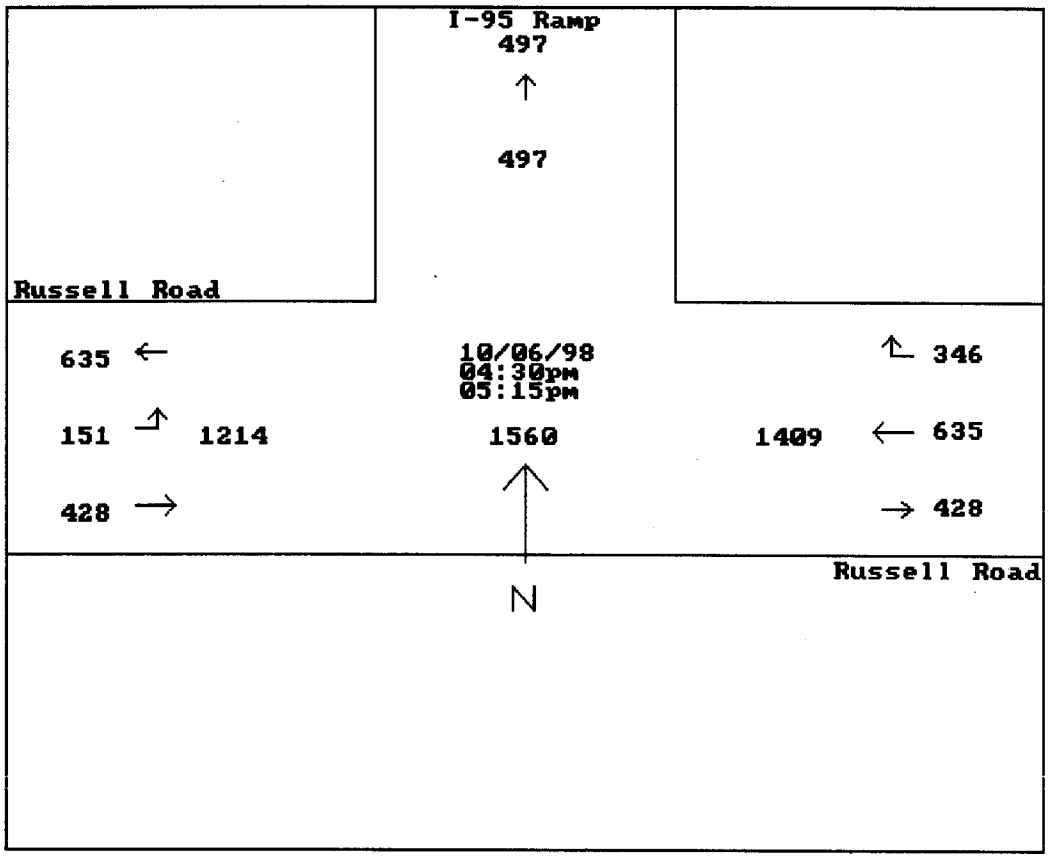
Counted by :ORGA-PR
Board :D1-0932
City/County:Quantico/Prince William
Weather :Warm/Cloudy/Dry

Study Name: RUS@I95E
Site Code : 01410932
Start Date: 10/06/98

Total Traffic

End Time	Russell Road From East Thru	Right	Apprch. Total	Russell Road From West Left	Thru	Apprch. Total	Intrvl. Total
Peak Hour Analysis By Entire Intersection for the Period: 15:30 on 10/06/98 to 17:15 on 10/06/98							
Time	16:30			16:30			
Vol.	635	346	16	151	428		
Pct.	64.7	35.2		26.0	73.9		
Total	981			579			
High	16:45			16:30			
Vol.	159	93		45	120		
Total	252			165			
PHF	0.973			0.877			



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Counted by :ORGA-NL, PB
Board :D1-0932, D1-0933
City/County:Quantico/Stafford
Weather :Warm/Cloudy/Dry

Study Name: US1@V637
Site Code : 04410932
Start Date: 10/07/98
Page : 1

Total Traffic

End Time	US Rte.1 (Jeff.Davis Hwy) From North Left	Thru	Right	Aprch. Total	VA 637 (Telegraph Road) From East Left	Thru	Right	Aprch. Total	US Rte.1 (Jeff.Davis Hwy) From South Left	Thru	Right	Aprch. Total	VA 637 (Telegraph Road) From West Left	Thru	Right	Aprch. Total	Intvl. Total
10/07/98																	
06:45	5	18	1	24	13	2	34	49	10	222	1	233	1	0	1	2	308
07:00	10	21	1	32	7	3	21	31	7	241	2	250	2	0	1	3	316
Hour	15	39	2	56	20	5	55	80	17	463	3	483	3	0	2	5	624
07:15	8	27	0	35	22	0	30	52	21	218	4	243	4	0	3	7	337
07:30	9	17	2	28	11	5	17	33	14	222	2	238	0	0	0	0	299
07:45	14	35	1	50	10	1	28	39	15	194	5	214	0	0	2	2	305
08:00	6	25	2	33	11	1	16	28	13	147	5	165	1	0	1	2	228
Hour	37	104	5	146	54	7	91	152	63	781	16	860	5	0	6	11	1169
08:15	12	44	2	58	8	1	11	20	3	82	3	88	2	0	3	5	171
08:30	8	41	0	49	6	1	11	18	3	81	6	90	1	1	1	3	160
[BREAK]																	
Hour	20	85	2	107	14	2	22	38	6	163	9	178	3	1	4	8	331
[BREAK]																	
15:45	21	161	1	183	9	0	8	17	2	50	14	66	3	1	10	14	280
16:00	13	170	0	183	9	0	4	13	2	57	12	71	1	0	5	6	273
Hour	34	331	1	366	18	0	12	30	4	107	26	137	4	1	15	20	553
16:15	16	206	2	224	10	0	3	13	1	49	11	61	3	2	17	22	320
16:30	35	223	2	260	5	0	16	21	3	69	15	87	2	2	10	14	382
16:45	29	238	2	269	13	2	13	28	2	57	8	67	1	1	9	11	375
17:00	23	233	2	258	3	0	11	14	2	74	13	89	6	1	15	22	383
Hour	103	900	8	1011	31	2	43	76	8	249	47	304	12	6	51	69	1460
17:15	28	243	2	273	5	0	14	19	2	57	8	67	8	0	18	26	385
17:30	47	232	0	279	17	0	18	35	3	56	7	66	0	0	12	12	392
Total	284	1934	20	2238	159	16	255	430	103	1876	116	2095	35	8	108	151	4914
% Apr.	12.6	86.4	0.8	-	36.9	3.7	59.3	-	4.9	89.5	5.5	-	23.1	5.2	71.5	-	-
% Int.	5.7	39.3	0.4	-	3.2	0.3	5.1	-	2.0	38.1	2.3	-	0.7	0.1	2.1	-	-

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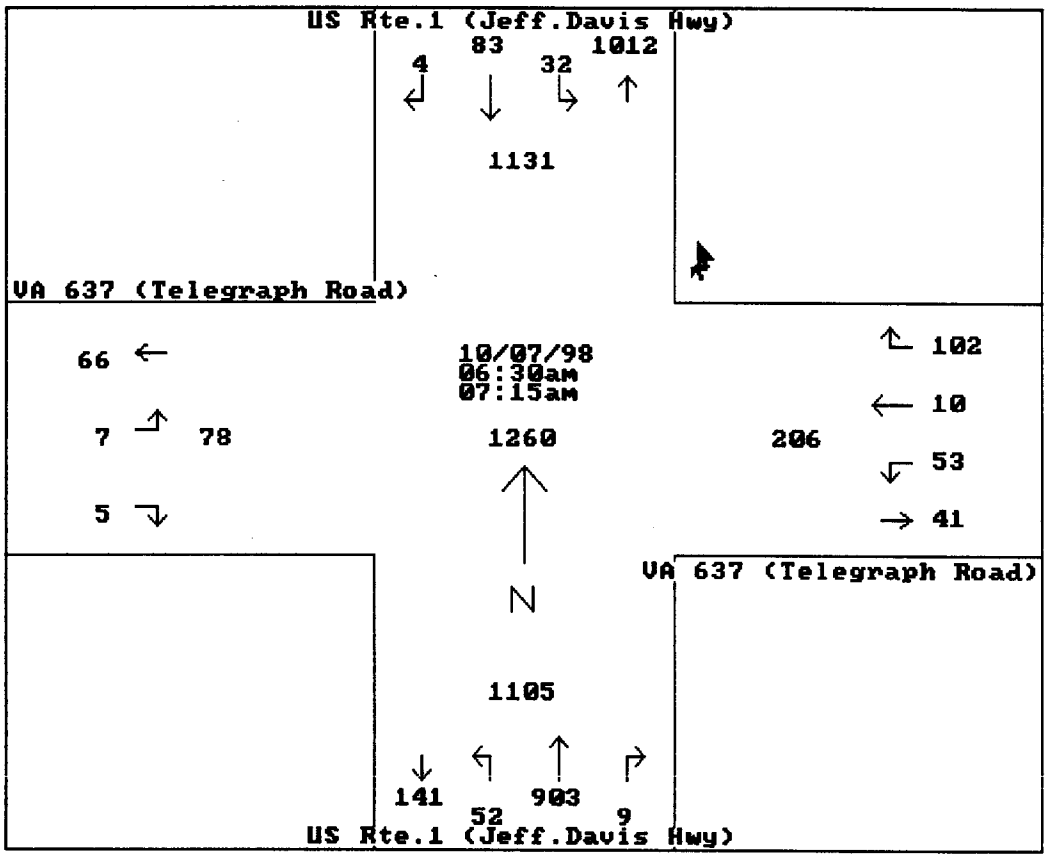
City/County:Quantico/Stafford
Weather :Warm/Cloudy/Dry

Study Name: US1@V637
Site Code : 04410932
Start Date: 10/07/98

Total Traffic

End Time	US Rte.1 (Jeff.Davis Hwy) From North Left	Thru	Right	Aprch. Total	VA 637 (Telegraph Road) From East Left	Thru	Right	Aprch. Total	US Rte.1 (Jeff.Davis Hwy) From South Left	Thru	Right	Aprch. Total	VA 637 (Telegraph Road) From West Left	Thru	Right	Aprch. Total	Intvl. Total
Peak Hour Analysis By Entire Intersection for the Period: 06:30 on 10/07/98 to 08:15 on 10/07/98																	
Time	06:30				06:30				06:30				06:30				
Vol.	32	83	4	0	53	10	102		52	903	9		7	0	5		
Pct.	26.8	69.7	3.3		32.1	6.0	61.8		5.3	93.6	0.9		58.3	0.0	41.6		
Total	119				165				964				12				
High	07:00				07:00				06:45				07:00				
Vol.	8	27	0		22	0	30		7	241	2		4	0	3		
Total	35				52				250				7				
PHF	0.850				0.793				0.964				0.428				



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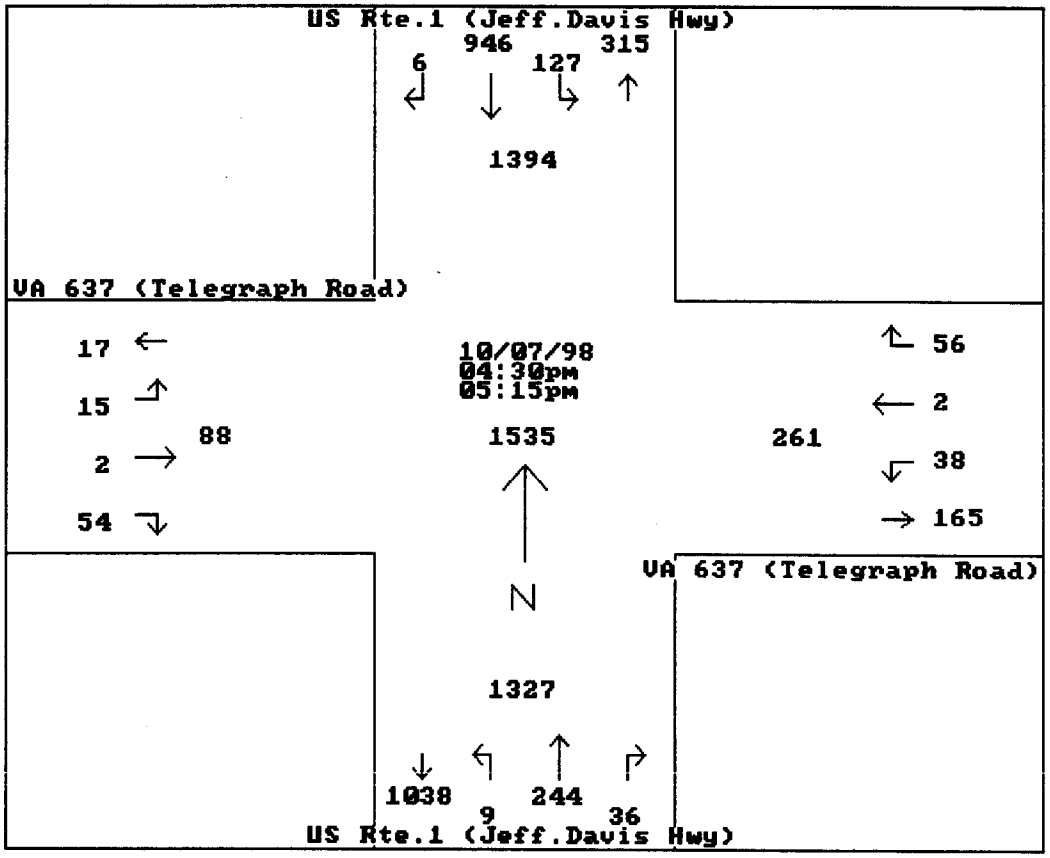
Board :D1-0932, D1-0933
City/County:Quantico/Stafford
Weather :Warm/Cloudy/Dry

Study Name: US1@V637
Site Code : 04410932
Start Date: 10/07/98

Total Traffic

End Time	US Rte.1 (Jeff.Davis Hwy) From North Left	Thru	Right	Aprch. Total	VA 637 (Telegraph Road) From East Left	Thru	Right	Aprch. Total	US Rte.1 (Jeff.Davis Hwy) From South Left	Thru	Right	Aprch. Total	VA 637 (Telegraph Road) From West Left	Thru	Right	Aprch. Total	Intvl. Total
Peak Hour Analysis By Entire Intersection for the Period: 15:30 on 10/07/98 to 17:15 on 10/07/98																	
Time	16:30				16:30				16:30				16:30				
Vol.	127	946	6	1	38	2	56		9	244	36		15	2	54		
Pct.	11.7	87.6	0.5		39.5	2.0	58.3		3.1	84.4	12.4		21.1	2.8	76.0		
Total	1079				96				289				71				
High	17:15				17:15				16:45				17:00				
Vol.	47	232	0		17	0	18		2	74	13		8	0	18		
Total	279				35				89				26				
PHF	0.966				0.685				0.811				0.682				



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Counted by :ORGA-JAA, AA
Board :D1-0931, D1-0933
City/County:Quantico/Prince William
Weather :Warm/Clear/Dry

Study Name: V619@US1
Site Code : 03080933
Start Date: 10/07/98
Page : 1

Total Traffic

End Time	US Rte 1 (Jeff.Davis Hwy) From North Left	Thru	Right	Aprch. Total	(VA 619) Fuller Road From East Left	Thru	Right	Aprch. Total	US Rte 1 (Jeff.Davis Hwy) From South Left	Thru	Right	Aprch. Total	(VA 619) Joplin Road From West Left	Thru	Right	Aprch. Total	Intvl. Total
10/07/98																	
06:45	55	24	26	105	5	55	22	82	37	65	30	132	52	125	4	181	500
07:00	71	25	33	129	11	31	21	63	33	66	32	131	53	164	4	221	544
Hour	126	49	59	234	16	86	43	145	70	131	62	263	105	289	8	402	1044
07:15	58	38	37	133	2	49	39	90	21	71	48	140	41	197	5	243	606
07:30	79	26	30	135	5	49	29	83	23	62	36	121	54	186	7	247	586
07:45	66	20	39	125	9	69	46	124	30	77	48	155	72	216	3	291	695
08:00	55	30	39	124	5	50	29	84	25	67	24	116	51	190	4	245	569
Hour	258	114	145	517	21	217	143	381	99	277	156	532	218	789	19	1026	2456
08:15	38	23	36	97	8	80	36	124	14	38	16	68	54	129	6	189	478
08:30	39	21	37	97	7	70	34	111	16	53	12	81	39	99	6	144	433
[BREAK]																	
Hour	77	44	73	194	15	150	70	235	30	91	28	149	93	228	12	333	911
[BREAK]																	
15:45	34	71	53	158	9	126	65	200	18	49	8	75	54	59	17	130	563
16:00	37	79	63	179	16	99	63	178	12	43	13	68	55	43	20	118	543
Hour	71	150	116	337	25	225	128	378	30	92	21	143	109	102	37	248	1106
16:15	39	80	58	177	28	108	55	191	10	41	9	60	42	59	28	129	557
16:30	40	80	39	159	23	128	55	206	5	47	19	71	44	54	15	113	549
16:45	35	87	59	181	34	154	61	249	18	51	15	84	43	59	26	128	642
17:00	51	79	54	184	42	177	84	303	21	67	22	110	51	60	22	133	730
Hour	165	326	210	701	127	567	255	949	54	206	65	325	180	232	91	503	2478
17:15	42	87	77	206	26	182	81	289	15	47	18	80	45	79	26	150	725
17:30	55	93	38	186	30	160	63	253	13	63	6	82	56	92	28	176	697
Total	794	863	718	2375	260	1587	783	2630	311	907	356	1574	806	1811	221	2838	9417
% Apr.	33.4	36.3	30.2	-	9.8	60.3	29.7	-	19.7	57.6	22.6	-	28.4	63.8	7.7	-	-
% Int.	8.4	9.1	7.6	-	2.7	16.8	8.3	-	3.3	9.6	3.7	-	8.5	19.2	2.3	-	-

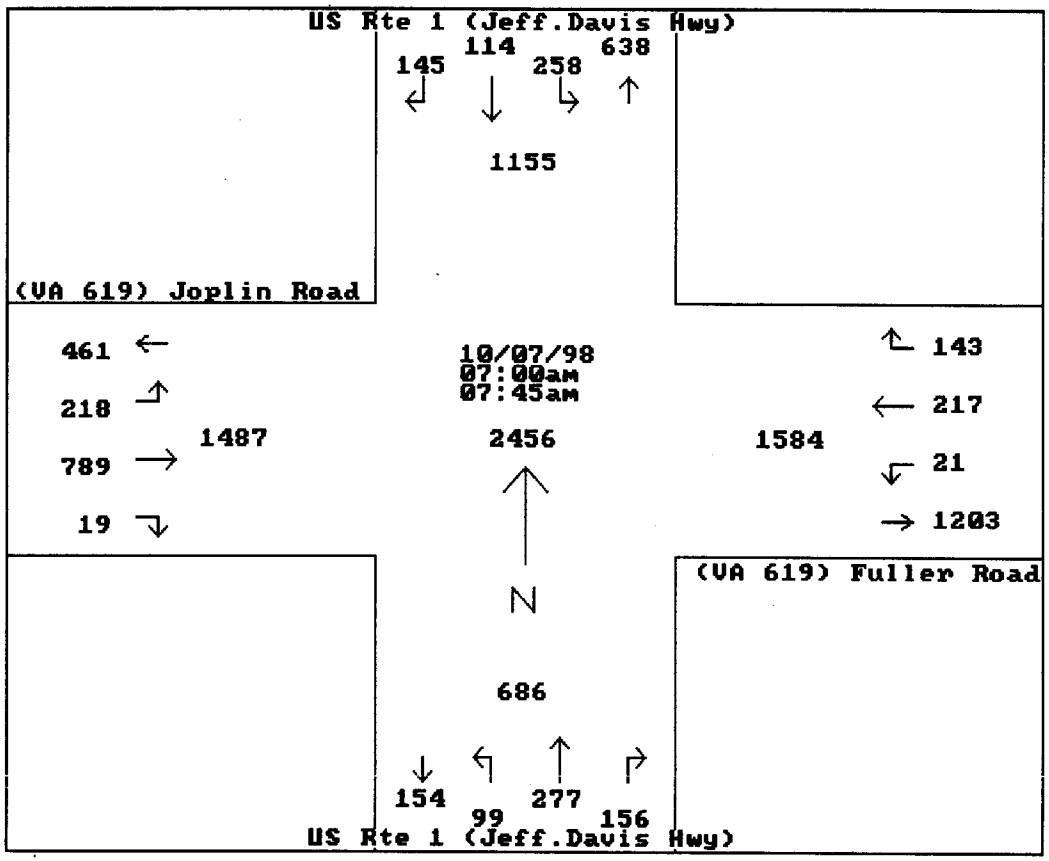
O.R. George & Associates, Inc.
1738 Elton Rd., Suite 321
Silver Spring, MD 20903
Tel:(301)439-7722 Fax:(301)439-7759

Counted by :ORGA-JAA, AA
Board :D1-0931, D1-0933
City/County:Quantico/Prince William
Weather :Warm/Clear/Dry

Study Name: V619@US1
Site Code : 03080933
Start Date: 10/07/98

Total Traffic

End Time	US Rte 1 (Jeff.Davis Hwy) From North Left	Thru	Right	Aprch. Total	(VA 619) Fuller Road From East Left	Thru	Right	Aprch. Total	US Rte 1 (Jeff.Davis Hwy) From South Left	Thru	Right	Aprch. Total	(VA 619) Joplin Road From West Left	Thru	Right	Aprch. Total	Intvl. Total
Peak Hour Analysis By Entire Intersection for the Period: 06:30 on 10/07/98 to 08:15 on 10/07/98																	
Time	07:00				07:00				07:00				07:00				
Vol.	258	114	145	0	21	217	143		99	277	156		218	789	19		
Pct.	49.9	22.0	28.0		5.5	56.9	37.5		18.6	52.0	29.3		21.2	76.9	1.8		
Total	517				381				532				1026				
High	07:15				07:30				07:30				07:30				
Vol.	79	26	30		9	69	46		30	77	48		72	216	3		
Total	135				124				155				291				
PHF	0.957				0.768				0.858				0.881				



C.R. George & Associates, Inc.
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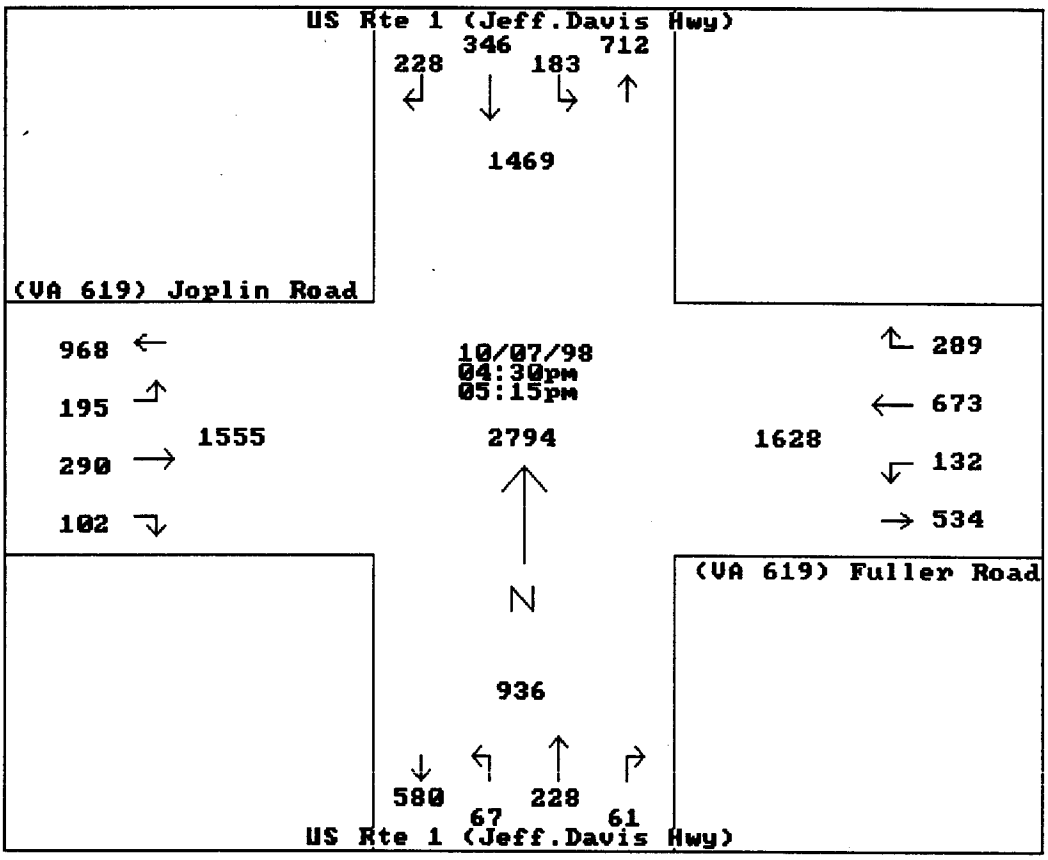
Counted by :ORGA-JAA, AA
Board :D1-0931, D1-0933
City/County:Quantico/Prince William
Weather :Warm/Clear/Dry

Study Name: V619@US1
Site Code : 03080933
Start Date: 10/07/98

Total Traffic

End Time	US Rte 1 (Jeff.Davis Hwy) From North Left	Thru	Right	Aprch. Total	(VA 619) Fuller Road From East Left	Thru	Right	Aprch. Total	US Rte 1 (Jeff.Davis Hwy) From South Left	Thru	Right	Aprch. Total	(VA 619) Joplin Road From West Left	Thru	Right	Aprch. Total	Intvl. Total
Peak Hour Analysis By Entire Intersection for the Period: 15:30 on 10/07/98 to 17:15 on 10/07/98																	
Time	16:30				16:30				16:30				16:30				
Vol.	183	346	228	1	132	673	289		67	228	61		195	290	102		
Pct.	24.1	45.7	30.1		12.0	61.5	26.4		18.8	64.0	17.1		33.2	49.4	17.3		
Total	757				1094				356				587				
High	17:00				16:45				16:45				17:15				
Vol.	42	87	77		42	177	84		21	67	22		56	92	28		
Total	206				303				110				176				
PHF	0.918				0.902				0.809				0.833				



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Tel:(301)439-7722 Fax:(301)439-7759

Counted by :ORGA-NL, KJ
Board :D1-0904, D1-0925
City/County:Quantico/Prince William
Weather :Warm/Clear/Dry

Study Name: V610@US1
Site Code : 02420925
Start Date: 10/06/98
Page : 1

Total Traffic

End Time	US Rte 1 (Jeff.Davis Hwy) From North Left	Thru	Right	Aprch. Total	VA 610 (Garrisonville Rd) From East Left	Thru	Right	Aprch. Total	US Rte 1 (Jeff.Davis Hwy) From South Left	Thru	Right	Aprch. Total	VA 610 (Garrisonville Rd) From West Left	Thru	Right	Aprch. Total	Intvl. Total
10/06/98																	
06:45	2	16	32	50	10	47	81	138	40	176	2	218	84	14	23	121	527
07:00	5	11	29	45	16	30	82	128	46	188	3	237	115	17	42	174	584
Hour	7	27	61	95	26	77	163	266	86	364	5	455	199	31	65	295	1111
07:15	2	32	17	51	40	82	87	209	56	157	8	221	128	29	71	228	709
07:30	16	52	39	107	50	54	114	218	69	151	5	225	96	18	68	182	732
07:45	7	23	32	62	29	66	57	152	72	169	5	246	73	25	72	170	630
08:00	6	35	38	79	33	54	74	161	80	127	22	229	69	31	87	187	656
Hour	31	142	126	299	152	256	332	740	277	604	40	921	366	103	298	767	2727
08:15	11	42	51	104	24	45	63	132	62	124	17	203	70	32	77	179	618
08:30	17	38	68	123	9	66	95	170	87	122	21	230	89	25	68	182	705
[BREAK]																	
Hour	28	80	119	227	33	111	158	302	149	246	38	433	159	57	145	361	1323
[BREAK]																	
15:45	44	69	81	194	14	48	23	85	90	87	21	198	42	120	157	319	796
16:00	38	83	83	204	19	46	13	78	108	75	23	206	49	101	185	335	823
Hour	82	152	164	398	33	94	36	163	198	162	44	404	91	221	342	654	1619
16:15	40	100	123	263	14	50	18	82	123	77	25	225	49	139	199	387	957
16:30	36	135	114	285	28	57	30	115	146	78	32	256	63	123	203	389	1045
16:45	55	111	146	312	21	47	24	92	147	83	40	270	91	136	185	412	1086
17:00	51	121	164	336	15	36	26	77	135	100	39	274	55	152	213	420	1107
Hour	182	467	547	1196	78	190	98	366	551	338	136	1025	258	550	800	1608	4195
17:15	64	128	170	362	17	47	17	81	133	87	36	256	88	138	195	421	1120
17:30	75	107	142	324	24	54	34	112	152	88	54	294	67	169	213	449	1179
Total	469	1103	1329	2901	363	829	838	2030	1546	1889	353	3788	1228	1269	2058	4555	13274
% Apr.	16.1	38.0	45.8	-	17.8	40.8	41.2	-	40.8	49.8	9.3	-	26.9	27.8	45.1	-	-
% Int.	3.5	8.3	10.0	-	2.7	6.2	6.3	-	11.6	14.2	2.6	-	9.2	9.5	15.5	-	-

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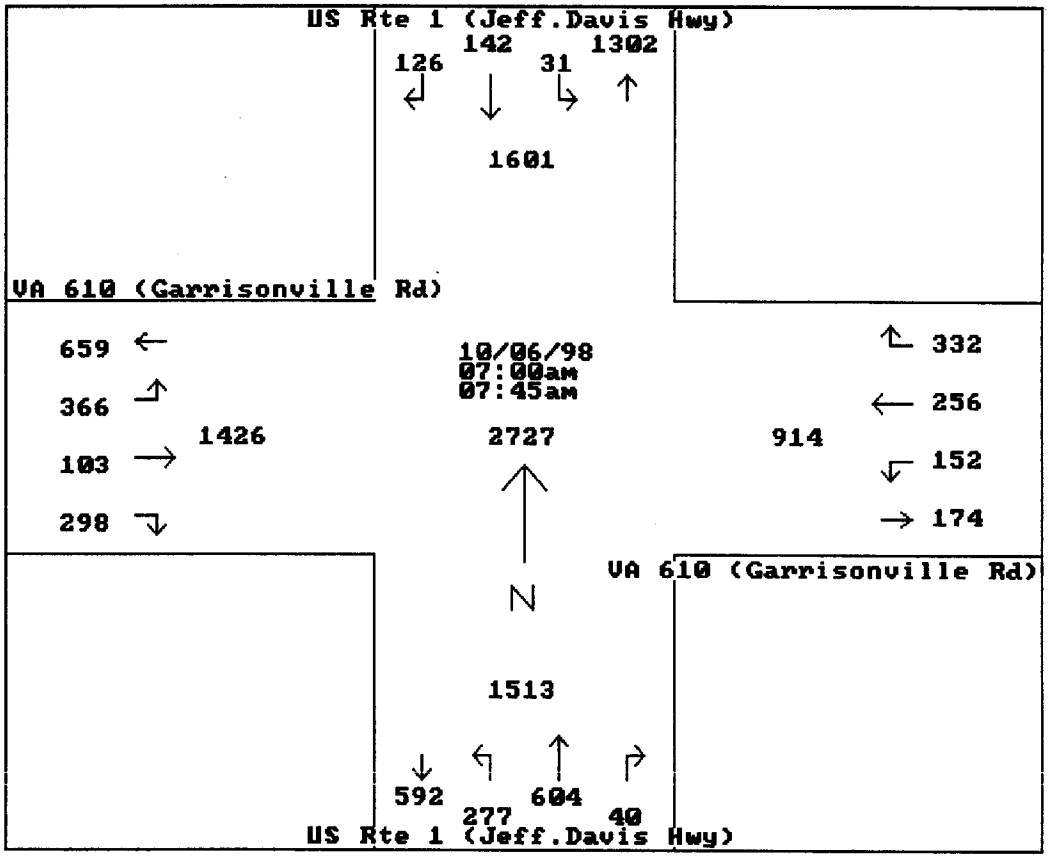
Counted by :ORGA-NL, KJ
Board :D1-0904, D1-0925
City/County:Quantico/Prince William
Weather :Warm/Clear/Dry

Study Name: V610@US1
Site Code : 02420925
Start Date: 10/06/98

Total Traffic

End Time	US Rte 1 (Jeff.Davis Hwy) From North Left	Thru	Right	Aprch. Total	VA 610 (Garrisonville Rd) From East Left	Thru	Right	Aprch. Total	US Rte 1 (Jeff.Davis Hwy) From South Left	Thru	Right	Aprch. Total	VA 610 (Garrisonville Rd) From West Left	Thru	Right	Aprch. Total	Intvl. Total
Peak Hour Analysis By Entire Intersection for the Period: 06:30 on 10/06/98 to 08:15 on 10/06/98																	
Time	07:00				07:00				07:00				07:00				
Vol.	31	142	126	0	152	256	332		277	604	40		366	103	298		
Pct.	10.3	47.4	42.1		20.5	34.5	44.8		30.0	65.5	4.3		47.7	13.4	38.8		
Total	299				740				921				767				
High	07:15				07:15				07:30				07:00				
Vol.	16	52	39		50	54	114		72	169	5		128	29	71		
Total	107				218				246				228				
PHF	0.698				0.848				0.935				0.841				



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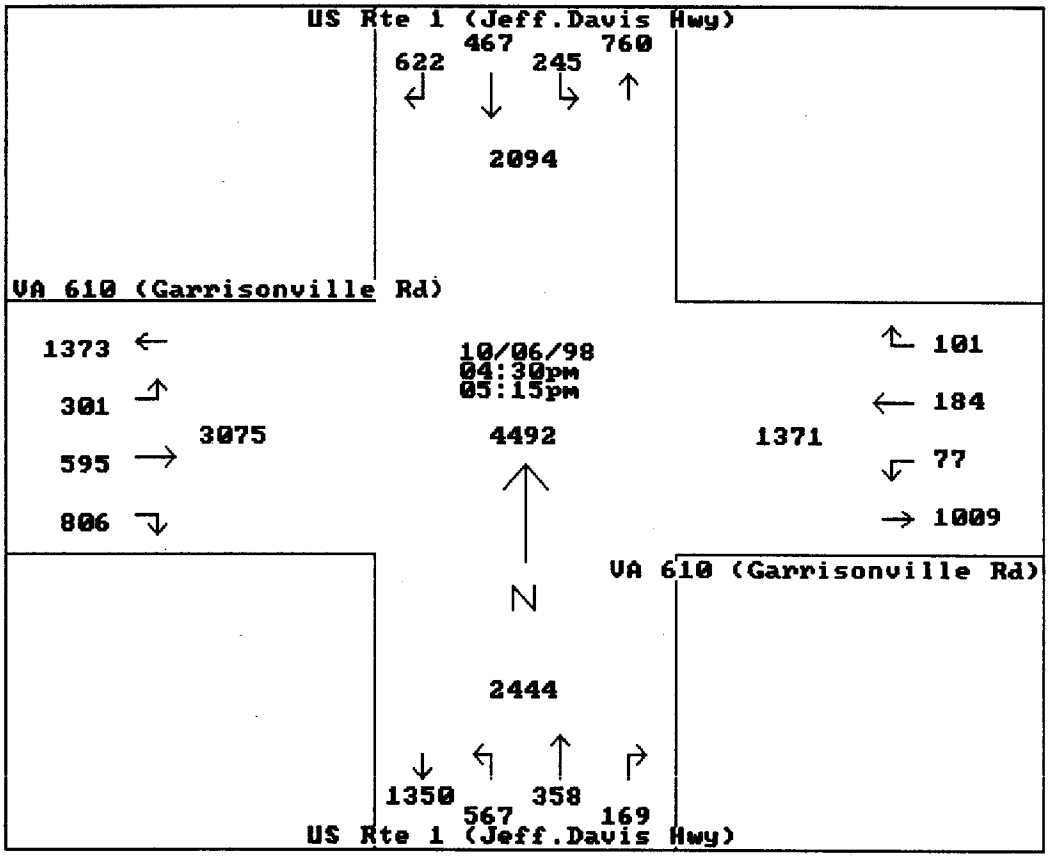
Counted by :ORGA-NL, KJ
Board :D1-0904, D1-0925
City/County:Quantico/Prince William
Weather :Warm/Clear/Dry

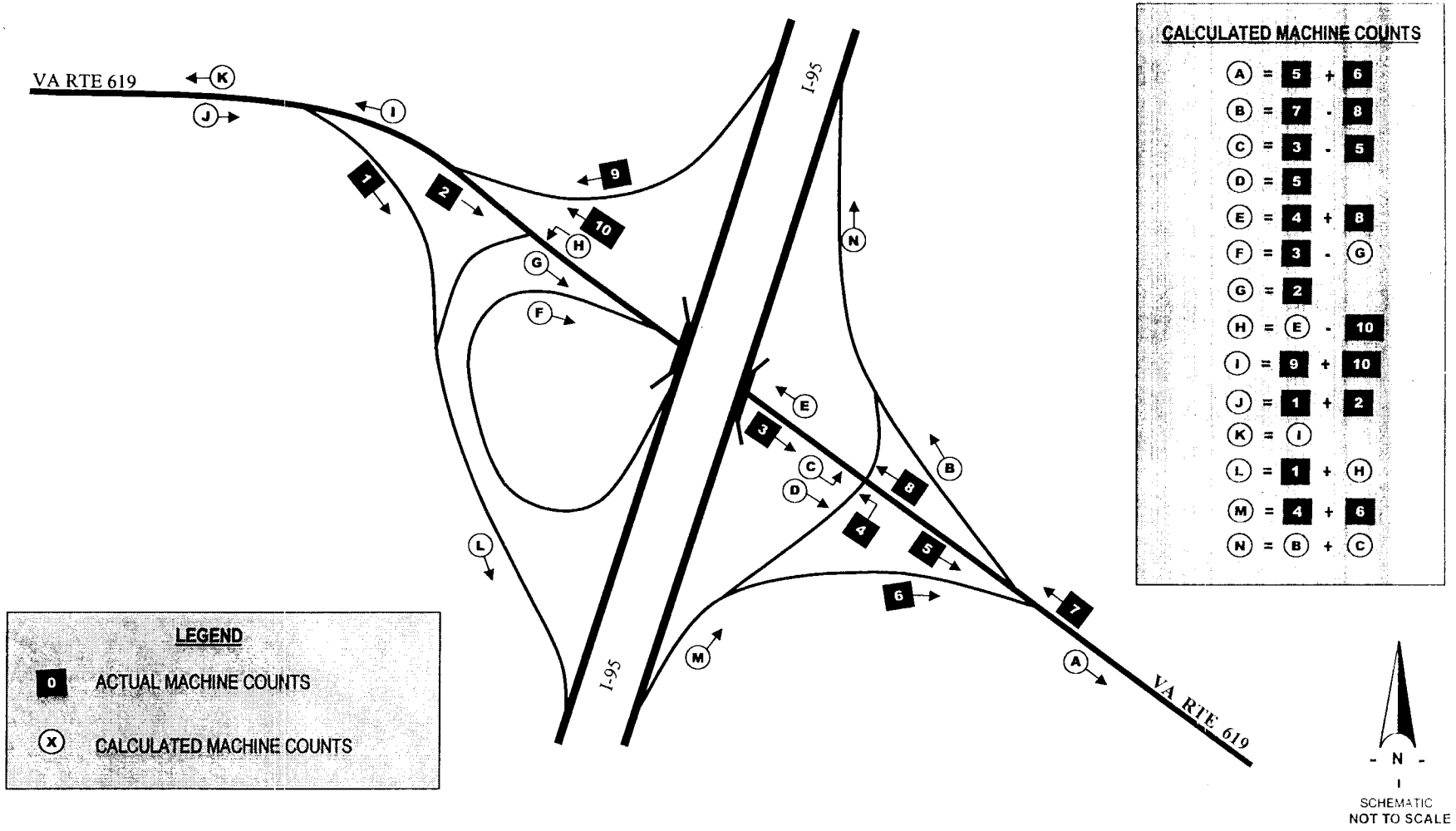
Study Name: V610@US1
Site Code : 02420925
Start Date: 10/06/98
Page : 3

Total Traffic

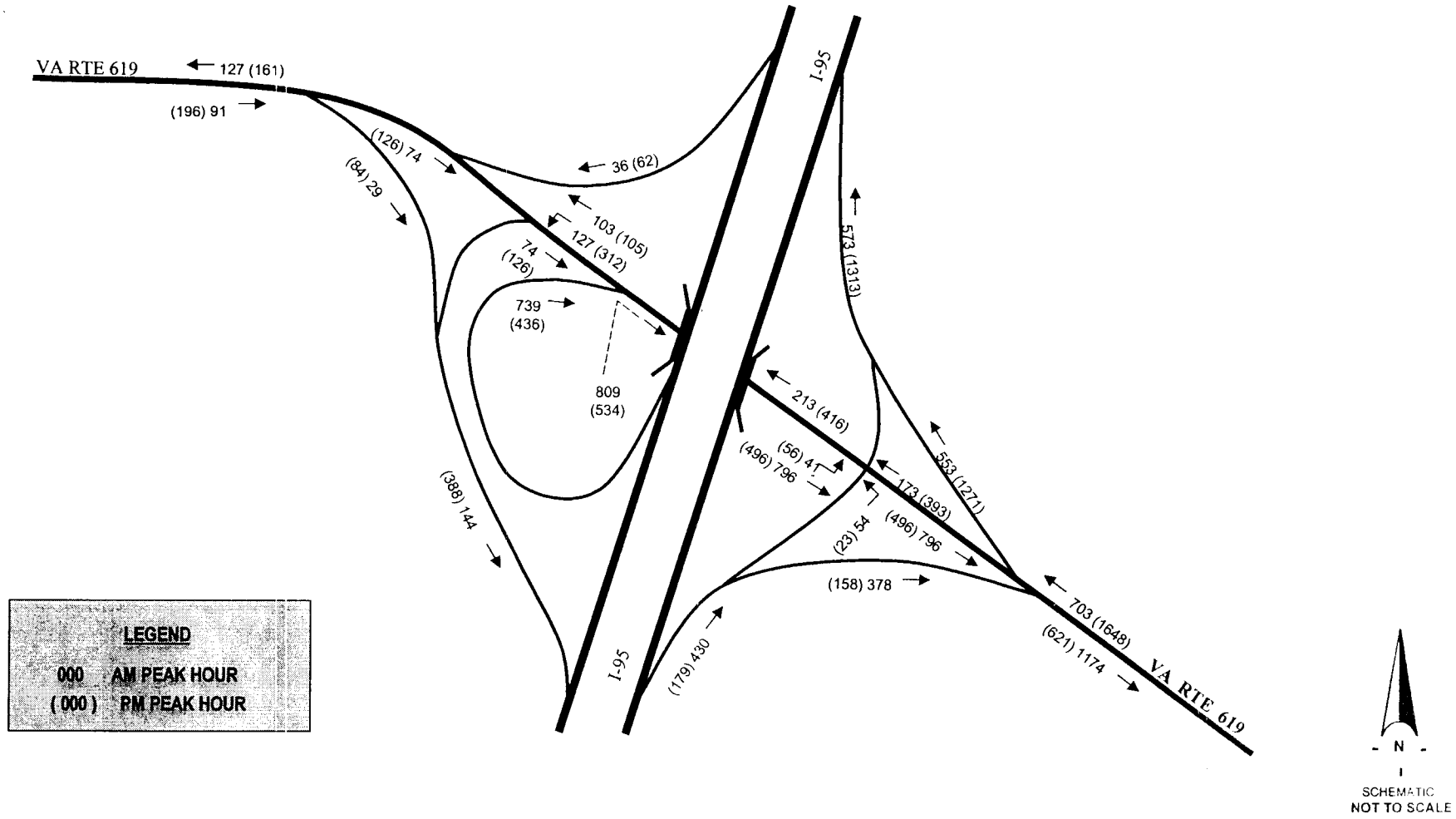
End Time	US Rte 1 (Jeff.Davis Hwy) From North Left	Thru	Right	Aprch. Total	VA 610 (Garrisonville Rd) From East Left	Thru	Right	Aprch. Total	US Rte 1 (Jeff.Davis Hwy) From South Left	Thru	Right	Aprch. Total	VA 610 (Garrisonville Rd) From West Left	Thru	Right	Aprch. Total	Intvl. Total
Peak Hour Analysis By Entire Intersection for the Period: 15:30 on 10/06/98 to 17:15 on 10/06/98																	
Time	16:30				16:30				16:30				16:30				
Vol.	245	467	622	1	77	184	101		567	358	169		301	595	806		
Pct.	18.3	35.0	46.6		21.2	50.8	27.9		51.8	32.7	15.4		17.6	34.9	47.3		
Total	1334				362				1094				1702				
High	17:00				17:15				17:15				17:15				
Vol.	64	128	170		24	54	34		152	88	54		67	169	213		
Total	362				112				294				449				
PHF	0.921				0.808				0.930				0.947				



MECHANICAL COUNTS



O.R. GEORGE & ASSOCIATES, INC.	VA RTE 619 @ INTERSATE 95 - MACHINE COUNT LOCATIONS	EXHIBIT 1



O.R. GEORGE & ASSOCIATES, INC.	VA RTE 619 @ INTERSATE 95 - PEAK HOUR TURNING MOVEMENT VOLUMES	EXHIBIT 2

Volume Count Report

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Location	VA Rte 619 WB to I-95 @ Ramp, SB
Location Code	I-95 Loc 13
County	Prince Williams, VA
Recorder Set	10/5/98 5:05 PM
Recording Start	10/5/98 6:00 PM
Recording End	10/9/98 8:00 AM
Sample Time	15
Operator Number	97
Machine Number	11
Channel	2
Divided By	2
Summation	No
Two-Way	No

Monday 10/05/98 Channel: 2 Direction: S

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
																		41	23	18	2	2	4	90
																		15	4	6	0	0	0	
																		10	10	5	1	0	1	
																		8	6	6	0	1	3	
																		8	3	1	1	1	0	

AM Peak Hour . . . . . Unavailable
AM Peak Hour Factor . . . . . Unavailable
PM Peak Hour . . . . . 18:00 to 19:00 (41 vehicles)
PM Peak Hour Factor 68.3%

Tuesday 10/06/98 Channel: 2 Direction: S

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
2	3	0	3	2	4	13	17	17	16	16	29	19	22	40	57	84	58	48	18	28	19	11	4	530
2	2	0	1	0	0	2	4	4	6	3	4	4	7	8	14	25	15	16	5	7	6	1	0	
0	0	0	0	1	1	1	3	3	2	3	5	6	5	9	20	18	14	15	5	2	8	4	1	
0	0	0	1	1	1	7	5	4	2	5	9	5	2	14	12	23	17	9	2	4	1	3	2	
0	1	0	1	0	2	3	5	6	6	5	11	4	8	9	11	18	12	8	6	15	4	3	1	

AM Peak Hour . . . . . 11:00 to 12:00 (29 vehicles)
AM Peak Hour Factor 65.9%
PM Peak Hour . . . . . 16:00 to 17:00 (84 vehicles)
PM Peak Hour Factor 84.0%

24 - Hour Moving Total

01:00 92	02:00 95	03:00 95	04:00 98	05:00 100	06:00 104	07:00 117	08:00 134
09:00 151	10:00 167	11:00 183	12:00 212	13:00 231	14:00 253	15:00 293	16:00 350
17:00 434	18:00 492	19:00 499	20:00 494	21:00 504	22:00 521	23:00 530	24:00 530

Volume Count Report

Generated by MSC3000 Version 2 01 Copyright 1990-1992 Mitron Systems Corporation

Location	VA Rte 619, W. of I-95, EB
Location Code	I-95 95 Loc 22
County	Prince Williams, VA
Recorder Set	10/5/98 5:05 PM
Recording Start	10/5/98 6:00 PM
Recording End	10/9/98 8:00 AM
Sample Time	15
Operator Number	97
Machine Number	11
Channel	1
Divided By	2
Summation	No
Two-Way	No

Monday 10/05/98 Channel: 1 Direction: E

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
																		101	53	43	11	22	11	241
																		28	23	13	5	5	5	
																		26	15	12	2	5	1	
																		22	6	13	1	4	3	
																		25	9	5	3	8	2	

AM Peak Hour ..... Unavailable
AM Peak Hour Factor ..... Unavailable
PM Peak Hour ..... 18:00 to 19:00 (101 vehicles)
PM Peak Hour Factor 90.2%

Tuesday 10/06/98 Channel: 1 Direction: E

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
6	8	3	28	14	46	61	74	65	68	66	46	74	113	92	99	103	110	98	80	62	26	25	16	1383
3	1	0	2	3	5	12	25	12	17	21	9	13	46	19	37	21	30	33	29	15	12	11	4	
0	3	2	13	4	10	14	13	21	21	11	10	18	19	14	20	20	34	26	23	13	7	4	2	
2	4	1	3	4	19	22	19	23	12	12	14	16	16	29	20	37	26	19	12	10	4	4	7	
1	0	0	10	3	12	13	17	9	18	22	13	27	32	30	22	25	20	20	16	24	3	6	3	

AM Peak Hour ..... 6:15 to 7:15 (74 vehicles)
AM Peak Hour Factor 74.0%
PM Peak Hour ..... 16:30 to 17:30 (126 vehicles)
PM Peak Hour Factor 85.1%

24 - Hour Moving Total

01:00 247	02:00 255	03:00 258	04:00 286	05:00 300	06:00 346	07:00 407	08:00 481
09:00 546	10:00 614	11:00 680	12:00 726	13:00 800	14:00 913	15:00 1005	16:00 1104
17:00 1207	18:00 1317	19:00 1314	20:00 1341	21:00 1360	22:00 1375	23:00 1378	24:00 1383

Volume Count Report

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Location	VA Rte 619 @ I-95 Overpass, EB
Location Code	I-95 95 Loc 32
County	Prince Williams, VA
Recorder Set	10/5/98 6:04 PM
Recording Start	10/5/98 7:00 PM
Recording End	10/8/98 4:00 PM
Sample Time	15
Operator Number	97
Machine Number	3
Channel	1
Divided By	2
Summation	No
Two-Way	No

Monday 10/05/98 Channel: 1 Direction: E

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
																			323	202	226	181	104	1036
																			105	57	55	44	31	
																			96	47	70	56	28	
																			51	53	44	48	22	
																			71	45	57	33	23	

AM Peak Hour ..... Unavailable
AM Peak Hour Factor ..... Unavailable
PM Peak Hour ..... 19:00 to 20:00 (323 vehicles)
PM Peak Hour Factor 76.9%

Tuesday 10/06/98 Channel: 1 Direction: E

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
78	41	31	46	62	168	494	784	383	248	275	236	313	383	444	511	498	503	521	389	259	234	174	104	7179
32	15	11	5	12	16	75	213	116	67	76	55	56	120	103	136	125	118	142	116	58	63	52	33	
17	9	10	15	14	29	109	215	118	65	56	58	82	92	92	110	129	139	146	113	70	58	57	29	
14	10	6	13	21	56	128	199	84	62	67	62	76	80	111	140	133	128	116	84	64	56	33	23	
15	7	4	13	15	67	182	157	65	54	76	61	99	91	138	125	111	118	117	76	67	57	32	19	

AM Peak Hour ..... 6:45 to 7:45 (809 vehicles)
AM Peak Hour Factor 94.1%
PM Peak Hour ..... 17:30 to 18:30 (534 vehicles)
PM Peak Hour Factor 91.4%

24 - Hour Moving Total

01:00 1114	02:00 1155	03:00 1186	04:00 1232	05:00 1294	06:00 1462	07:00 1956	08:00 2740
09:00 3123	10:00 3371	11:00 3646	12:00 3882	13:00 4195	14:00 4578	15:00 5022	16:00 5533
17:00 6031	18:00 6534	19:00 7055	20:00 7121	21:00 7178	22:00 7186	23:00 7179	24:00 7179

Volume Count Report

Generated by MSC3000 Version 2.01 Copyright 1990-1992 Mitron Systems Corporation

Location	I-95 NB to VA Rte 619 WB Ramp
Location Code	I-95 95 Loc 44
County	Prince Williams, VA
Recorder Set	10/5/98 6:12 PM
Recording Start	10/5/98 7:00 PM
Recording End	10/9/98 8:00 AM
Sample Time	15
Operator Number	97
Machine Number	31
Channel	1
Divided By	2
Summation	No
Two-Way	No

Monday 10/05/98 Channel: 1 Direction: W

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
																			10	4	2	4	3	23
																			0	0	0	3	0	
																			1	2	1	1	0	
																			4	0	1	0	1	
																			5	2	0	0	2	

AM Peak Hour . . . . . Unavailable
AM Peak Hour Factor . . . . . Unavailable
PM Peak Hour . . . . . 19:30 to 20:30 (11 vehicles)
PM Peak Hour Factor 55.0%

Tuesday 10/06/98 Channel: 1 Direction: W

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
4	3	8	4	9	14	43	49	20	15	10	16	16	15	13	15	19	20	17	19	4	6	4	6	349
1	2	1	0	0	1	3	14	5	3	3	5	4	6	2	6	4	8	3	4	1	0	2	2	
3	0	5	0	1	2	11	10	8	2	1	5	7	4	4	3	4	2	5	2	3	0	1	0	
0	0	0	1	3	3	14	13	4	3	5	2	3	2	3	3	4	6	5	7	0	6	0	2	
0	1	2	3	5	8	15	12	3	7	1	4	2	3	4	3	7	4	4	6	0	0	1	2	

AM Peak Hour . . . . . 6:15 to 7:15 (54 vehicles)
AM Peak Hour Factor 90.0%
PM Peak Hour . . . . . 16:15 to 17:15 (23 vehicles)
PM Peak Hour Factor 71.9%

24 - Hour Moving Total

01:00 27	02:00 30	03:00 38	04:00 42	05:00 51	06:00 65	07:00 108	08:00 157
09:00 177	10:00 192	11:00 202	12:00 218	13:00 234	14:00 249	15:00 262	16:00 277
17:00 296	18:00 316	19:00 333	20:00 342	21:00 342	22:00 346	23:00 346	24:00 349

Volume Count Report

Generated by MSC3000 Version 2.01 Copyright 1990-1992 Mitron Systems Corporation

Location	VA Rte 619, E. of I-95 @ Ramp, EB
Location Code	I-95 95 Loc 52
County	Prince Williams, VA
Recorder Set	10/5/98 6:36 PM
Recording Start	10/5/98 7:00 PM
Recording End	10/9/98 8:00 AM
Sample Time	15
Operator Number	97
Machine Number	42
Channel	2
Divided By	2
Summation	No
Two-Way	No

Monday 10/05/98 Channel: 2 Direction: E

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
																			300	180	211	164	94	949
																			103	48	52	38	31	
																			85	43	62	55	28	
																			50	49	41	43	15	
																			62	40	56	28	20	

AM Peak Hour ..... Unavailable
AM Peak Hour Factor ..... Unavailable
PM Peak Hour ..... 19:00 to 20:00 (300 vehicles)
PM Peak Hour Factor 72.8%

Tuesday 10/06/98 Channel: 2 Direction: E

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
69	35	25	31	41	140	479	760	355	220	250	216	286	327	390	474	460	457	484	352	229	220	157	100	6557
25	13	11	2	8	14	70	208	103	63	64	52	56	93	76	116	122	98	137	100	58	56	50	33	
15	6	6	7	3	28	107	211	105	55	56	56	69	83	87	106	113	136	132	101	63	55	51	28	
14	10	4	10	19	41	122	197	82	53	66	61	67	68	107	134	118	110	103	75	61	55	30	21	
15	6	4	12	11	57	180	144	65	49	64	47	94	83	120	118	107	113	112	76	47	54	26	18	

AM Peak Hour ..... 6:45 to 7:45 (796 vehicles)
AM Peak Hour Factor 94.3%
PM Peak Hour ..... 17:15 to 18:15 (496 vehicles)
PM Peak Hour Factor 90.5%

24 - Hour Moving Total

01:00 1018	02:00 1053	03:00 1078	04:00 1109	05:00 1150	06:00 1290	07:00 1769	08:00 2529
09:00 2884	10:00 3104	11:00 3354	12:00 3570	13:00 3856	14:00 4183	15:00 4573	16:00 5047
17:00 5507	18:00 5964	19:00 6448	20:00 6500	21:00 6549	22:00 6558	23:00 6551	24:00 6557

Volume Count Report

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Location	I-95 NB to VA Rte 619 EB Ramp
Location Code	I-95 95 Loc 62
County	Prince Williams, VA
Recorder Set	10/5/98 6:36 PM
Recording Start	10/5/98 7:00 PM
Recording End	10/9/98 8:00 AM
Sample Time	15
Operator Number	97
Machine Number	42
Channel	1
Divided By	2
Summation	No
Two-Way	No

Monday 10/05/98 Channel: 1 Direction: E

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
																			94	66	56	58	36	310
																			28	17	17	20	10	
																			23	17	16	9	12	
																			25	14	10	14	11	
																			18	18	13	15	3	

AM Peak Hour ..... Unavailable
AM Peak Hour Factor ..... Unavailable
PM Peak Hour ..... 19:00 to 20:00 (94 vehicles)
PM Peak Hour Factor 83.9%

Tuesday 10/06/98 Channel: 1 Direction: E

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
19	16	18	12	38	77	243	362	181	143	95	108	118	127	119	112	135	132	111	99	79	57	56	17	2474
5	3	3	1	7	15	33	73	51	35	24	27	27	32	32	25	29	36	29	33	20	16	19	3	
7	5	4	3	8	21	64	124	52	44	21	23	32	36	29	24	23	39	29	19	27	18	14	6	
4	1	7	3	9	14	54	89	40	29	26	23	27	29	23	26	37	26	30	23	17	12	13	4	
3	7	4	5	14	27	92	76	38	35	24	35	32	30	35	37	46	31	23	24	15	11	10	4	

AM Peak Hour ..... 6:45 to 7:45 (378 vehicles)
AM Peak Hour Factor 76.2%
PM Peak Hour ..... 16:30 to 17:30 (158 vehicles)
PM Peak Hour Factor 85.9%

24 - Hour Moving Total

01:00 329	02:00 345	03:00 363	04:00 375	05:00 413	06:00 490	07:00 733	08:00 1095
09:00 1276	10:00 1419	11:00 1514	12:00 1622	13:00 1740	14:00 1867	15:00 1986	16:00 2098
17:00 2233	18:00 2365	19:00 2476	20:00 2481	21:00 2494	22:00 2495	23:00 2493	24:00 2474

Volume Count Report

Generated by MSC3000 Version 2.01 Copyright 1990-1992 Mitron Systems Corporation

Location	VA Rte 619, E. of I-95, WB
Location Code	I-95 95 Loc 74
County	Prince Williams, VA
Recorder Set	10/5/98 6:57 PM
Recording Start	10/5/98 7:00 PM
Recording End	10/9/98 8:00 AM
Sample Time	15
Operator Number	97
Machine Number	27
Channel	1
Divided By	2
Summation	No
Two-Way	No

Monday 10/05/98 Channel: 1 Direction: W

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
																			465	311	262	209	119	1366
																			152	74	104	42	33	
																			105	68	62	57	29	
																			113	85	38	50	37	
																			95	84	58	60	20	

AM Peak Hour ..... Unavailable
AM Peak Hour Factor ..... Unavailable
PM Peak Hour ..... 19:00 to 20:00 (465 vehicles)
PM Peak Hour Factor 76.5%

Tuesday 10/06/98 Channel: 1 Direction: W

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
101	44	43	74	169	519	580	630	656	593	502	703	694	698	724	1029	1572	1330	842	602	461	358	286	128	13338
24	11	4	14	38	75	143	136	170	136	132	167	190	153	169	280	355	396	248	164	127	108	86	46	
34	13	12	19	33	124	171	151	159	144	108	156	152	167	187	265	343	378	207	159	127	93	86	32	
16	9	14	23	34	149	136	184	149	151	126	228	175	214	176	242	408	306	177	159	82	77	51	29	
27	11	13	18	64	171	130	159	178	162	136	152	177	164	192	242	466	250	210	120	125	80	63	21	

AM Peak Hour ..... 11:00 to 12:00 (703 vehicles)
AM Peak Hour Factor 77.1%
PM Peak Hour ..... 16:30 to 17:30 (1648 vehicles)
PM Peak Hour Factor 88.4%

24 - Hour Moving Total

01:00 1467	02:00 1511	03:00 1554	04:00 1628	05:00 1797	06:00 2316	07:00 2896	08:00 3526
09:00 4182	10:00 4775	11:00 5277	12:00 5980	13:00 6674	14:00 7372	15:00 8096	16:00 9125
17:00 10697	18:00 12027	19:00 12869	20:00 13006	21:00 13156	22:00 13252	23:00 13329	24:00 13338

Volume Count Report

Generated by MSC3000 Version 2.01 Copyright 1990-1992 Mitron Systems Corporation

Location	VA Rte 619, E. of I-95 @ Ramp, WB
Location Code	I-95 Loc 84
County	Prince Williams, VA
Recorder Set	10/5/98 7:12 PM
Recording Start	10/5/98 8:00 PM
Recording End	10/9/98 8:00 AM
Sample Time	15
Operator Number	97
Machine Number	13
Channel	1
Divided By	2
Summation	No
Two-Way	No

Monday 10/05/98 Channel: 1 Direction: W

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
																				90	73	67	36	266
																				24	31	15	12	
																				20	15	15	7	
																				21	12	18	8	
																				25	15	19	9	

AM Peak Hour ..... Unavailable
AM Peak Hour Factor ..... Unavailable
PM Peak Hour ..... 20:15 to 21:15 (97 vehicles)
PM Peak Hour Factor 78.2%

Tuesday 10/06/98 Channel: 1 Direction: W

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
41	17	14	16	27	66	130	159	154	134	134	150	150	162	169	263	390	266	209	178	100	84	98	44	3155
10	2	0	4	13	10	37	31	45	31	36	33	37	38	37	66	86	89	55	45	28	23	24	19	
15	5	5	4	4	19	31	41	34	30	32	39	36	38	48	58	81	65	42	48	31	24	29	8	
7	6	5	4	4	20	34	45	33	40	27	39	39	49	44	70	104	52	58	48	22	14	23	9	
9	4	4	4	6	17	28	42	42	33	39	39	38	37	40	69	119	60	54	37	19	23	22	8	

AM Peak Hour ..... 7:15 to 8:15 (173 vehicles)
AM Peak Hour Factor 96.1%
PM Peak Hour ..... 16:15 to 17:15 (393 vehicles)
PM Peak Hour Factor 82.6%

24 - Hour Moving Total

01:00 307	02:00 324	03:00 338	04:00 354	05:00 381	06:00 447	07:00 577	08:00 736
09:00 890	10:00 1024	11:00 1158	12:00 1308	13:00 1458	14:00 1620	15:00 1789	16:00 2052
17:00 2442	18:00 2708	19:00 2917	20:00 3095	21:00 3105	22:00 3116	23:00 3147	24:00 3155

Volume Count Report

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Location	I-95 SB to VA Rte 619 WB Ramp
Location Code	I-95 Loc 94
County	Prince Williams, VA
Recorder Set	10/5/98 7:25 PM
Recording Start	10/5/98 8:00 PM
Recording End	10/8/98 3:45 PM
Sample Time	15
Operator Number	97
Machine Number	37
Channel	1
Divided By	2
Summation	No
Two-Way	No

Monday 10/05/98 Channel: 1 Direction: W

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
																				15	12	6	10	43
																				6	1	3	1	
																				4	4	0	4	
																				3	2	2	5	
																				2	5	1	0	

AM Peak Hour . . . . . Unavailable
AM Peak Hour Factor . . . . . Unavailable
PM Peak Hour . . . . . 20:00 to 21:00 (15 vehicles)
PM Peak Hour Factor 62.5%

Tuesday 10/06/98 Channel: 1 Direction: W

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
3	5	3	12	4	10	24	24	23	28	31	29	40	40	42	61	55	35	27	47	21	17	25	7	613
0	0	1	4	0	2	6	5	10	7	9	5	7	10	11	15	12	9	6	6	9	5	4	1	
1	3	0	3	2	3	9	8	4	6	4	4	16	16	9	17	18	9	11	22	3	5	16	5	
0	2	0	4	2	4	3	7	1	4	12	11	11	8	11	8	11	6	4	10	7	1	3	0	
2	0	2	1	0	1	6	4	8	11	6	9	6	6	11	21	14	11	6	9	2	6	2	1	

AM Peak Hour . . . . . 9:45 to 10:45 (36 vehicles)
AM Peak Hour Factor 75.0%
PM Peak Hour . . . . . 15:45 to 16:45 (62 vehicles)
PM Peak Hour Factor 73.8%

24 - Hour Moving Total

01:00 46	02:00 51	03:00 54	04:00 66	05:00 70	06:00 80	07:00 104	08:00 128
09:00 151	10:00 179	11:00 210	12:00 239	13:00 279	14:00 319	15:00 361	16:00 422
17:00 477	18:00 512	19:00 539	20:00 586	21:00 592	22:00 597	23:00 616	24:00 613

Volume Count Report

Generated by MSC3000 Version 2.01 Copyright 1990-1992 Mitron Systems Corporation

Location	VA Rte 619, W. of I-95 @ Ramp, WB
Location Code	I-95 Loc 104
County	Prince Williams, VA
Recorder Set	10/5/98 7:42 PM
Recording Start	10/5/98 8:00 PM
Recording End	10/9/98 8:00 AM
Sample Time	15
Operator Number	97
Machine Number	21
Channel	1
Divided By	2
Summation	No
Two-Way	No

Monday 10/05/98 Channel: 1 Direction: W

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
																				31	16	13	10	70
																				13	5	3	2	
																				5	5	1	2	
																				5	2	3	3	
																				8	4	6	3	

AM Peak Hour ..... Unavailable
AM Peak Hour Factor ..... Unavailable
PM Peak Hour ..... 20:00 to 21:00 (31 vehicles)
PM Peak Hour Factor 59.6%

Tuesday 10/06/98 Channel: 1 Direction: W

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
9	6	8	10	8	24	81	103	55	51	48	65	60	69	69	90	105	76	78	83	33	18	23	11	1183
3	2	0	2	2	2	14	28	11	11	12	12	11	21	10	22	29	28	20	16	10	3	7	7	
1	2	2	2	2	6	24	22	14	9	11	19	18	17	20	24	21	15	15	16	13	3	8	1	
1	0	0	3	0	5	23	22	18	9	13	17	18	17	13	17	22	17	23	26	7	7	3	2	
4	2	6	3	4	11	20	31	12	22	12	17	13	14	26	27	33	16	20	25	3	5	5	1	

AM Peak Hour ..... 7:00 to 8:00 (103 vehicles)
AM Peak Hour Factor 83.1%
PM Peak Hour ..... 16:00 to 17:00 (105 vehicles)
PM Peak Hour Factor 79.5%

24 - Hour Moving Total

01:00 79	02:00 85	03:00 93	04:00 103	05:00 111	06:00 135	07:00 216	08:00 319
09:00 374	10:00 425	11:00 473	12:00 538	13:00 598	14:00 667	15:00 736	16:00 826
17:00 931	18:00 1007	19:00 1085	20:00 1168	21:00 1170	22:00 1172	23:00 1182	24:00 1183

Volume Count Report

Generated by MSC3000 Version 2.01 Copyright 1990-1992 Mitron Systems Corporation

Location ..... VA Rte 619 EB, East of I-95 NB Off-Ramp
Location Code ..... I-95 LOC (A) [5+6]
County ..... Prince Williams, VA
Recorder Set .....
Recording Start ..... 10/5/98 6:00 PM
Recording End ..... 10/6/98 12:00 AM
Sample Time .....
Operator Number ....
Machine Number ....
Channel .....
Divided By .....
Summation .....
Two-Way .....

Monday 10/05/98 Channel: 0 Direction: E

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
																			394	246	267	222	130	1259
																			131	65	69	58	41	
																			108	60	78	64	40	
																			75	63	51	57	26	
																			80	58	69	43	23	

AM Peak Hour ..... Unavailable
AM Peak Hour Factor ..... Unavailable
PM Peak Hour ..... 19:00 to 20:00 (394 vehicles)
PM Peak Hour Factor 75.2%

Tuesday 10/06/98 Channel: 0 Direction: E

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
88	51	43	43	79	217	722	1122	536	363	345	324	404	454	509	586	595	589	595	451	308	277	213	117	9031
30	16	14	3	15	29	103	281	154	98	88	79	83	125	108	141	151	134	166	133	78	72	69	36	
22	11	10	10	11	49	171	335	157	99	77	79	101	119	116	130	136	175	161	120	90	73	65	34	
18	11	11	13	28	55	176	286	122	82	92	84	94	97	130	160	155	136	133	98	78	67	43	25	
18	13	8	17	25	84	272	220	103	84	88	82	126	113	155	155	153	144	135	100	62	65	36	22	

AM Peak Hour ..... 6:45 to 7:45 (1174 vehicles)
AM Peak Hour Factor 87.6%
PM Peak Hour ..... 17:15 to 18:15 (621 vehicles)
PM Peak Hour Factor 88.7%

24 - Hour Moving Total

01:00 1347	02:00 1398	03:00 1441	04:00 1484	05:00 1563	06:00 1780	07:00 2502	08:00 3624
09:00 4160	10:00 4523	11:00 4868	12:00 5192	13:00 5596	14:00 6050	15:00 6559	16:00 7145
17:00 7740	18:00 8329	19:00 8924	20:00 8981	21:00 9043	22:00 9053	23:00 9044	24:00 9031

Volume Count Report

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Location ..... I-95 NB On-Ramp from VA Rte 619 WB
Location Code..... I-95 LOC (B) [7-8]
County ..... Prince Williams, VA
Recorder Set .....
Recording Start..... 10/5/98 6:00 PM
Recording End ..... 10/6/98 12:00 AM
Sample Time .....
Operator Number ....
Machine Number ....
Channel .....
Divided By .....
Summation .....
Two-Way .....

Monday 10/05/98 Channel: 0 Direction: N

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
																				221	189	142	83	635
																				50	73	27	21	
																				48	47	42	22	
																				64	26	32	29	
																				59	43	41	11	

AM Peak Hour ..... Unavailable
AM Peak Hour Factor ..... Unavailable
PM Peak Hour ..... 20:15 to 21:15 (244 vehicles)
PM Peak Hour Factor 83.6%

Tuesday 10/06/98 Channel: 0 Direction: N

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
60	27	29	58	142	453	450	471	502	459	368	553	544	536	555	766	1182	1064	633	424	361	274	188	84	10183
14	9	4	10	25	65	106	105	125	105	96	134	153	115	132	214	269	307	193	119	99	85	62	27	
19	8	7	15	29	105	140	110	125	114	76	117	116	129	139	207	262	313	165	111	96	69	57	24	
9	3	9	19	30	129	102	139	116	111	99	189	136	165	132	172	304	254	119	111	60	63	28	20	
18	7	9	14	58	154	102	117	136	129	97	113	139	127	152	173	347	190	156	83	106	57	41	13	

AM Peak Hour ..... 11:00 to 12:00 (553 vehicles)
AM Peak Hour Factor 73.1%
PM Peak Hour ..... 16:30 to 17:30 (1271 vehicles)
PM Peak Hour Factor 91.6%

24 - Hour Moving Total

01:00 695	02:00 722	03:00 751	04:00 809	05:00 951	06:00 1404	07:00 1854	08:00 2325
09:00 2827	10:00 3286	11:00 3654	12:00 4207	13:00 4751	14:00 5287	15:00 5842	16:00 6608
17:00 7790	18:00 8854	19:00 9487	20:00 9911	21:00 10051	22:00 10136	23:00 10182	24:00 10183

Volume Count Report

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Location ..... I-95 NB On-Ramp from VA Rte 619 EB
Location Code ..... I-95 LOC (C) [3-5]
County ..... Prince Williams, VA
Recorder Set .....
Recording Start ..... 10/5/98 6:00 PM
Recording End ..... 10/6/98 12:00 AM
Sample Time .....
Operator Number ....
Machine Number ....
Channel .....
Divided By .....
Summation .....
Two-Way .....

Monday 10/05/98 Channel: 0 Direction: N

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
																			23	22	15	17	10	87
																			2	9	3	6	0	
																			11	4	8	1	0	
																			1	4	3	5	7	
																			9	5	1	5	3	

AM Peak Hour ..... Unavailable
AM Peak Hour Factor ..... Unavailable
PM Peak Hour ..... 19:15 to 20:15 (30 vehicles)
PM Peak Hour Factor 68.2%

Tuesday 10/06/98 Channel: 0 Direction: N

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
9	6	6	15	21	28	15	24	28	28	25	20	27	56	54	37	38	46	37	37	30	14	17	4	622
7	2	0	3	4	2	5	5	13	4	12	3	0	27	27	20	3	20	5	16	0	7	2	0	
2	3	4	8	11	1	2	4	13	10	0	2	13	9	5	4	16	3	14	12	7	3	6	1	
0	0	2	3	2	15	6	2	2	9	1	1	9	12	4	6	15	18	13	9	3	1	3	2	
0	1	0	1	4	10	2	13	0	5	12	14	5	8	18	7	4	5	5	0	20	3	6	1	

AM Peak Hour ..... 7:30 to 8:30 (41 vehicles)
AM Peak Hour Factor 78.8%
PM Peak Hour ..... 13:00 to 14:00 (56 vehicles)
PM Peak Hour Factor 51.9%

24 - Hour Moving Total

01:00 96	02:00 102	03:00 108	04:00 123	05:00 144	06:00 172	07:00 187	08:00 211
09:00 239	10:00 267	11:00 292	12:00 312	13:00 339	14:00 395	15:00 449	16:00 486
17:00 524	18:00 570	19:00 607	20:00 621	21:00 629	22:00 628	23:00 628	24:00 622

Volume Count Report

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Location ..... VA Rte 619 EB, West of I-95 NB Off-Ramp
Location Code ..... I-95 LOC (D) [5]
County ..... Prince Williams, VA
Recorder Set .....
Recording Start ..... 10/5/98 6:00 PM
Recording End ..... 10/6/98 12:00 AM
Sample Time .....
Operator Number ....
Machine Number ....
Channel .....
Divided By .....
Summation .....
Two-Way .....

Monday 10/05/98 Channel: 0 Direction: E

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
																			300	180	211	164	94	949
																			103	48	52	38	31	
																			85	43	62	55	28	
																			50	49	41	43	15	
																			62	40	56	28	20	

AM Peak Hour ..... Unavailable
AM Peak Hour Factor ..... Unavailable
PM Peak Hour ..... 19:00 to 20:00 (300 vehicles)
PM Peak Hour Factor 72.8%

Tuesday 10/06/98 Channel: 0 Direction: E

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
69	35	25	31	41	140	479	760	355	220	250	216	286	327	390	474	460	457	484	352	229	220	157	100	6557
25	13	11	2	8	14	70	208	103	63	64	52	56	93	76	116	122	98	137	100	58	56	50	33	
15	6	6	7	3	28	107	211	105	55	56	56	69	83	87	106	113	136	132	101	63	55	51	28	
14	10	4	10	19	41	122	197	82	53	66	61	67	68	107	134	118	110	103	75	61	55	30	21	
15	6	4	12	11	57	180	144	65	49	64	47	94	83	120	118	107	113	112	76	47	54	26	18	

AM Peak Hour ..... 6:45 to 7:45 (796 vehicles)
AM Peak Hour Factor 94.3%
PM Peak Hour ..... 17:15 to 18:15 (496 vehicles)
PM Peak Hour Factor 90.5%

24 - Hour Moving Total

01:00 1018	02:00 1053	03:00 1078	04:00 1109	05:00 1150	06:00 1290	07:00 1769	08:00 2529
09:00 2884	10:00 3104	11:00 3354	12:00 3570	13:00 3856	14:00 4183	15:00 4573	16:00 5047
17:00 5507	18:00 5964	19:00 6448	20:00 6500	21:00 6549	22:00 6558	23:00 6551	24:00 6557

Volume Count Report

Generated by MSC3000 Version 2.01 Copyright 1990-1992 Mitron Systems Corporation

Location ..... VA Rte 619 WB, West of I-95 NB Off-Ramp
Location Code ..... I-95 LOC (E) [4+8]
County ..... Prince Williams, VA
Recorder Set .....
Recording Start ..... 10/5/98 6:00 PM
Recording End ..... 10/6/98 12:00 AM
Sample Time .....
Operator Number ....
Machine Number ....
Channel .....
Divided By .....
Summation .....
Two-Way .....

Monday 10/05/98 Channel: 0 Direction: W

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
																				94	75	71	39	279
																				24	31	18	12	
																				22	16	16	7	
																				21	13	18	9	
																				27	15	19	11	

AM Peak Hour ..... Unavailable
AM Peak Hour Factor ..... Unavailable
PM Peak Hour ..... 20:15 to 21:15 (101 vehicles)
PM Peak Hour Factor 81.5%

Tuesday 10/06/98 Channel: 0 Direction: W

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
45	20	22	20	36	80	173	208	174	149	144	166	166	177	182	278	409	286	226	197	104	90	102	50	3504
11	4	1	4	13	11	40	45	50	34	39	38	41	44	39	72	90	97	58	49	29	23	26	21	
18	5	10	4	5	21	42	51	42	32	33	44	43	42	52	61	85	67	47	50	34	24	30	8	
7	6	5	5	7	23	48	58	37	43	32	41	42	51	47	73	108	58	63	55	22	20	23	11	
9	5	6	7	11	25	43	54	45	40	40	43	40	40	44	72	126	64	58	43	19	23	23	10	

AM Peak Hour ..... 7:15 to 8:15 (213 vehicles)
AM Peak Hour Factor 91.8%
PM Peak Hour ..... 16:15 to 17:15 (416 vehicles)
PM Peak Hour Factor 82.5%

24 - Hour Moving Total

01:00 324	02:00 344	03:00 366	04:00 386	05:00 422	06:00 502	07:00 675	08:00 883
09:00 1057	10:00 1206	11:00 1350	12:00 1516	13:00 1682	14:00 1859	15:00 2041	16:00 2319
17:00 2728	18:00 3014	19:00 3240	20:00 3437	21:00 3447	22:00 3462	23:00 3493	24:00 3504

Volume Count Report

Generated by MSC3000 Version 2.01 Copyright 1990-1992 Mitron Systems Corporation

Location ..... I-95 SB Off-Ramp to VA Rte 619 EB
Location Code ..... I-95 LOC (F) [3-G]
County ..... Prince Williams, VA
Recorder Set .....
Recording Start ..... 10/5/98 6:00 PM
Recording End ..... 10/6/98 12:00 AM
Sample Time .....
Operator Number ....
Machine Number ....
Channel .....
Divided By .....
Summation .....
Two-Way .....

Monday 10/05/98 Channel: 0 Direction: E

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
																			270	159	215	159	93	896
																			82	44	50	39	26	
																			81	35	68	51	27	
																			45	40	43	44	19	
																			62	40	54	25	21	

AM Peak Hour ..... Unavailable
AM Peak Hour Factor ..... Unavailable
PM Peak Hour ..... 19:00 to 20:00 (270 vehicles)
PM Peak Hour Factor 82.3%

Tuesday 10/06/98 Channel: 0 Direction: E

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
72	33	28	18	48	122	433	710	318	180	209	190	239	270	352	412	395	393	423	309	197	208	149	88	5796
29	14	11	3	9	11	63	188	104	50	55	46	43	74	84	99	104	88	109	87	43	51	41	29	
17	6	8	2	10	19	95	202	97	44	45	48	64	73	78	90	109	105	120	90	57	51	53	27	
12	6	5	10	17	37	106	180	61	50	55	48	60	64	82	120	96	102	97	72	54	52	29	16	
14	7	4	3	12	55	169	140	56	36	54	48	72	59	108	103	86	98	97	60	43	54	26	16	

AM Peak Hour ..... 6:45 to 7:45 (739 vehicles)
AM Peak Hour Factor 91.5%
PM Peak Hour ..... 15:30 to 16:30 (436 vehicles)
PM Peak Hour Factor 90.8%

24 - Hour Moving Total

01:00 968	02:00 1001	03:00 1029	04:00 1047	05:00 1095	06:00 1217	07:00 1650	08:00 2360
09:00 2678	10:00 2858	11:00 3067	12:00 3257	13:00 3496	14:00 3766	15:00 4118	16:00 4530
17:00 4925	18:00 5318	19:00 5741	20:00 5780	21:00 5818	22:00 5811	23:00 5801	24:00 5796

Volume Count Report

Generated by MSC3000 Version 2.01 Copyright 1990-1992 Mitron Systems Corporation

Location ..... VA Rte 619 EB, West of I-95 SB Off-Ramp
Location Code ..... I-95 LOC (G) [2]
County ..... Prince Williams, VA
Recorder Set .....
Recording Start ..... 10/5/98 6:00 PM
Recording End ..... 10/6/98 12:00 AM
Sample Time .....
Operator Number ....
Machine Number ....
Channel .....
Divided By .....
Summation .....
Two-Way .....

Monday 10/05/98 Channel: 0 Direction: E

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
																		101	53	43	11	22	11	241
																		28	23	13	5	5	5	
																		26	15	12	2	5	1	
																		22	6	13	1	4	3	
																		25	9	5	3	8	2	

AM Peak Hour ..... Unavailable
AM Peak Hour Factor ..... Unavailable
PM Peak Hour ..... 18:00 to 19:00 (101 vehicles)
PM Peak Hour Factor 90.2%

Tuesday 10/06/98 Channel: 0 Direction: E

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
6	8	3	28	14	46	61	74	65	68	66	46	74	113	92	99	103	110	98	80	62	26	25	16	1383
3	1	0	2	3	5	12	25	12	17	21	9	13	46	19	37	21	30	33	29	15	12	11	4	
0	3	2	13	4	10	14	13	21	21	11	10	18	19	14	20	20	34	26	23	13	7	4	2	
2	4	1	3	4	19	22	19	23	12	12	14	16	16	29	20	37	26	19	12	10	4	4	7	
1	0	0	10	3	12	13	17	9	18	22	13	27	32	30	22	25	20	20	16	24	3	6	3	

AM Peak Hour ..... 6:15 to 7:15 (74 vehicles)
AM Peak Hour Factor 74.0%
PM Peak Hour ..... 16:30 to 17:30 (126 vehicles)
PM Peak Hour Factor 85.1%

24 - Hour Moving Total

01:00 247	02:00 255	03:00 258	04:00 286	05:00 300	06:00 346	07:00 407	08:00 481
09:00 546	10:00 614	11:00 680	12:00 726	13:00 800	14:00 913	15:00 1005	16:00 1104
17:00 1207	18:00 1317	19:00 1314	20:00 1341	21:00 1360	22:00 1375	23:00 1378	24:00 1383

Volume Count Report

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Location ..... I-95 SB On-Ramp from VA Rte 619 EB
Location Code ..... I-95 LOC (H) [E-10]
County ..... Prince Williams, VA
Recorder Set .....
Recording Start ..... 10/5/98 6:00 PM
Recording End ..... 10/6/98 12:00 AM
Sample Time .....
Operator Number ....
Machine Number ....
Channel .....
Divided By .....
Summation .....
Two-Way .....

Monday 10/05/98 Channel: 0 Direction: S

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
																				63	59	58	29	209
																				11	26	15	10	
																				17	11	15	5	
																				16	11	15	6	
																				19	11	13	8	

AM Peak Hour ..... Unavailable
AM Peak Hour Factor ..... Unavailable
PM Peak Hour ..... 20:15 to 21:15 (78 vehicles)
PM Peak Hour Factor 75.0%

Tuesday 10/06/98 Channel: 0 Direction: S

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
36	14	14	10	28	56	92	105	119	98	96	101	106	108	113	188	304	210	148	114	71	72	79	39	2321
8	2	1	2	11	9	26	17	39	23	27	26	30	23	29	50	61	69	38	33	19	20	19	14	
17	3	8	2	3	15	18	29	28	23	22	25	25	25	32	37	64	52	32	34	21	21	22	7	
6	6	5	2	7	18	25	36	19	34	19	24	24	34	34	56	86	41	40	29	15	13	20	9	
5	3	0	4	7	14	23	23	33	18	28	26	27	26	18	45	93	46	38	18	16	18	18	9	

AM Peak Hour ..... 7:15 to 8:15 (127 vehicles)
AM Peak Hour Factor 81.4%
PM Peak Hour ..... 16:15 to 17:15 (312 vehicles)
PM Peak Hour Factor 83.9%

24 - Hour Moving Total

01:00 245	02:00 259	03:00 273	04:00 283	05:00 311	06:00 367	07:00 459	08:00 564
09:00 683	10:00 781	11:00 877	12:00 978	13:00 1084	14:00 1192	15:00 1305	16:00 1493
17:00 1797	18:00 2007	19:00 2155	20:00 2269	21:00 2277	22:00 2290	23:00 2311	24:00 2321

Volume Count Report

Generated by MSC3000 Version 2.01 Copyright 1990-1992 Mitron Systems Corporation

Location ..... VA Rte 619 WB, West of I-95 SB Off-Ramp
Location Code ..... I-95 LOC (I) [9+10]
County ..... Prince Williams, VA
Recorder Set .....
Recording Start ..... 10/5/98 6:00 PM
Recording End ..... 10/6/98 12:00 AM
Sample Time .....
Operator Number ....
Machine Number ....
Channel .....
Divided By .....
Summation .....
Two-Way .....

Monday 10/05/98 Channel: 0 Direction: W

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
																				46	28	19	20	113
																				19	6	6	3	
																				9	9	1	6	
																				8	4	5	8	
																				10	9	7	3	

AM Peak Hour ..... Unavailable
AM Peak Hour Factor ..... Unavailable
PM Peak Hour ..... 20:00 to 21:00 (46 vehicles)
PM Peak Hour Factor 60.5%

Tuesday 10/06/98 Channel: 0 Direction: W

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
12	11	11	22	12	34	105	127	78	79	79	94	100	109	111	151	160	111	105	130	54	35	48	18	1796
3	2	1	6	2	4	20	33	21	18	21	17	18	31	21	37	41	37	26	22	19	8	11	8	
2	5	2	5	4	9	33	30	18	15	15	23	34	33	29	41	39	24	26	38	16	8	24	6	
1	2	0	7	2	9	26	29	19	13	25	28	29	25	24	25	33	23	27	36	14	8	6	2	
6	2	8	4	4	12	26	35	20	33	18	26	19	20	37	48	47	27	26	34	5	11	7	2	

AM Peak Hour ..... 7:00 to 8:00 (127 vehicles)
AM Peak Hour Factor 90.7%
PM Peak Hour ..... 15:45 to 16:45 (161 vehicles)
PM Peak Hour Factor 83.9%

24 - Hour Moving Total

01:00 125	02:00 136	03:00 147	04:00 169	05:00 181	06:00 215	07:00 320	08:00 447
09:00 525	10:00 604	11:00 683	12:00 777	13:00 877	14:00 986	15:00 1097	16:00 1248
17:00 1408	18:00 1519	19:00 1624	20:00 1754	21:00 1762	22:00 1769	23:00 1798	24:00 1796

Volume Count Report

Generated by MSC3000 Version 2 01 Copyright 1990-1992 Mitron Systems Corporation

Location ..... VA Rte 619 EB, West of I-95 SB On-Ramp
Location Code ..... I-95 LOC (J) [1+2]
County ..... Prince Williams, VA
Recorder Set .....
Recording Start ..... 10/5/98 6:00 PM
Recording End ..... 10/6/98 12:00 AM
Sample Time .....
Operator Number ....
Machine Number ....
Channel .....
Divided By .....
Summation .....
Two-Way .....

Monday 10/05/98 Channel: 0 Direction: E

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
																		142	76	61	13	24	15	331
																		43	27	19	5	5	5	
																		36	25	17	3	5	2	
																		30	12	19	1	5	6	
																		33	12	6	4	9	2	

AM Peak Hour ..... Unavailable
AM Peak Hour Factor ..... Unavailable
PM Peak Hour ..... 18:00 to 19:00 (142 vehicles)
PM Peak Hour Factor 82.6%

Tuesday 10/06/98 Channel: 0 Direction: E

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
8	11	3	31	16	50	74	91	82	84	82	75	93	135	132	156	187	168	146	98	90	45	36	20	1913
5	3	0	3	3	5	14	29	16	23	24	13	17	53	27	51	46	45	49	34	22	18	12	4	
0	3	2	13	5	11	15	16	24	23	14	15	24	24	23	40	38	48	41	28	15	15	8	3	
2	4	1	4	5	20	29	24	27	14	17	23	21	18	43	32	60	43	28	14	14	5	7	9	
1	1	0	11	3	14	16	22	15	24	27	24	31	40	39	33	43	32	28	22	39	7	9	4	

AM Peak Hour ..... 7:00 to 8:00 (91 vehicles)
AM Peak Hour Factor 78.4%
PM Peak Hour ..... 16:30 to 17:30 (196 vehicles)
PM Peak Hour Factor 81.7%

24 - Hour Moving Total

01:00 339	02:00 350	03:00 353	04:00 384	05:00 400	06:00 450	07:00 524	08:00 615
09:00 697	10:00 781	11:00 863	12:00 938	13:00 1031	14:00 1166	15:00 1298	16:00 1454
17:00 1641	18:00 1809	19:00 1813	20:00 1835	21:00 1864	22:00 1896	23:00 1908	24:00 1913

Volume Count Report

Generated by MSC3000 Version 2.01 Copyright 1990-1992 Mitron Systems Corporation

Location ..... VA Rte 619 WB, West of I-95 SB On-Ramp
Location Code ..... I-95 LOC (K) [I]
County ..... Prince Williams, VA
Recorder Set .....
Recording Start ..... 10/5/98 6:00 PM
Recording End ..... 10/6/98 12:00 AM
Sample Time .....
Operator Number ....
Machine Number ....
Channel .....
Divided By .....
Summation .....
Two-Way .....

Monday 10/05/98 Channel: 0 Direction: W

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
																				46	28	19	20	113
																				19	6	6	3	
																				9	9	1	6	
																				8	4	5	8	
																				10	9	7	3	

AM Peak Hour ..... Unavailable
AM Peak Hour Factor ..... Unavailable
PM Peak Hour ..... 20:00 to 21:00 (46 vehicles)
PM Peak Hour Factor 60.5%

Tuesday 10/06/98 Channel: 0 Direction: W

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
12	11	11	22	12	34	105	127	78	79	79	94	100	109	111	151	160	111	105	130	54	35	48	18	1796
3	2	1	6	2	4	20	33	21	18	21	17	18	31	21	37	41	37	26	22	19	8	11	8	
2	5	2	5	4	9	33	30	18	15	15	23	34	33	29	41	39	24	26	38	16	8	24	6	
1	2	0	7	2	9	26	29	19	13	25	28	29	25	24	25	33	23	27	36	14	8	6	2	
6	2	8	4	4	12	26	35	20	33	18	26	19	20	37	48	47	27	26	34	5	11	7	2	

AM Peak Hour ..... 7:00 to 8:00 (127 vehicles)
AM Peak Hour Factor 90.7%
PM Peak Hour ..... 15:45 to 16:45 (161 vehicles)
PM Peak Hour Factor 83.9%

24 - Hour Moving Total

01:00 125	02:00 136	03:00 147	04:00 169	05:00 181	06:00 215	07:00 320	08:00 447
09:00 525	10:00 604	11:00 683	12:00 777	13:00 877	14:00 986	15:00 1097	16:00 1248
17:00 1408	18:00 1519	19:00 1624	20:00 1754	21:00 1762	22:00 1769	23:00 1798	24:00 1796

Volume Count Report

Generated by MSC3000 Version 2.01 Copyright 1990-1992 Mitron Systems Corporation

Location ..... I-95 SB On-Ramp from VA Rte 619 EB and VA Rte 619 WB
Location Code ..... I-95 LOC (L) [1+H]
County ..... Prince Williams, VA
Recorder Set .....
Recording Start ..... 10/5/98 6:00 PM
Recording End ..... 10/6/98 12:00 AM
Sample Time .....
Operator Number ....
Machine Number ....
Channel .....
Divided By .....
Summation .....
Two-Way .....

Monday 10/05/98 Channel: 0 Direction: S

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
																				81	61	60	33	235
																				17	26	15	10	
																				22	12	15	6	
																				22	11	16	9	
																				20	12	14	8	

AM Peak Hour ..... Unavailable
AM Peak Hour Factor ..... Unavailable
PM Peak Hour ..... 20:15 to 21:15 (90 vehicles)
PM Peak Hour Factor 86.5%

Tuesday 10/06/98 Channel: 0 Direction: S

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
38	17	14	13	30	60	105	122	136	114	112	130	125	130	153	245	388	268	196	132	99	91	90	43	2851
10	4	1	3	11	9	28	21	43	29	30	30	34	30	37	64	86	84	54	38	26	26	20	14	
17	3	8	2	4	16	19	32	31	25	25	30	31	30	41	57	82	66	47	39	23	29	26	8	
6	6	5	3	8	19	32	41	23	36	24	33	29	36	48	68	109	58	49	31	19	14	23	11	
5	4	0	5	7	16	26	28	39	24	33	37	31	34	27	56	111	60	46	24	31	22	21	10	

AM Peak Hour ..... 7:15 to 8:15 (144 vehicles)
AM Peak Hour Factor 83.7%
PM Peak Hour ..... 16:00 to 17:00 (388 vehicles)
PM Peak Hour Factor 87.4%

24 - Hour Moving Total

01:00 273	02:00 290	03:00 304	04:00 317	05:00 347	06:00 407	07:00 512	08:00 634
09:00 770	10:00 884	11:00 996	12:00 1126	13:00 1251	14:00 1381	15:00 1534	16:00 1779
17:00 2167	18:00 2435	19:00 2631	20:00 2763	21:00 2781	22:00 2811	23:00 2841	24:00 2851

Volume Count Report

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Location ..... I-95 NB Off-Ramp to VA Rte 619 EB and VA Rte 619 WB
Location Code ..... I-95 LOC (M) [4+6]
County ..... Prince Williams, VA
Recorder Set .....
Recording Start ..... 10/5/98 6:00 PM
Recording End ..... 10/6/98 12:00 AM
Sample Time .....
Operator Number ....
Machine Number ....
Channel .....
Divided By .....
Summation .....
Two-Way .....

Monday 10/05/98 Channel: 0 Direction: N

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
																			104	70	58	62	39	333
																			28	17	17	23	10	
																			24	19	17	10	12	
																			29	14	11	14	12	
																			23	20	13	15	5	

AM Peak Hour ..... Unavailable
AM Peak Hour Factor ..... Unavailable
PM Peak Hour ..... 19:00 to 20:00 (104 vehicles)
PM Peak Hour Factor 89.7%

Tuesday 10/06/98 Channel: 0 Direction: N

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
23	19	26	16	47	91	286	411	201	158	105	124	134	142	132	127	154	152	128	118	83	63	60	23	2823
6	5	4	1	7	16	36	87	56	38	27	32	31	38	34	31	33	44	32	37	21	16	21	5	
10	5	9	3	9	23	75	134	60	46	22	28	39	40	33	27	27	41	34	21	30	18	15	6	
4	1	7	4	12	17	68	102	44	32	31	25	30	31	26	29	41	32	35	30	17	18	13	6	
3	8	6	8	19	35	107	88	41	42	25	39	34	33	39	40	53	35	27	30	15	11	11	6	

AM Peak Hour ..... 6:45 to 7:45 (430 vehicles)
AM Peak Hour Factor 80.2%
PM Peak Hour ..... 16:30 to 17:30 (179 vehicles)
PM Peak Hour Factor 84.4%

24 - Hour Moving Total

01:00 356	02:00 375	03:00 401	04:00 417	05:00 464	06:00 555	07:00 841	08:00 1252
09:00 1453	10:00 1611	11:00 1716	12:00 1840	13:00 1974	14:00 2116	15:00 2248	16:00 2375
17:00 2529	18:00 2681	19:00 2809	20:00 2823	21:00 2836	22:00 2841	23:00 2839	24:00 2823

Volume Count Report

Generated by MSC3000 Version 2.01 Copyright 1990-1992 Mitron Systems Corporation

Location ..... I-95 NB On-Ramp from VA Rte 619 EB and VA Rte 619 WB
Location Code ..... I-95 LOC (N) [B+C]
County ..... Prince Williams, VA
Recorder Set .....
Recording Start ..... 10/5/98 6:00 PM
Recording End ..... 10/6/98 12:00 AM
Sample Time .....
Operator Number ....
Machine Number ....
Channel .....
Divided By .....
Summation .....
Two-Way .....

Monday 10/05/98 Channel: 0 Direction: N

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
																				243	204	159	93	699
																				59	76	33	21	
																				52	55	43	22	
																				68	29	37	36	
																				64	44	46	14	

AM Peak Hour ..... Unavailable
AM Peak Hour Factor ..... Unavailable
PM Peak Hour ..... 20:30 to 21:30 (263 vehicles)
PM Peak Hour Factor 86.5%

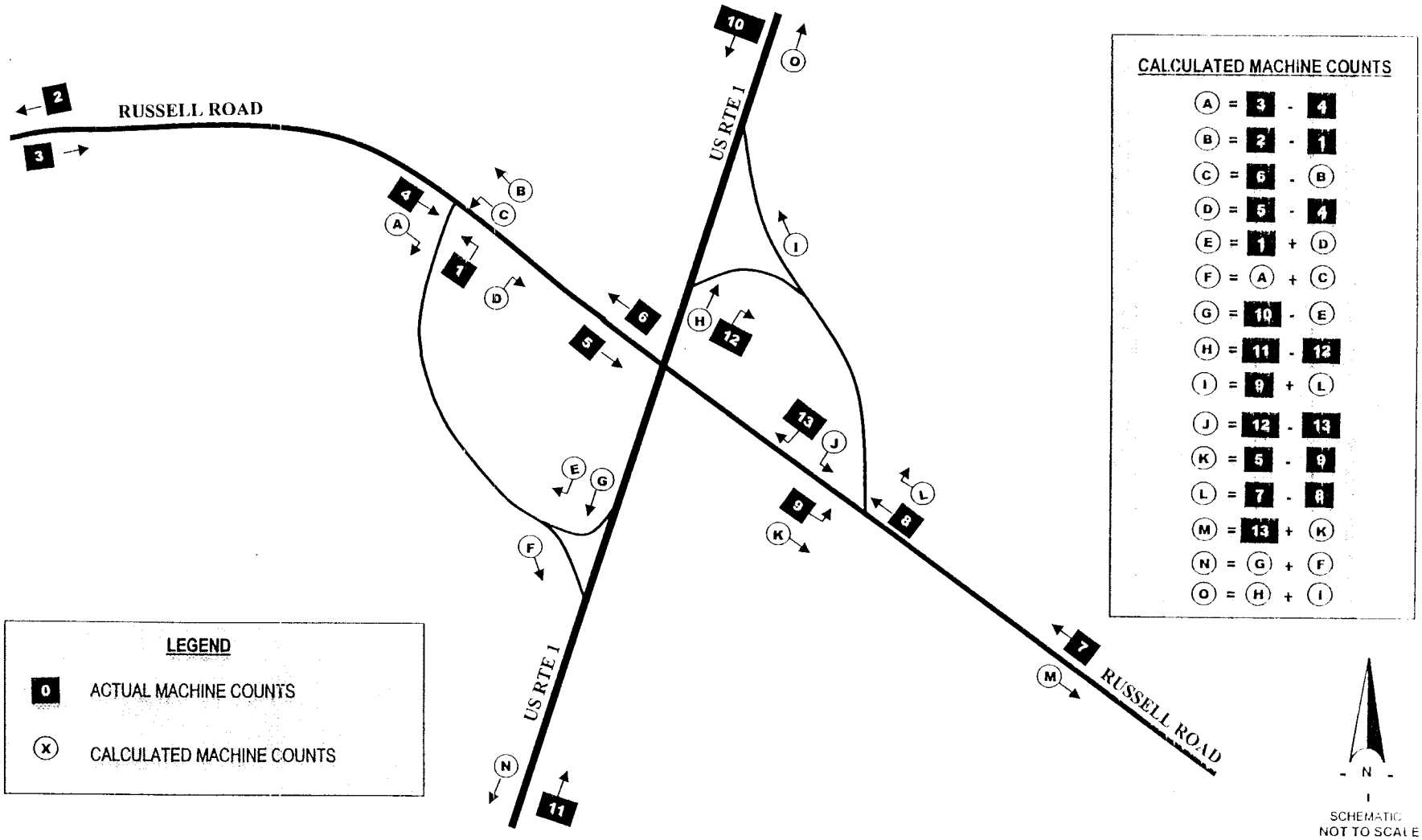
Tuesday 10/06/98 Channel: 0 Direction: N

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
69	33	35	73	163	481	465	495	530	487	393	573	571	592	609	803	1220	1110	670	461	391	288	205	88	10805
21	11	4	13	29	67	111	110	138	109	108	137	153	142	159	234	272	327	198	135	99	92	64	27	
21	11	11	23	40	106	142	114	138	124	76	119	129	138	144	211	278	316	179	123	103	72	63	25	
9	3	11	22	32	144	108	141	118	120	100	190	145	177	136	178	319	272	132	120	63	64	31	22	
18	8	9	15	62	164	104	130	136	134	109	127	144	135	170	180	351	195	161	83	126	60	47	14	

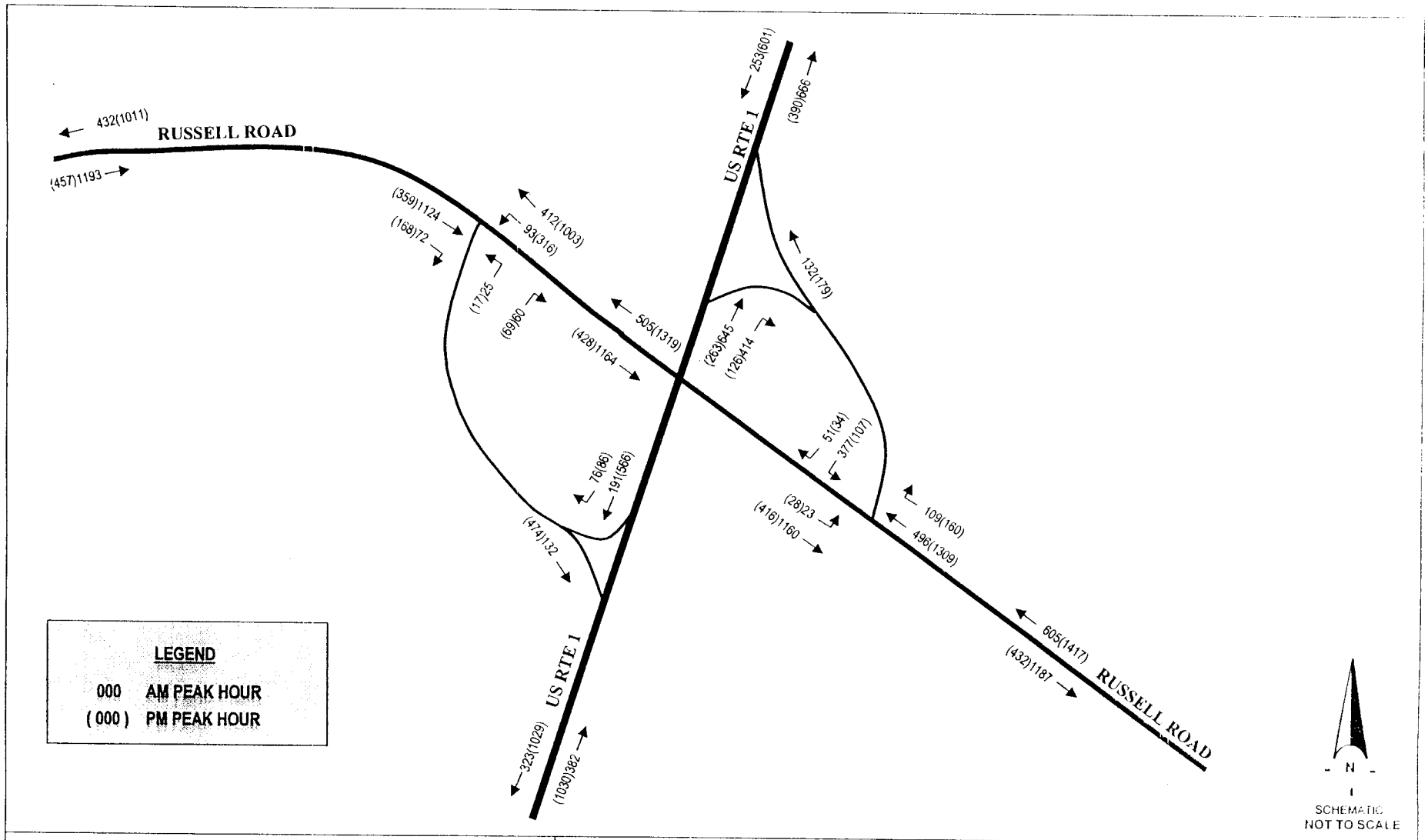
AM Peak Hour ..... 11:00 to 12:00 (573 vehicles)
AM Peak Hour Factor 75.4%
PM Peak Hour ..... 16:30 to 17:30 (1313 vehicles)
PM Peak Hour Factor 93.5%

24 - Hour Moving Total

01:00 768	02:00 801	03:00 836	04:00 909	05:00 1072	06:00 1553	07:00 2018	08:00 2513
09:00 3043	10:00 3530	11:00 3923	12:00 4496	13:00 5067	14:00 5659	15:00 6268	16:00 7071
17:00 8291	18:00 9401	19:00 10071	20:00 10532	21:00 10680	22:00 10764	23:00 10810	24:00 10805



O.R. GEORGE & ASSOCIATES, INC.	US RTE 1 @ RUSSELL ROAD MACHINE COUNT LOCATIONS	EXHIBIT 3



O.R. GEORGE & ASSOCIATES, INC.	US RTE 1 @ RUSSELL ROAD - PEAK HOUR TURNING MOVEMENT VOLUMES	EXHIBIT 4

Volume Count Report

Generated by MSC3000 Version 2.01 Copyright 1990-1992 Mitron Systems Corporation

Location	US Rte 1 SB to Russell Rd WB
Location Code	US 1 Loc 14
County	Prince Williams, VA
Recorder Set	10/5/98 11:25 AM
Recording Start	10/5/98 12:00 PM
Recording End	10/9/98 8:00 AM
Sample Time	15
Operator Number	97
Machine Number	9
Channel	1
Divided By	2
Summation	No
Two-Way	No

Monday 10/05/98 Channel: 1 Direction: W

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
												14	12	11	10	5	18	8	3	3	3	9	5	101
												1	2	2	4	3	4	3	0	0	0	3	2	
												3	4	2	2	0	6	0	2	1	2	2	3	
												5	3	2	2	1	5	3	1	1	0	0	0	
												5	3	5	2	1	3	2	0	1	1	4	0	

AM Peak Hour . . . . . Unavailable
AM Peak Hour Factor . . . . . Unavailable
PM Peak Hour . . . . . 17:00 to 18:00 (18 vehicles)
PM Peak Hour Factor 75.0%

Tuesday 10/06/98 Channel: 1 Direction: W

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
2	1	0	2	4	15	22	15	5	9	5	20	16	11	14	12	9	6	7	7	2	3	6	0	193
1	0	0	0	0	2	2	4	1	1	2	3	4	5	4	4	2	1	4	2	0	1	1	0	
0	0	0	0	0	2	7	8	1	5	2	8	5	1	6	1	3	3	2	3	1	1	1	0	
0	0	0	2	2	3	8	3	1	1	0	5	3	1	1	4	2	0	1	1	0	1	1	0	
1	1	0	0	2	8	5	0	2	2	1	4	4	4	3	3	2	2	0	1	1	0	3	0	

AM Peak Hour . . . . . 5:45 to 6:45 (25 vehicles)
AM Peak Hour Factor 78.1%
PM Peak Hour . . . . . 12:15 to 13:15 (17 vehicles)
PM Peak Hour Factor 85.0%

24 - Hour Moving Total

01:00 103	02:00 104	03:00 104	04:00 106	05:00 110	06:00 125	07:00 147	08:00 162
09:00 167	10:00 176	11:00 181	12:00 201	13:00 203	14:00 202	15:00 205	16:00 207
17:00 211	18:00 199	19:00 198	20:00 202	21:00 201	22:00 201	23:00 198	24:00 193

Volume Count Report

Generated by MSC3000 Version 2.01 Copyright 1990-1992 Mitron Systems Corporation

Location	Russell Rd., West of US Rte 1 WB
Location Code	US1 Loc 24
County	Prince Williams, VA
Recorder Set	10/5/98 11:32 AM
Recording Start	10/5/98 12:00 PM
Recording End	10/9/98 8:00 AM
Sample Time	15
Operator Number	97
Machine Number	16
Channel	1
Divided By	2
Summation	No
Two-Way	No

Monday 10/05/98 Channel: 1 Direction: W

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
												278	259	303	451	914	721	340	180	119	55	17	6	3643
												68	55	63	119	186	237	96	50	29	21	8	3	
												70	67	74	91	179	206	94	59	35	12	4	3	
												72	73	85	129	276	147	83	39	30	13	0	0	
												68	64	81	112	273	131	67	32	25	9	5	0	

AM Peak Hour . . . . . Unavailable
AM Peak Hour Factor . . . . . Unavailable
PM Peak Hour . . . . . 16:30 to 17:30 (992 vehicles)
PM Peak Hour Factor 89.9%

Tuesday 10/06/98 Channel: 1 Direction: W

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
3	10	1	3	11	144	198	194	176	223	258	432	368	348	379	545	981	742	341	242	165	118	17	3	5902
1	1	0	0	1	20	43	60	29	61	51	102	95	81	86	122	213	241	117	69	29	47	1	0	
1	5	0	0	2	19	45	62	39	53	66	95	80	98	93	103	221	223	90	51	42	36	5	2	
0	2	1	3	2	48	61	33	56	50	71	132	110	83	100	169	262	163	64	54	44	23	5	1	
1	2	0	0	6	57	49	39	52	59	70	103	83	86	100	151	285	115	70	68	50	12	6	0	

AM Peak Hour . . . . . 11:00 to 12:00 (432 vehicles)
AM Peak Hour Factor 81.8%
PM Peak Hour . . . . . 16:30 to 17:30 (1011 vehicles)
PM Peak Hour Factor 88.7%

24 - Hour Moving Total

01:00 3646	02:00 3656	03:00 3657	04:00 3660	05:00 3671	06:00 3815	07:00 4013	08:00 4207
09:00 4383	10:00 4606	11:00 4864	12:00 5296	13:00 5386	14:00 5475	15:00 5551	16:00 5645
17:00 5712	18:00 5733	19:00 5734	20:00 5796	21:00 5842	22:00 5905	23:00 5905	24:00 5902

Volume Count Report

Generated by MSC3000 Version 2.01 Copyright 1990-1992 Mitron Systems Corporation

Location	Russell Rd., West of US Rte 1 EB
Location Code	US1 Loc 32
County	Prince Williams, VA
Recorder Set	10/5/98 11:47 AM
Recording Start	10/5/98 12:00 PM
Recording End	10/9/98 8:00 AM
Sample Time	15
Operator Number	97
Machine Number	25
Channel	1
Divided By	2
Summation	No
Two-Way	No

Monday 10/05/98 Channel: 1 Direction: E

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
												295	305	255	351	377	316	305	181	86	78	54	21	2624
												62	79	68	84	105	90	90	59	24	20	17	7	
												65	85	55	90	94	69	78	56	22	19	15	5	
												67	62	60	89	97	72	68	42	17	23	10	4	
												101	79	72	88	81	85	69	24	23	16	12	5	

AM Peak Hour . . . . . Unavailable
AM Peak Hour Factor . . . . . Unavailable
PM Peak Hour . . . . . 15:45 to 16:45 (384 vehicles)
PM Peak Hour Factor 91.4%

Tuesday 10/06/98 Channel: 1 Direction: E

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
16	14	6	3	17	200	844	1091	443	311	360	378	391	348	350	370	457	389	353	215	121	103	45	24	6849
7	3	1	0	1	25	130	274	128	81	80	102	90	96	96	76	111	75	97	66	40	32	12	5	
4	3	3	1	1	32	188	317	117	85	85	101	94	95	86	92	107	116	103	59	26	28	17	4	
3	4	2	1	4	55	222	298	99	70	98	92	93	81	83	117	126	105	83	44	30	24	11	10	
2	4	0	1	11	88	304	202	99	75	97	83	114	76	85	85	113	93	70	46	25	19	5	5	

AM Peak Hour . . . . . 6:45 to 7:45 (1193 vehicles)
AM Peak Hour Factor 94.1%
PM Peak Hour . . . . . 16:00 to 17:00 (457 vehicles)
PM Peak Hour Factor 90.7%

24 - Hour Moving Total

01:00 2640	02:00 2654	03:00 2660	04:00 2663	05:00 2680	06:00 2880	07:00 3724	08:00 4815
09:00 5258	10:00 5569	11:00 5929	12:00 6307	13:00 6403	14:00 6446	15:00 6541	16:00 6560
17:00 6640	18:00 6713	19:00 6761	20:00 6795	21:00 6830	22:00 6855	23:00 6846	24:00 6849

Volume Count Report

Generated by MSC3000 Version 2.01 Copyright 1990-1992 Mitron Systems Corporation

Location	Russell Rd., West of US Rte 1 @ Ramp EB
Location Code	US1 Loc 42
County	Prince Williams, VA
Recorder Set	10/5/98 12:09 PM
Recording Start	10/5/98 1:00 PM
Recording End	10/9/98 8:00 AM
Sample Time	15
Operator Number	97
Machine Number	46
Channel	1
Divided By	2
Summation	No
Two-Way	No

Monday 10/05/98 Channel: 1 Direction: E

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
													237	187	234	225	221	180	106	41	39	8	3	1481
													63	49	59	64	68	64	39	12	13	2	0	
													63	43	63	55	49	51	31	11	10	3	0	
													48	43	56	54	47	31	25	9	12	2	2	
													63	52	56	52	57	34	11	9	4	1	1	

AM Peak Hour . . . . . Unavailable
AM Peak Hour Factor . . . . . Unavailable
PM Peak Hour . . . . . 15:15 to 16:15 (239 vehicles)
PM Peak Hour Factor 93.4%

Tuesday 10/06/98 Channel: 1 Direction: E

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
3	4	0	0	12	190	805	1031	393	283	322	339	339	294	288	255	289	242	220	126	57	56	8	0	5556
0	0	0	0	1	19	122	271	120	73	77	85	67	87	81	58	77	48	65	42	24	21	3	0	
0	1	0	0	0	29	187	278	103	77	75	90	86	78	79	64	65	77	79	38	10	15	1	0	
3	2	0	0	2	55	212	291	88	61	85	86	82	66	65	78	78	62	39	24	14	13	3	0	
0	1	0	0	9	87	284	191	82	72	85	78	104	63	63	55	69	55	37	22	9	7	1	0	

AM Peak Hour . . . . . 6:45 to 7:45 (1124 vehicles)
AM Peak Hour Factor 96.6%
PM Peak Hour . . . . . 12:15 to 13:15 (359 vehicles)
PM Peak Hour Factor 86.3%

24 - Hour Moving Total

01:00 1484	02:00 1488	03:00 1488	04:00 1488	05:00 1500	06:00 1690	07:00 2495	08:00 3526
09:00 3919	10:00 4202	11:00 4524	12:00 4863	13:00 5202	14:00 5259	15:00 5360	16:00 5381
17:00 5445	18:00 5466	19:00 5506	20:00 5526	21:00 5542	22:00 5559	23:00 5559	24:00 5556

Volume Count Report

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Location	Russell Rd., West of US Rte 1 @ Overpass EB
Location Code	US1 Loc 52
County	Prince Williams, VA
Recorder Set	10/5/98 1:29 PM
Recording Start	10/5/98 2:00 PM
Recording End	10/9/98 8:00 AM
Sample Time	15
Operator Number	97
Machine Number	53
Channel	1
Divided By	2
Summation	Yes
Two-Way	Yes

Monday 10/05/98 Channel: 1 Direction: E

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
														208	257	247	243	203	116	45	41	8	4	1372
														54	65	68	73	72	43	13	14	2	0	
														49	66	60	57	56	32	13	10	3	0	
														45	63	62	51	39	27	10	12	2	3	
														60	63	57	62	36	14	9	5	1	1	

AM Peak Hour ..... Unavailable
AM Peak Hour Factor ..... Unavailable
PM Peak Hour ..... 15:15 to 16:15 (260 vehicles)
PM Peak Hour Factor 95.6%

Tuesday 10/06/98 Channel: 1 Direction: E

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
3	4	1	0	12	204	831	1091	419	324	350	381	403	346	314	281	319	263	252	138	64	57	10	0	6067
0	0	0	0	1	21	122	286	123	83	83	96	76	101	89	66	85	53	74	46	25	22	3	0	
0	1	0	0	0	29	200	282	109	85	81	97	99	90	84	70	73	84	91	44	12	15	1	0	
3	2	1	0	2	57	225	312	96	67	94	95	102	81	72	83	86	65	45	25	15	13	5	0	
0	1	0	0	9	97	284	211	91	89	92	93	126	74	69	62	75	61	42	23	12	7	1	0	

AM Peak Hour ..... 6:45 to 7:45 (1164 vehicles)
AM Peak Hour Factor 93.3%
PM Peak Hour ..... 12:15 to 13:15 (428 vehicles)
PM Peak Hour Factor 84.9%

24 - Hour Moving Total

01:00 1375	02:00 1379	03:00 1380	04:00 1380	05:00 1392	06:00 1596	07:00 2427	08:00 3518
09:00 3937	10:00 4261	11:00 4611	12:00 4992	13:00 5395	14:00 5741	15:00 5847	16:00 5871
17:00 5943	18:00 5963	19:00 6012	20:00 6034	21:00 6053	22:00 6069	23:00 6071	24:00 6067

Volume Count Report

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Location	Russell Rd., West of US Rte 1 @ Overpass WB
Location Code	US1 Loc 64
County	Prince Williams, VA
Recorder Set	10/5/98 1:29 PM
Recording Start	10/5/98 2:00 PM
Recording End	10/9/98 8:00 AM
Sample Time	15
Operator Number	97
Machine Number	53
Channel	2
Divided By	2
Summation	Yes
Two-Way	Yes

Monday 10/05/98 Channel: 2 Direction: W

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
														361	585	1211	995	443	237	160	69	12	2	4075
														72	150	255	314	129	82	44	25	6	1	
														97	121	230	288	132	64	46	12	3	0	
														95	179	364	186	97	49	35	19	1	1	
														97	135	362	207	85	42	35	13	2	0	

AM Peak Hour ..... Unavailable
AM Peak Hour Factor ..... Unavailable
PM Peak Hour ..... 16:30 to 17:30 (1328 vehicles)
PM Peak Hour Factor 91.2%

Tuesday 10/06/98 Channel: 2 Direction: W

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
3	11	1	1	8	143	177	186	190	263	330	505	434	453	473	684	1255	1027	449	319	226	140	14	4	7296
0	1	0	0	1	22	41	57	34	76	62	111	118	112	110	147	299	344	141	82	40	61	1	1	
2	5	0	0	2	21	38	59	41	54	85	108	92	119	118	139	286	305	116	76	70	43	4	2	
1	3	1	1	0	47	53	31	60	68	91	154	122	116	117	222	341	209	98	74	54	23	5	1	
0	2	0	0	5	53	45	39	55	65	92	132	102	106	128	176	329	169	94	87	62	13	4	0	

AM Peak Hour ..... 11:00 to 12:00 (505 vehicles)
AM Peak Hour Factor 82.0%
PM Peak Hour ..... 16:30 to 17:30 (1319 vehicles)
PM Peak Hour Factor 95.9%

24 - Hour Moving Total

01:00 4078	02:00 4089	03:00 4090	04:00 4091	05:00 4099	06:00 4242	07:00 4419	08:00 4605
09:00 4795	10:00 5058	11:00 5388	12:00 5893	13:00 6327	14:00 6780	15:00 6892	16:00 6991
17:00 7035	18:00 7067	19:00 7073	20:00 7155	21:00 7221	22:00 7292	23:00 7294	24:00 7296

Volume Count Report

Generated by MSC3000 Version 2.01 Copyright 1990-1992 Mitron Systems Corporation

Location	Russell Rd., East of US Rte 1 WB
Location Code	US1 Loc 74
County	Prince Williams, VA
Recorder Set	10/5/98 2:03 PM
Recording Start	10/5/98 3:00 PM
Recording End	10/9/98 8:15 AM
Sample Time	15
Operator Number	97
Machine Number	28
Channel	1
Divided By	2
Summation	No
Two-Way	No

Monday 10/05/98 Channel: 1 Direction: W

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
															617	1245	1065	481	239	156	73	6	0	3882
															160	258	337	151	73	41	32	3	0	
															124	235	301	137	71	47	9	3	0	
															194	379	197	99	55	35	17	0	0	
															139	373	230	94	40	33	15	0	0	

AM Peak Hour . . . . . Unavailable
AM Peak Hour Factor . . . . . Unavailable
PM Peak Hour . . . . . 16:30 to 17:30 (1390 vehicles)
PM Peak Hour Factor 91.7%

Tuesday 10/06/98 Channel: 1 Direction: W

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
0	1	0	0	1	87	146	174	173	258	357	605	494	461	485	800	1340	1116	482	356	238	149	2	0	7725
0	0	0	0	0	11	37	57	27	71	68	130	132	114	106	169	314	369	150	93	48	56	0	0	
0	1	0	0	0	5	30	52	40	55	84	134	116	127	124	146	302	324	133	85	63	47	0	0	
0	0	0	0	0	31	37	36	53	65	111	179	131	127	131	241	372	233	100	82	59	32	2	0	
0	0	0	0	1	40	42	29	53	67	94	162	115	93	124	244	352	190	99	96	68	14	0	0	

AM Peak Hour . . . . . 11:00 to 12:00 (605 vehicles)
AM Peak Hour Factor 84.5%
PM Peak Hour . . . . . 16:30 to 17:30 (1417 vehicles)
PM Peak Hour Factor 95.2%

24 - Hour Moving Total

01:00 3882	02:00 3883	03:00 3883	04:00 3883	05:00 3884	06:00 3971	07:00 4117	08:00 4291
09:00 4464	10:00 4722	11:00 5079	12:00 5684	13:00 6178	14:00 6639	15:00 7124	16:00 7307
17:00 7402	18:00 7453	19:00 7454	20:00 7571	21:00 7653	22:00 7729	23:00 7725	24:00 7725

Volume Count Report

Generated by MSC3000 Version 2.01 Copyright 1990-1992 Mitron Systems Corporation

Location	Russell Rd., East of US Rte 1 @ Ramp WB
Location Code	US1 Loc 84
County	Prince Williams, VA
Recorder Set	10/5/98 2:16 PM
Recording Start	10/5/98 3:00 PM
Recording End	10/9/98 8:15 AM
Sample Time	15
Operator Number	97
Machine Number	54
Channel	1
Divided By	2
Summation	No
Two-Way	No

Monday 10/05/98 Channel: 1 Direction: W

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
															575	1167	982	443	225	142	64	3	0	3601
															148	244	311	136	72	38	26	2	0	
															115	221	284	130	64	42	9	1	0	
															179	351	185	91	50	32	15	0	0	
															133	351	202	86	39	30	14	0	0	

AM Peak Hour ..... Unavailable
AM Peak Hour Factor ..... Unavailable
PM Peak Hour ..... 16:30 to 17:30 (1297 vehicles)
PM Peak Hour Factor 92.4%

Tuesday 10/06/98 Channel: 1 Direction: W

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
0	1	0	0	0	82	129	164	151	230	309	496	429	409	439	676	1200	1041	443	327	215	143	1	0	6885
0	0	0	0	0	11	33	57	23	63	59	101	113	106	97	142	258	348	138	88	41	56	0	0	
0	1	0	0	0	5	30	46	35	52	73	111	94	101	106	131	286	305	124	80	58	45	0	0	
0	0	0	0	0	27	32	33	45	52	98	156	122	116	120	205	330	214	97	65	57	29	1	0	
0	0	0	0	0	39	34	28	48	63	79	128	100	86	116	198	326	174	84	94	59	13	0	0	

AM Peak Hour ..... 11:00 to 12:00 (496 vehicles)
AM Peak Hour Factor 79.5%
PM Peak Hour ..... 16:30 to 17:30 (1309 vehicles)
PM Peak Hour Factor 94.0%

24 - Hour Moving Total

01:00 3601	02:00 3602	03:00 3602	04:00 3602	05:00 3602	06:00 3684	07:00 3813	08:00 3977
09:00 4128	10:00 4358	11:00 4667	12:00 5163	13:00 5592	14:00 6001	15:00 6440	16:00 6541
17:00 6574	18:00 6633	19:00 6633	20:00 6735	21:00 6808	22:00 6887	23:00 6885	24:00 6885

Volume Count Report

Generated by MSC3000 Version 2 01 Copyright 1990-1992 Mitron Systems Corporation

Location	Russell Rd EB to US Rte 1 NB
Location Code	US1 Loc 91
County	Prince Williams, VA
Recorder Set	10/5/98 2:28 PM
Recording Start	10/5/98 3:00 PM
Recording End	10/9/98 8:00 AM
Sample Time	15
Operator Number	97
Machine Number	10
Channel	1
Divided By	2
Summation	No
Two-Way	No

Monday 10/05/98 Channel: 1 Direction: N

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
															20	17	13	17	12	3	6	5	3	96
															4	3	4	6	5	0	3	0	0	
															6	5	3	7	4	0	1	2	0	
															2	3	3	1	1	2	0	2	2	
															8	6	3	3	2	1	2	1	1	

AM Peak Hour . . . . . Unavailable
AM Peak Hour Factor . . . . . Unavailable
PM Peak Hour . . . . . 15:00 to 16:00 (20 vehicles)
PM Peak Hour Factor 62.5%

Tuesday 10/06/98 Channel: 1 Direction: N

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
3	3	1	0	4	6	3	4	9	5	8	23	13	13	23	20	24	15	14	13	7	16	9	0	236
0	0	0	0	1	0	0	1	4	0	5	5	5	4	6	5	3	4	4	4	2	3	3	0	
0	0	0	0	0	2	3	0	2	2	2	6	1	5	6	8	3	6	7	4	1	6	1	0	
3	2	1	0	1	1	0	3	0	1	1	6	4	3	7	3	9	2	1	2	3	5	4	0	
0	1	0	0	2	3	0	0	3	2	0	6	3	1	4	4	9	3	2	3	1	2	1	0	

AM Peak Hour . . . . . 11:00 to 12:00 (23 vehicles)
AM Peak Hour Factor 95.8%
PM Peak Hour . . . . . 16:30 to 17:30 (28 vehicles)
PM Peak Hour Factor 77.8%

24 - Hour Moving Total

01:00 89	02:00 102	03:00 103	04:00 103	05:00 107	06:00 113	07:00 116	08:00 120
09:00 129	10:00 134	11:00 142	12:00 165	13:00 178	14:00 191	15:00 214	16:00 214
17:00 221	18:00 223	19:00 220	20:00 221	21:00 225	22:00 235	23:00 239	24:00 236

Volume Count Report

Generated by MSC3000 Version 2.01 Copyright 1990-1992 Mitron Systems Corporation

Location	US Rte 1, North of Russell Rd. SB
Location Code	US1 Loc 103
County	Prince Williams, VA
Recorder Set	10/5/98 3:19 PM
Recording Start	10/5/98 4:00 PM
Recording End	10/9/98 8:00 AM
Sample Time	15
Operator Number	97
Machine Number	2
Channel	1
Divided By	2
Summation	No
Two-Way	No

Monday 10/05/98 Channel: 1 Direction: S

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
																634	1002	579	228	131	121	88	57	2840
																140	309	131	79	42	37	29	19	
																117	283	235	54	33	34	21	19	
																165	248	127	50	32	24	20	15	
																212	162	86	45	24	26	18	4	

AM Peak Hour ..... Unavailable
AM Peak Hour Factor ..... Unavailable
PM Peak Hour ..... 16:45 to 17:45 (1052 vehicles)
PM Peak Hour Factor 85.1%

Tuesday 10/06/98 Channel: 1 Direction: S

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
34	14	8	9	21	69	128	167	167	175	177	253	298	289	316	449	591	545	422	234	135	110	99	58	4768
10	5	1	0	7	7	19	39	50	36	35	55	68	92	90	93	148	158	114	71	35	36	33	17	
15	3	2	1	4	10	37	49	33	40	48	54	59	66	68	101	146	134	131	62	38	30	27	20	
4	4	4	7	6	21	38	44	39	45	46	71	70	72	82	120	150	116	99	59	38	20	20	11	
5	2	1	1	4	31	34	35	45	54	48	73	101	59	76	135	147	137	78	42	24	24	19	10	

AM Peak Hour ..... 11:00 to 12:00 (253 vehicles)
AM Peak Hour Factor 86.6%
PM Peak Hour ..... 16:15 to 17:15 (601 vehicles)
PM Peak Hour Factor 95.1%

24 - Hour Moving Total

01:00 2874	02:00 2888	03:00 2896	04:00 2905	05:00 2926	06:00 2995	07:00 3123	08:00 3290
09:00 3457	10:00 3632	11:00 3809	12:00 4062	13:00 4360	14:00 4649	15:00 4965	16:00 5414
17:00 5371	18:00 4914	19:00 4757	20:00 4763	21:00 4767	22:00 4756	23:00 4767	24:00 4768

Volume Count Report

Generated by MSC3000 Version 2.01 Copyright 1990-1992 Mitron Systems Corporation

Location	US Rte 1, South of Russell Rd. NB
Location Code	US1 Loc 111
County	Prince Williams, VA
Recorder Set	10/5/98 3:35 PM
Recording Start	10/5/98 4:00 PM
Recording End	10/9/98 8:00 AM
Sample Time	15
Operator Number	97
Machine Number	36
Channel	1
Divided By	2
Summation	No
Two-Way	No

Monday 10/05/98 Channel: 1 Direction: N

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
																292	287	231	176	145	107	57	40	1335
																57	86	66	56	49	29	14	13	
																78	74	56	50	36	31	14	13	
																93	62	50	34	31	20	13	7	
																64	65	59	36	29	27	16	7	

AM Peak Hour ..... Unavailable
AM Peak Hour Factor ..... Unavailable
PM Peak Hour ..... 16:15 to 17:15 (321 vehicles)
PM Peak Hour Factor 86.3%

Tuesday 10/06/98 Channel: 1 Direction: N

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
16	15	19	25	97	494	867	907	401	393	310	292	382	327	322	282	293	332	291	177	150	99	77	46	6614
5	2	4	3	7	66	172	275	110	98	84	60	116	80	76	85	59	105	75	38	33	29	20	9	
6	7	6	9	22	116	220	280	104	95	68	69	80	76	67	59	78	61	89	60	38	22	24	21	
1	4	2	10	27	152	229	213	100	104	96	75	100	93	85	70	77	102	53	55	39	22	21	4	
4	2	7	3	41	160	246	139	87	96	62	88	86	78	94	68	79	64	74	24	40	26	12	12	

AM Peak Hour ..... 6:30 to 7:30 (1030 vehicles)
AM Peak Hour Factor 92.0%
PM Peak Hour ..... 12:00 to 13:00 (382 vehicles)
PM Peak Hour Factor 82.3%

24 - Hour Moving Total

01:00 1351	02:00 1366	03:00 1385	04:00 1410	05:00 1507	06:00 2001	07:00 2868	08:00 3775
09:00 4176	10:00 4569	11:00 4879	12:00 5171	13:00 5553	14:00 5880	15:00 6202	16:00 6484
17:00 6485	18:00 6530	19:00 6590	20:00 6591	21:00 6596	22:00 6588	23:00 6608	24:00 6614

Volume Count Report

Generated by MSC3000 Version 2.01 Copyright 1990-1992 Mitron Systems Corporation

Location	US Rte 1 NB Off-Ramp
Location Code	US 1 Loc 122
County	Prince Williams, VA
Recorder Set	10/5/98 3:50 PM
Recording Start	10/5/98 4:00 PM
Recording End	10/9/98 8:00 AM
Sample Time	15
Operator Number	97
Machine Number	5
Channel	1
Divided By	2
Summation	No
Two-Way	No

Monday 10/05/98 Channel: 1 Direction: E

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
																77	61	59	48	38	15	5	1	304
																15	17	11	13	15	4	2	1	
																22	16	13	10	9	4	2	0	
																22	16	20	11	7	4	0	0	
																18	12	15	14	7	3	1	0	

AM Peak Hour . . . . . Unavailable
AM Peak Hour Factor . . . . . Unavailable
PM Peak Hour . . . . . 16:15 to 17:15 (79 vehicles)
PM Peak Hour Factor 89.8%

Tuesday 10/06/98 Channel: 1 Direction: E

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
0	5	3	2	14	137	373	295	123	117	102	83	126	92	65	55	76	84	93	39	34	17	11	4	1950
0	0	0	0	1	11	52	93	23	30	22	17	32	22	11	17	13	23	31	7	8	4	3	1	
0	4	2	1	2	26	94	94	30	31	24	18	27	24	15	4	16	19	22	17	8	4	4	1	
0	1	1	0	3	54	111	66	34	26	30	15	41	21	19	17	25	28	15	8	9	5	2	1	
0	0	0	1	8	46	116	42	36	30	26	33	26	25	20	17	22	14	25	7	9	4	2	1	

AM Peak Hour . . . . . 6:15 to 7:15 (414 vehicles)
AM Peak Hour Factor 89.2%
PM Peak Hour . . . . . 12:00 to 13:00 (126 vehicles)
PM Peak Hour Factor 76.8%

24 - Hour Moving Total

01:00 304	02:00 309	03:00 312	04:00 314	05:00 328	06:00 465	07:00 838	08:00 1133
09:00 1256	10:00 1373	11:00 1475	12:00 1558	13:00 1684	14:00 1776	15:00 1841	16:00 1896
17:00 1895	18:00 1918	19:00 1952	20:00 1943	21:00 1939	22:00 1941	23:00 1947	24:00 1950

Volume Count Report

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Location	US Rte 1 NB to Russell Rd. WB
Location Code	US1 Loc 132
County	Prince Williams, VA
Recorder Set	10/5/98 4:06 PM
Recording Start	10/5/98 5:00 PM
Recording End	10/9/98 8:00 AM
Sample Time	15
Operator Number	97
Machine Number	23
Channel	1
Divided By	2
Summation	No
Two-Way	No

Monday 10/05/98 Channel: 1 Direction: E

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
																	25	12	11	11	3	4	1	67
																	9	2	6	4	1	2	1	
																	6	1	2	3	1	1	0	
																	5	7	0	2	1	0	0	
																	5	2	3	2	0	1	0	

AM Peak Hour . . . . . Unavailable
AM Peak Hour Factor . . . . . Unavailable
PM Peak Hour . . . . . 17:00 to 18:00 (25 vehicles)
PM Peak Hour Factor 69.4%

Tuesday 10/06/98 Channel: 1 Direction: E

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
0	3	1	0	4	47	46	27	35	23	15	16	19	16	25	14	27	31	11	9	8	6	8	3	394
0	0	0	0	1	7	6	5	9	5	2	6	6	3	7	4	8	8	5	5	1	0	0	1	
0	2	0	0	1	10	11	3	6	5	4	3	4	3	8	3	4	11	2	0	2	3	4	1	
0	1	1	0	0	17	21	11	11	9	1	4	6	3	2	4	8	7	1	3	4	1	2	1	
0	0	0	0	2	13	8	8	9	4	8	3	3	7	8	3	7	5	3	1	1	2	2	0	

AM Peak Hour . . . . . 5:45 to 6:45 (51 vehicles)
AM Peak Hour Factor 60.7%
PM Peak Hour . . . . . 16:30 to 17:30 (34 vehicles)
PM Peak Hour Factor 77.3%

24 - Hour Moving Total

01:00 67	02:00 70	03:00 71	04:00 71	05:00 75	06:00 122	07:00 168	08:00 195
09:00 230	10:00 253	11:00 268	12:00 284	13:00 303	14:00 319	15:00 344	16:00 358
17:00 385	18:00 391	19:00 390	20:00 388	21:00 385	22:00 388	23:00 392	24:00 394

Volume Count Report

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Location ..... Russell Rd. EB to US Rte 1 SB On-Ramp
Location Code ..... US-1 LOC (A) [3-4]
County ..... Prince Williams, VA
Recorder Set .....
Recording Start ..... 10/5/98 6:00 PM
Recording End ..... 10/6/98 12:00 AM
Sample Time .....
Operator Number ....
Machine Number ....
Channel .....
Divided By .....
Summation .....
Two-Way .....

Monday 10/05/98 Channel: 0 Direction: S

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
																	95	125	75	45	39	46	18	443
																	22	26	20	12	7	15	7	
																	20	27	25	11	9	12	5	
																	25	37	17	8	11	8	2	
																	28	35	13	14	12	11	4	

AM Peak Hour ..... Unavailable
AM Peak Hour Factor ..... Unavailable
PM Peak Hour ..... 18:00 to 19:00 (125 vehicles)
PM Peak Hour Factor 84.5%

Tuesday 10/06/98 Channel: 0 Direction: S

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
13	10	6	3	5	10	39	60	50	28	38	39	52	54	62	115	168	147	133	89	64	47	37	24	1293
7	3	1	0	0	6	8	3	8	8	3	17	23	9	15	18	34	27	32	24	16	11	9	5	
4	2	3	1	1	3	1	39	14	8	10	11	8	17	7	28	42	39	24	21	16	13	16	4	
0	2	2	1	2	0	10	7	11	9	13	6	11	15	18	39	48	43	44	20	16	11	8	10	
2	3	0	1	2	1	20	11	17	3	12	5	10	13	22	30	44	38	33	24	16	12	4	5	

AM Peak Hour ..... 6:30 to 7:30 (72 vehicles)
AM Peak Hour Factor 46.2%
PM Peak Hour ..... 16:00 to 17:00 (168 vehicles)
PM Peak Hour Factor 87.5%

24 - Hour Moving Total

01:00 456	02:00 466	03:00 472	04:00 475	05:00 480	06:00 490	07:00 529	08:00 589
09:00 639	10:00 667	11:00 705	12:00 744	13:00 796	14:00 850	15:00 912	16:00 1027
17:00 1195	18:00 1247	19:00 1255	20:00 1269	21:00 1288	22:00 1296	23:00 1287	24:00 1293

Volume Count Report

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Location ..... Russell Rd. WB, at US Rte 1 SB On-Ramp
Location Code ..... US-1 LOC (B) [2-1]
County ..... Prince Williams, VA
Recorder Set .....
Recording Start ..... 10/5/98 6:00 PM
Recording End ..... 10/6/98 12:00 AM
Sample Time .....
Operator Number ....
Machine Number ....
Channel .....
Divided By .....
Summation .....
Two-Way .....

Monday 10/05/98 Channel: 0 Direction: W

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
																	703	332	177	116	52	8	1	1389
																	233	93	50	29	21	5	1	
																	200	94	57	34	10	2	0	
																	142	80	38	29	13	0	0	
																	128	65	32	24	8	1	0	

AM Peak Hour ..... Unavailable
AM Peak Hour Factor ..... Unavailable
PM Peak Hour ..... 17:00 to 18:00 (703 vehicles)
PM Peak Hour Factor 75.4%

Tuesday 10/06/98 Channel: 0 Direction: W

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
1	9	1	1	7	129	176	179	171	214	253	412	352	337	365	533	972	736	334	235	163	115	11	3	5709
0	1	0	0	1	18	41	56	28	60	49	99	91	76	82	118	211	240	113	67	29	46	0	0	
1	5	0	0	2	17	38	54	38	48	64	87	75	97	87	102	218	220	88	48	41	35	4	2	
0	2	1	1	0	45	53	30	55	49	71	127	107	82	99	165	260	163	63	53	44	22	4	1	
0	1	0	0	4	49	44	39	50	57	69	99	79	82	97	148	283	113	70	67	49	12	3	0	

AM Peak Hour ..... 11:00 to 12:00 (412 vehicles)
AM Peak Hour Factor 81.1%
PM Peak Hour ..... 16:30 to 17:30 (1003 vehicles)
PM Peak Hour Factor 88.6%

24 - Hour Moving Total

01:00 1390	02:00 1399	03:00 1400	04:00 1401	05:00 1408	06:00 1537	07:00 1713	08:00 1892
09:00 2063	10:00 2277	11:00 2530	12:00 2942	13:00 3294	14:00 3631	15:00 3996	16:00 4529
17:00 5501	18:00 5534	19:00 5536	20:00 5594	21:00 5641	22:00 5704	23:00 5707	24:00 5709

Volume Count Report

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Location ..... Russell Rd. WB to US Rte 1 SB On-Ramp
Location Code..... US-1 LOC (C) [6-B]
County ..... Prince Williams, VA
Recorder Set .....
Recording Start..... 10/5/98 6:00 PM
Recording End ..... 10/6/98 12:00 AM
Sample Time .....
Operator Number ....
Machine Number ....
Channel .....
Divided By .....
Summation .....
Two-Way .....

Monday 10/05/98 Channel: 0 Direction: S

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
																	292	111	60	44	17	4	1	529
																	81	36	32	15	4	1	0	
																	88	38	7	12	2	1	0	
																	44	17	11	6	6	1	1	
																	79	20	10	11	5	1	0	

AM Peak Hour ..... Unavailable
AM Peak Hour Factor ..... Unavailable
PM Peak Hour ..... 17:00 to 18:00 (292 vehicles)
PM Peak Hour Factor 83.0%

Tuesday 10/06/98 Channel: 0 Direction: S

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
2	2	0	0	1	14	1	7	19	49	77	93	82	116	108	151	283	291	115	84	63	25	3	1	1587
0	0	0	0	0	4	0	1	6	16	13	12	27	36	28	29	88	104	28	15	11	15	1	1	
1	0	0	0	0	4	0	5	3	6	21	21	17	22	31	37	68	85	28	28	29	8	0	0	
1	1	0	0	0	2	0	1	5	19	20	27	15	34	18	57	81	46	35	21	10	1	1	0	
0	1	0	0	1	4	1	0	5	8	23	33	23	24	31	28	46	56	24	20	13	1	1	0	

AM Peak Hour ..... 11:00 to 12:00 (93 vehicles)
AM Peak Hour Factor 70.5%
PM Peak Hour ..... 16:30 to 17:30 (316 vehicles)
PM Peak Hour Factor 76.0%

24 - Hour Moving Total

01:00 531	02:00 533	03:00 533	04:00 533	05:00 534	06:00 548	07:00 549	08:00 556
09:00 575	10:00 624	11:00 701	12:00 794	13:00 876	14:00 992	15:00 1100	16:00 1251
17:00 1534	18:00 1533	19:00 1537	20:00 1561	21:00 1580	22:00 1588	23:00 1587	24:00 1587

Volume Count Report

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Location ..... US Rte 1 SB Off-Ramp to Russell Rd EB
Location Code ..... US-1 LOC (D) [5-4]
County ..... Prince Williams, VA
Recorder Set .....
Recording Start ..... 10/5/98 6:00 PM
Recording End ..... 10/6/98 12:00 AM
Sample Time .....
Operator Number ....
Machine Number ....
Channel .....
Divided By .....
Summation .....
Two-Way .....

Monday 10/05/98 Channel: 0 Direction: E

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
																	22	23	10	4	2	0	1	62
																	5	8	4	1	1	0	0	
																	8	5	1	2	0	0	0	
																	4	8	2	1	0	0	1	
																	5	2	3	0	1	0	0	

AM Peak Hour ..... Unavailable
AM Peak Hour Factor ..... Unavailable
PM Peak Hour ..... 17:45 to 18:45 (26 vehicles)
PM Peak Hour Factor 81.3%

Tuesday 10/06/98 Channel: 0 Direction: E

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
0	0	1	0	0	14	26	60	26	41	28	42	64	52	26	26	30	21	32	12	7	1	2	0	511
0	0	0	0	0	2	0	15	3	10	6	11	9	14	8	8	8	5	9	4	1	1	0	0	
0	0	0	0	0	0	13	4	6	8	6	7	13	12	5	6	8	7	12	6	2	0	0	0	
0	0	1	0	0	2	13	21	8	6	9	9	20	15	7	5	8	3	6	1	1	0	2	0	
0	0	0	0	0	10	0	20	9	17	7	15	22	11	6	7	6	6	5	1	3	0	0	0	

AM Peak Hour ..... 7:00 to 8:00 (60 vehicles)
AM Peak Hour Factor 71.4%
PM Peak Hour ..... 12:15 to 13:15 (69 vehicles)
PM Peak Hour Factor 78.4%

24 - Hour Moving Total

01:00 62	02:00 62	03:00 63	04:00 63	05:00 63	06:00 77	07:00 103	08:00 163
09:00 189	10:00 230	11:00 258	12:00 300	13:00 364	14:00 416	15:00 442	16:00 468
17:00 498	18:00 497	19:00 506	20:00 508	21:00 511	22:00 510	23:00 512	24:00 511

Volume Count Report

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Location ..... US Rte 1 SB Off-Ramp to Russell Rd EB and Russell Rd WB
Location Code ..... US-1 LOC (E) [1+D]
County ..... Prince Williams, VA
Recorder Set .....
Recording Start ..... 10/5/98 6:00 PM
Recording End ..... 10/6/98 12:00 AM
Sample Time .....
Operator Number ....
Machine Number ....
Channel .....
Divided By .....
Summation .....
Two-Way .....

Monday 10/05/98 Channel: 0 Direction: S

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
																	40	31	13	7	5	9	6	111
																	9	11	4	1	1	3	2	
																	14	5	3	3	2	2	3	
																	9	11	3	2	0	0	1	
																	8	4	3	1	2	4	0	

AM Peak Hour ..... Unavailable
AM Peak Hour Factor ..... Unavailable
PM Peak Hour ..... 17:15 to 18:15 (42 vehicles)
PM Peak Hour Factor 75.0%

Tuesday 10/06/98 Channel: 0 Direction: S

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
2	1	1	2	4	29	48	75	31	50	33	62	80	63	40	38	39	27	39	19	9	4	8	0	704
1	0	0	0	0	4	2	19	4	11	8	14	13	19	12	12	10	6	13	6	1	2	1	0	
0	0	0	0	0	2	20	12	7	13	8	15	18	13	11	7	11	10	14	9	3	1	1	0	
0	0	1	2	2	5	21	24	9	7	9	14	23	16	8	9	10	3	7	2	1	1	3	0	
1	1	0	0	2	18	5	20	11	19	8	19	26	15	9	10	8	8	5	2	4	0	3	0	

AM Peak Hour ..... 7:00 to 8:00 (75 vehicles)
AM Peak Hour Factor 78.1%
PM Peak Hour ..... 12:15 to 13:15 (86 vehicles)
PM Peak Hour Factor 82.7%

24 - Hour Moving Total

01:00 113	02:00 114	03:00 115	04:00 117	05:00 121	06:00 150	07:00 198	08:00 273
09:00 304	10:00 354	11:00 387	12:00 449	13:00 529	14:00 592	15:00 632	16:00 670
17:00 709	18:00 696	19:00 704	20:00 710	21:00 712	22:00 711	23:00 710	24:00 704

Volume Count Report

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Location ..... US Rte 1 SB On-Ramp from Russell Rd EB and Russell Rd WB
Location Code ..... US-1 LOC (F) [A+C]
County ..... Prince Williams, VA
Recorder Set .....
Recording Start ..... 10/5/98 6:00 PM
Recording End ..... 10/6/98 12:00 AM
Sample Time .....
Operator Number ....
Machine Number ....
Channel .....
Divided By .....
Summation .....
Two-Way .....

Monday 10/05/98 Channel: 0 Direction: S

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
																	387	236	135	89	56	50	19	972
																	103	62	52	27	11	16	7	
																	108	65	32	23	11	13	5	
																	69	54	28	14	17	9	3	
																	107	55	23	25	17	12	4	

AM Peak Hour ..... Unavailable
AM Peak Hour Factor ..... Unavailable
PM Peak Hour ..... 17:00 to 18:00 (387 vehicles)
PM Peak Hour Factor 89.6%

Tuesday 10/06/98 Channel: 0 Direction: S

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
15	12	6	3	6	24	40	67	69	77	115	132	134	170	170	266	451	438	248	173	127	72	40	25	2880
7	3	1	0	0	10	8	4	14	24	16	29	50	45	43	47	122	131	60	39	27	26	10	6	
5	2	3	1	1	7	1	44	17	14	31	32	25	39	38	65	110	124	52	49	45	21	16	4	
1	3	2	1	2	2	10	8	16	28	33	33	26	49	36	96	129	89	79	41	26	12	9	10	
2	4	0	1	3	5	21	11	22	11	35	38	33	37	53	58	90	94	57	44	29	13	5	5	

AM Peak Hour ..... 11:00 to 12:00 (132 vehicles)
AM Peak Hour Factor 86.8%
PM Peak Hour ..... 16:30 to 17:30 (474 vehicles)
PM Peak Hour Factor 90.5%

24 - Hour Moving Total

01:00 987	02:00 999	03:00 1005	04:00 1008	05:00 1014	06:00 1038	07:00 1078	08:00 1145
09:00 1214	10:00 1291	11:00 1406	12:00 1538	13:00 1672	14:00 1842	15:00 2012	16:00 2278
17:00 2729	18:00 2780	19:00 2792	20:00 2830	21:00 2868	22:00 2884	23:00 2874	24:00 2880

Volume Count Report

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Location ..... US Rte 1 SB at US Rte 1 SB Off-Ramp to Russell Rd
Location Code ..... US-1 LOC (G) [10-E]
County ..... Prince Williams, VA
Recorder Set .....
Recording Start ..... 10/5/98 6:00 PM
Recording End ..... 10/6/98 12:00 AM
Sample Time .....
Operator Number ....
Machine Number ....
Channel .....
Divided By .....
Summation .....
Two-Way .....

Monday 10/05/98 Channel: 0 Direction: S

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
																	962	548	215	124	116	79	51	2095
																	300	120	75	41	36	26	17	
																	269	230	51	30	32	19	16	
																	239	116	47	30	24	20	14	
																	154	82	42	23	24	14	4	

AM Peak Hour ..... Unavailable
AM Peak Hour Factor ..... Unavailable
PM Peak Hour ..... 17:00 to 18:00 (962 vehicles)
PM Peak Hour Factor 80.2%

Tuesday 10/06/98 Channel: 0 Direction: S

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
32	13	7	7	17	40	80	92	136	125	144	191	218	226	276	411	552	518	383	215	126	106	91	58	4064
9	5	1	0	7	3	17	20	46	25	27	41	55	73	78	81	138	152	101	65	34	34	32	17	
15	3	2	1	4	8	17	37	26	27	40	39	41	53	57	94	135	124	117	53	35	29	26	20	
4	4	3	5	4	16	17	20	30	38	37	57	47	56	74	111	140	113	92	57	37	19	17	11	
4	1	1	1	2	13	29	15	34	35	40	54	75	44	67	125	139	129	73	40	20	24	16	10	

AM Peak Hour ..... 11:00 to 12:00 (191 vehicles)
AM Peak Hour Factor 83.8%
PM Peak Hour ..... 16:15 to 17:15 (566 vehicles)
PM Peak Hour Factor 93.1%

24 - Hour Moving Total

01:00 2127	02:00 2140	03:00 2147	04:00 2154	05:00 2171	06:00 2211	07:00 2291	08:00 2383
09:00 2519	10:00 2644	11:00 2788	12:00 2979	13:00 3197	14:00 3423	15:00 3699	16:00 4110
17:00 4662	18:00 4218	19:00 4053	20:00 4053	21:00 4055	22:00 4045	23:00 4057	24:00 4064

Volume Count Report

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Location ..... US Rte 1 NB at US Rte 1 NB Off-Ramp to Russell Rd
Location Code ..... US-1 LOC (H) [11-12]
County ..... Prince Williams, VA
Recorder Set .....
Recording Start ..... 10/5/98 6:00 PM
Recording End ..... 10/6/98 12:00 AM
Sample Time .....
Operator Number ....
Machine Number ....
Channel .....
Divided By .....
Summation .....
Two-Way .....

Monday 10/05/98 Channel: 0 Direction: N

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
																	226	172	128	107	92	52	39	816
																	69	55	43	34	25	12	12	
																	58	43	40	27	27	12	13	
																	46	30	23	24	16	13	7	
																	53	44	22	22	24	15	7	

AM Peak Hour ..... Unavailable
AM Peak Hour Factor ..... Unavailable
PM Peak Hour ..... 17:00 to 18:00 (226 vehicles)
PM Peak Hour Factor 81.9%

Tuesday 10/06/98 Channel: 0 Direction: N

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
16	10	16	23	83	357	494	612	278	276	208	209	256	235	257	227	217	248	198	138	116	82	66	42	4664
5	2	4	3	6	55	120	182	87	68	62	43	84	58	65	68	46	82	44	31	25	25	17	8	
6	3	4	8	20	90	126	186	74	64	44	51	53	52	52	55	62	42	67	43	30	18	20	20	
1	3	1	10	24	98	118	147	66	78	66	60	59	72	66	53	52	74	38	47	30	17	19	3	
4	2	7	2	33	114	130	97	51	66	36	55	60	53	74	51	57	50	49	17	31	22	10	11	

AM Peak Hour ..... 6:45 to 7:45 (645 vehicles)
AM Peak Hour Factor 86.7%
PM Peak Hour ..... 14:30 to 15:30 (263 vehicles)
PM Peak Hour Factor 88.9%

24 - Hour Moving Total

01:00 832	02:00 842	03:00 858	04:00 881	05:00 964	06:00 1321	07:00 1815	08:00 2427
09:00 2705	10:00 2981	11:00 3189	12:00 3398	13:00 3654	14:00 3889	15:00 4146	16:00 4373
17:00 4590	18:00 4612	19:00 4638	20:00 4648	21:00 4657	22:00 4647	23:00 4661	24:00 4664

Volume Count Report

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Location ..... US Rte 1 NB On-Ramp from Russell Rd EB and Russell Rd WB
Location Code ..... US-1 LOC (I) [9+L]
County ..... Prince Williams, VA
Recorder Set .....
Recording Start ..... 10/5/98 6:00 PM
Recording End ..... 10/6/98 12:00 AM
Sample Time .....
Operator Number ....
Machine Number ....
Channel .....
Divided By .....
Summation .....
Two-Way .....

Monday 10/05/98 Channel: 0 Direction: N

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
																	96	55	26	17	15	8	3	220
																	30	21	6	3	9	1	0	
																	20	14	11	5	1	4	0	
																	15	9	6	5	2	2	2	
																	31	11	3	4	3	1	1	

AM Peak Hour ..... Unavailable
AM Peak Hour Factor ..... Unavailable
PM Peak Hour ..... 17:00 to 18:00 (96 vehicles)
PM Peak Hour Factor 77.4%

Tuesday 10/06/98 Channel: 0 Direction: N

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
3	3	1	0	5	11	20	14	31	33	56	132	78	65	69	144	164	90	53	42	30	22	10	0	1076
0	0	0	0	1	0	4	1	8	8	14	34	24	12	15	32	59	25	16	9	9	3	3	0	
0	0	0	0	0	2	3	6	7	5	13	29	23	31	24	23	19	25	16	9	6	8	1	0	
3	2	1	0	1	5	5	6	8	14	14	29	13	14	18	39	51	21	4	19	5	8	5	0	
0	1	0	0	3	4	8	1	8	6	15	40	18	8	12	50	35	19	17	5	10	3	1	0	

AM Peak Hour ..... 11:00 to 12:00 (132 vehicles)
AM Peak Hour Factor 82.5%
PM Peak Hour ..... 15:45 to 16:45 (179 vehicles)
PM Peak Hour Factor 75.8%

24 - Hour Moving Total

01:00 223	02:00 226	03:00 227	04:00 227	05:00 232	06:00 243	07:00 263	08:00 277
09:00 308	10:00 341	11:00 397	12:00 529	13:00 607	14:00 672	15:00 741	16:00 885
17:00 1049	18:00 1043	19:00 1041	20:00 1057	21:00 1070	22:00 1077	23:00 1079	24:00 1076

Volume Count Report

Generated by MSC3000 Version 2.01 Copyright 1990-1992 Mitron Systems Corporation

Location ..... US Rte 1 NB Off-Ramp to Russell Rd EB
Location Code ..... US-1 LOC (J) [12-13]
County ..... Prince Williams, VA
Recorder Set .....
Recording Start ..... 10/5/98 6:00 PM
Recording End ..... 10/6/98 12:00 AM
Sample Time .....
Operator Number ....
Machine Number ....
Channel .....
Divided By .....
Summation .....
Two-Way .....

Monday 10/05/98 Channel: 0 Direction: W

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
																	36	47	37	27	12	1	0	160
																	8	9	7	11	3	0	0	
																	10	12	8	6	3	1	0	
																	11	13	11	5	3	0	0	
																	7	13	11	5	3	0	0	

AM Peak Hour ..... Unavailable
AM Peak Hour Factor ..... Unavailable
PM Peak Hour ..... 18:00 to 19:00 (47 vehicles)
PM Peak Hour Factor 90.4%

Tuesday 10/06/98 Channel: 0 Direction: W

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
0	2	2	2	10	90	327	268	88	94	87	67	107	76	40	41	49	53	82	30	26	11	3	1	1556
0	0	0	0	0	4	46	88	14	25	20	11	26	19	4	13	5	15	26	2	7	4	3	0	
0	2	2	1	1	16	83	91	24	26	20	15	23	21	7	1	12	8	20	17	6	1	0	0	
0	0	0	0	3	37	90	55	23	17	29	11	35	18	17	13	17	21	14	5	5	4	0	0	
0	0	0	1	6	33	108	34	27	26	18	30	23	18	12	14	15	9	22	6	8	2	0	1	

AM Peak Hour ..... 6:30 to 7:30 (377 vehicles)
AM Peak Hour Factor 87.3%
PM Peak Hour ..... 12:00 to 13:00 (107 vehicles)
PM Peak Hour Factor 76.4%

24 - Hour Moving Total

01:00 160	02:00 162	03:00 164	04:00 166	05:00 176	06:00 266	07:00 593	08:00 861
09:00 949	10:00 1043	11:00 1130	12:00 1197	13:00 1304	14:00 1380	15:00 1420	16:00 1461
17:00 1510	18:00 1527	19:00 1562	20:00 1555	21:00 1554	22:00 1553	23:00 1555	24:00 1556

Volume Count Report

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Location ..... Russell Rd. EB, at US Rte 1 NB On-Ramp
Location Code ..... US-1 LOC (K) [5-9]
County ..... Prince Williams, VA
Recorder Set .....
Recording Start ..... 10/5/98 6:00 PM
Recording End ..... 10/6/98 12:00 AM
Sample Time .....
Operator Number ....
Machine Number ....
Channel .....
Divided By .....
Summation .....
Two-Way .....

Monday 10/05/98 Channel: 0 Direction: E

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
																	230	186	104	42	35	3	1	601
																	69	66	38	13	11	2	0	
																	54	49	28	13	9	1	0	
																	48	38	26	8	12	0	1	
																	59	33	12	8	3	0	0	

AM Peak Hour ..... Unavailable
AM Peak Hour Factor ..... Unavailable
PM Peak Hour ..... 17:00 to 18:00 (230 vehicles)
PM Peak Hour Factor 83.3%

Tuesday 10/06/98 Channel: 0 Direction: E

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
0	1	0	0	8	198	828	1087	410	319	342	358	390	333	291	261	295	248	238	125	57	41	1	0	5831
0	0	0	0	0	21	122	285	119	83	78	91	71	97	83	61	82	49	70	42	23	19	0	0	
0	1	0	0	0	27	197	282	107	83	79	91	98	85	78	62	70	78	84	40	11	9	0	0	
0	0	0	0	1	56	225	309	96	66	93	89	98	78	65	80	77	63	44	23	12	8	1	0	
0	0	0	0	7	94	284	211	86	87	92	87	123	73	65	58	66	58	40	20	11	5	0	0	

AM Peak Hour ..... 6:45 to 7:45 (1160 vehicles)
AM Peak Hour Factor 93.9%
PM Peak Hour ..... 12:15 to 13:15 (416 vehicles)
PM Peak Hour Factor 84.6%

24 - Hour Moving Total

01:00 601	02:00 602	03:00 602	04:00 602	05:00 610	06:00 808	07:00 1636	08:00 2723
09:00 3133	10:00 3452	11:00 3794	12:00 4152	13:00 4542	14:00 4875	15:00 5166	16:00 5427
17:00 5722	18:00 5740	19:00 5792	20:00 5813	21:00 5828	22:00 5834	23:00 5832	24:00 5831

Volume Count Report

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Location ..... Russell Rd. WB to US Rte 1 NB On-Ramp
Location Code ..... US-1 LOC (L) [7-8]
County ..... Prince Williams, VA
Recorder Set .....
Recording Start ..... 10/5/98 6:00 PM
Recording End ..... 10/6/98 12:00 AM
Sample Time .....
Operator Number ....
Machine Number ....
Channel .....
Divided By .....
Summation .....
Two-Way .....

Monday 10/05/98 Channel: 0 Direction: N

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
																	83	38	14	14	9	3	0	161
																	26	15	1	3	6	1	0	
																	17	7	7	5	0	2	0	
																	12	8	5	3	2	0	0	
																	28	8	1	3	1	0	0	

AM Peak Hour ..... Unavailable
AM Peak Hour Factor ..... Unavailable
PM Peak Hour ..... 17:00 to 18:00 (83 vehicles)
PM Peak Hour Factor 74.1%

Tuesday 10/06/98 Channel: 0 Direction: N

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
0	0	0	0	1	5	17	10	22	28	48	109	65	52	46	124	140	75	39	29	23	6	1	0	840
0	0	0	0	0	0	4	0	4	8	9	29	19	8	9	27	56	21	12	5	7	0	0	0	
0	0	0	0	0	0	0	6	5	3	11	23	22	26	18	15	16	19	9	5	5	2	0	0	
0	0	0	0	0	4	5	3	8	13	13	23	9	11	11	36	42	19	3	17	2	3	1	0	
0	0	0	0	1	1	8	1	5	4	15	34	15	7	8	46	26	16	15	2	9	1	0	0	

AM Peak Hour ..... 11:00 to 12:00 (109 vehicles)
AM Peak Hour Factor 80.1%
PM Peak Hour ..... 15:45 to 16:45 (160 vehicles)
PM Peak Hour Factor 71.4%

24 - Hour Moving Total

01:00 161	02:00 161	03:00 161	04:00 161	05:00 162	06:00 167	07:00 184	08:00 194
09:00 216	10:00 244	11:00 292	12:00 401	13:00 466	14:00 518	15:00 564	16:00 688
17:00 828	18:00 820	19:00 821	20:00 836	21:00 845	22:00 842	23:00 840	24:00 840

Volume Count Report

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Location ..... Russell Rd. EB, East of US Rte 1 NB On-Ramp
Location Code ..... US-1 LOC (M) [13+K]
County ..... Prince Williams, VA
Recorder Set .....
Recording Start ..... 10/5/98 6:00 PM
Recording End ..... 10/6/98 12:00 AM
Sample Time .....
Operator Number ....
Machine Number ....
Channel .....
Divided By .....
Summation .....
Two-Way .....

Monday 10/05/98 Channel: 0 Direction: E

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
																	255	198	115	53	38	7	2	668
																	78	68	44	17	12	4	1	
																	60	50	30	16	10	2	0	
																	53	45	26	10	13	0	1	
																	64	35	15	10	3	1	0	

AM Peak Hour ..... Unavailable
AM Peak Hour Factor ..... Unavailable
PM Peak Hour ..... 17:00 to 18:00 (255 vehicles)
PM Peak Hour Factor 81.7%

Tuesday 10/06/98 Channel: 0 Direction: E

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
0	4	1	0	12	245	874	1114	445	342	357	374	409	349	316	275	322	279	249	134	65	47	9	3	6225
0	0	0	0	1	28	128	290	128	88	80	97	77	100	90	65	90	57	75	47	24	19	0	1	
0	3	0	0	1	37	208	285	113	88	83	94	102	88	86	65	74	89	86	40	13	12	4	1	
0	1	1	0	1	73	246	320	107	75	94	93	104	81	67	84	85	70	45	26	16	9	3	1	
0	0	0	0	9	107	292	219	97	91	100	90	126	80	73	61	73	63	43	21	12	7	2	0	

AM Peak Hour ..... 6:45 to 7:45 (1187 vehicles)
AM Peak Hour Factor 92.7%
PM Peak Hour ..... 12:15 to 13:15 (432 vehicles)
PM Peak Hour Factor 85.7%

24 - Hour Moving Total

01:00 668	02:00 672	03:00 673	04:00 673	05:00 685	06:00 930	07:00 1804	08:00 2918
09:00 3363	10:00 3705	11:00 4062	12:00 4436	13:00 4845	14:00 5194	15:00 5510	16:00 5785
17:00 6107	18:00 6131	19:00 6182	20:00 6201	21:00 6213	22:00 6222	23:00 6224	24:00 6225

Volume Count Report

Generated by MSC3000 Version 2.01 Copyright 1990-1992 Mitron Systems Corporation

Location ..... US Rte 1 SB, South of US Rte 1 SB Off-Ramp to Russell Rd
Location Code..... US-1 LOC (N) [G+F]
County ..... Prince Williams, VA
Recorder Set .....
Recording Start..... 10/5/98 6:00 PM
Recording End ..... 10/6/98 12:00 AM
Sample Time .....
Operator Number ....
Machine Number ....
Channel .....
Divided By .....
Summation .....
Two-Way .....

Monday 10/05/98 Channel: 0 Direction: S

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
																	1349	784	350	213	172	129	70	3067
																	403	182	127	68	47	42	24	
																	377	295	83	53	43	32	21	
																	308	170	75	44	41	29	17	
																	261	137	65	48	41	26	8	

AM Peak Hour ..... Unavailable
AM Peak Hour Factor ..... Unavailable
PM Peak Hour ..... 17:00 to 18:00 (1349 vehicles)
PM Peak Hour Factor 83.7%

Tuesday 10/06/98 Channel: 0 Direction: S

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
47	25	13	10	23	64	120	159	205	202	259	323	352	396	446	677	1003	956	631	388	253	178	131	83	6944
16	8	2	0	7	13	25	24	60	49	43	70	105	118	121	128	260	283	161	104	61	60	42	23	
20	5	5	2	5	15	18	81	43	41	71	71	66	92	95	159	245	248	169	102	80	50	42	24	
5	7	5	6	6	18	27	28	46	66	70	90	73	105	110	207	269	202	171	98	63	31	26	21	
6	5	1	2	5	18	50	26	56	46	75	92	108	81	120	183	229	223	130	84	49	37	21	15	

AM Peak Hour ..... 11:00 to 12:00 (323 vehicles)
AM Peak Hour Factor 87.8%
PM Peak Hour ..... 16:30 to 17:30 (1029 vehicles)
PM Peak Hour Factor 90.9%

24 - Hour Moving Total

01:00 3114	02:00 3139	03:00 3152	04:00 3162	05:00 3185	06:00 3249	07:00 3369	08:00 3528
09:00 3733	10:00 3935	11:00 4194	12:00 4517	13:00 4869	14:00 5265	15:00 5711	16:00 6388
17:00 7391	18:00 6998	19:00 6845	20:00 6883	21:00 6923	22:00 6929	23:00 6931	24:00 6944

Volume Count Report

Generated by MSC3000 Version 2.01 Copyright 1990-1992 Mitron Systems Corporation

Location ..... US Rte 1 NB, North of US Rte 1 NB On-Ramp from Russell Rd
Location Code ..... US-1 LOC (O) [H+I]
County ..... Prince Williams, VA
Recorder Set .....
Recording Start ..... 10/5/98 6:00 PM
Recording End ..... 10/6/98 12:00 AM
Sample Time .....
Operator Number ....
Machine Number ....
Channel .....
Divided By .....
Summation .....
Two-Way .....

Monday 10/05/98 Channel: 0 Direction: N

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
																	322	227	154	124	107	60	42	1036
																	99	76	49	37	34	13	12	
																	78	57	51	32	28	16	13	
																	61	39	29	29	18	15	9	
																	84	55	25	26	27	16	8	

AM Peak Hour ..... Unavailable
AM Peak Hour Factor ..... Unavailable
PM Peak Hour ..... 17:00 to 18:00 (322 vehicles)
PM Peak Hour Factor 81.3%

Tuesday 10/06/98 Channel: 0 Direction: N

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
19	13	17	23	88	368	514	626	309	309	264	341	334	300	326	371	381	338	251	180	146	104	76	42	5740
5	2	4	3	7	55	124	183	95	76	76	77	108	70	80	100	105	107	60	40	34	28	20	8	
6	3	4	8	20	92	129	192	81	69	57	80	76	83	76	78	81	67	83	52	36	26	21	20	
4	5	2	10	25	103	123	153	74	92	80	89	72	86	84	92	103	95	42	66	35	25	24	3	
4	3	7	2	36	118	138	98	59	72	51	95	78	61	86	101	92	69	66	22	41	25	11	11	

AM Peak Hour ..... 6:45 to 7:45 (666 vehicles)
AM Peak Hour Factor 86.7%
PM Peak Hour ..... 15:45 to 16:45 (390 vehicles)
PM Peak Hour Factor 92.9%

24 - Hour Moving Total

01:00 1055	02:00 1068	03:00 1085	04:00 1108	05:00 1196	06:00 1564	07:00 2078	08:00 2704
09:00 3013	10:00 3322	11:00 3586	12:00 3927	13:00 4261	14:00 4561	15:00 4887	16:00 5258
17:00 5639	18:00 5655	19:00 5679	20:00 5705	21:00 5727	22:00 5724	23:00 5740	24:00 5740

ADDITIONAL DATA

O.R. George & Associates, Inc.
1738 Elton Rd., Suite 321
Silver Spring, MD 20903
Tel: (301)439-7722 Fax: (301)439-7759

Counted by :ORGA-JAA
Board :D1-0933
City/County:Quantico/Prince William
Weather :Warm/Cloudy/Dry

Study Name: FUR@FULH
Site Code : 03081933
Start Date: 10/07/98

Total Traffic

End Time	Fuller Heights From North Left	Right	Apprch. Total	Fuller Road From East Thru	Right	Apprch. Total	Fuller Road From West Left	Thru	Apprch. Total	Intrvl. Total
10/07/98										
06:45	1	39	40	82	2	84	20	190	210	334
07:00	0	41	41	63	0	63	14	253	267	371
Hour	1	80	81	145	2	147	34	443	477	705
07:15	0	40	40	90	0	90	32	271	303	433
07:30	0	35	35	83	0	83	31	270	301	419
07:45	0	60	60	124	0	124	32	298	330	514
08:00	0	59	59	84	0	84	53	216	269	412
Hour	0	194	194	381	0	381	148	1055	1203	1778
08:15	0	78	78	124	0	124	95	88	183	385
08:30	0	56	56	111	0	111	67	83	150	317
[BREAK]										
Hour	0	134	134	235	0	235	162	171	333	702
[BREAK]										
15:45	1	52	53	200	0	200	49	52	101	354
16:00	0	58	58	178	0	178	44	49	93	329
Hour	1	110	111	378	0	378	93	101	194	683
16:15	0	52	52	191	0	191	51	56	107	350
16:30	0	48	48	206	0	206	44	69	113	367
16:45	0	49	49	249	0	249	52	57	109	407
17:00	1	29	30	303	0	303	65	68	133	466
Hour	1	178	179	949	0	949	212	250	462	1590
17:15	0	41	41	289	0	289	71	68	139	469
17:30	0	39	39	253	0	253	57	96	153	445
Total	3	776	779	2630	2	2632	777	2184	2961	6372
% Apr.	0.3	99.6	-	99.9	-	-	26.2	73.7	-	-
% Int.	-	12.1	-	41.2	-	-	12.1	34.2	-	-

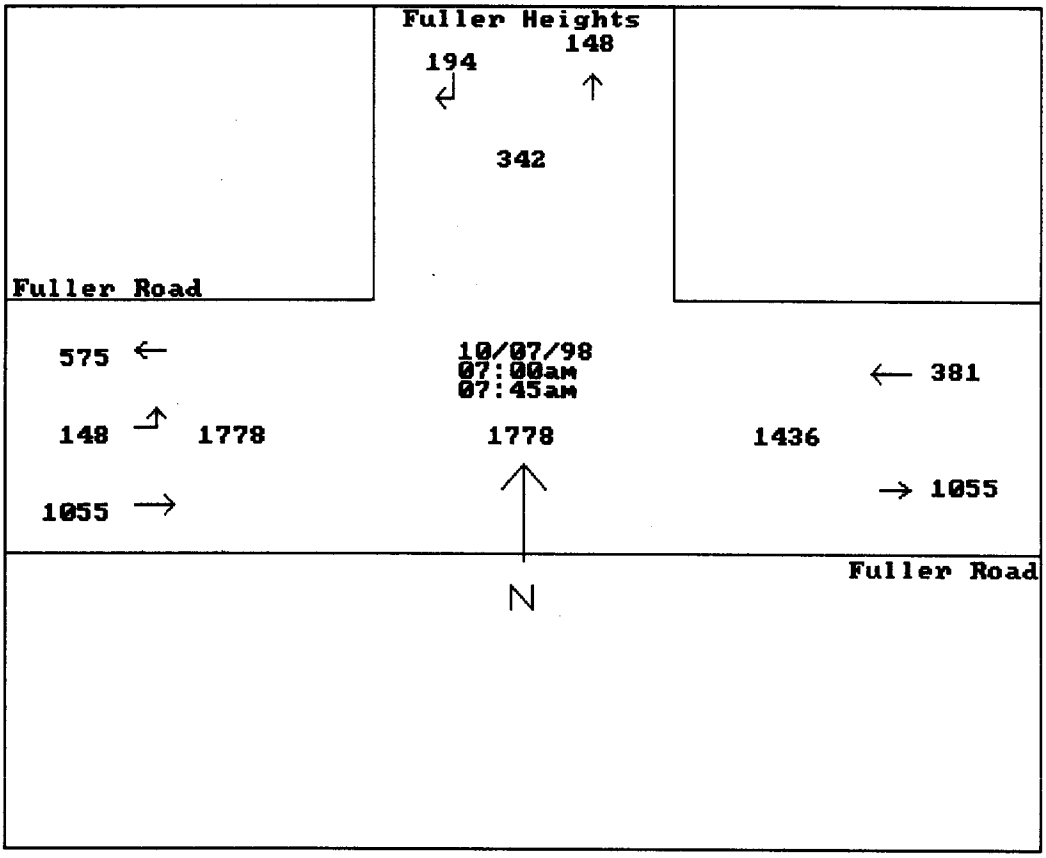
C.R. George & Associates, Inc.
1738 Elton Rd., Suite 321
Silver Spring, MD 20903
Tel: (301)439-7722 Fax: (301)439-7759

Counted by :CRGA-JAA
Board :D1-0933
City/County:Quantico/Prince William
Weather :Warm/Cloudy/Dry

Study Name: FUR@FULH
Site Code : 03081933
Start Date: 10/07/98

Total Traffic

End Time	Fuller Heights From North Left	Right	Apprch. Total	Fuller Road From East Thru	Right	Apprch. Total	Fuller Road From West Left	Thru	Apprch. Total	Intrvl. Total
Peak Hour Analysis By Entire Intersection for the Period: 06:30 on 10/07/98 to 08:15 on 10/07/98										
Time	07:00			07:00			07:00			
Vol.	0	194	07	381	0		148	1055		
Pct.	0.0	100.0		100.0	0.0		12.3	87.6		
Total	194			381			1203			
High	07:30			07:30			07:30			
Vol.	0	60		124	0		32	298		
Total	60			124			330			
PHF	0.808			0.768			0.911			



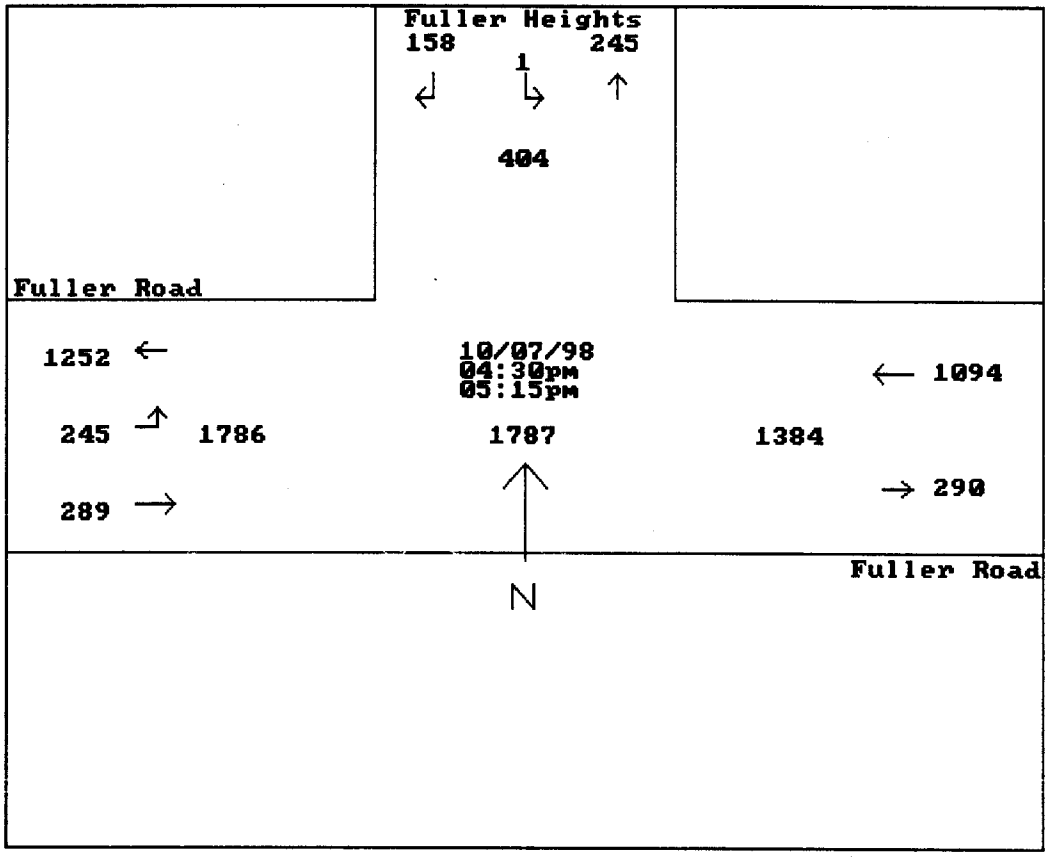
O.R. George & Associates, Inc.
1738 Elton Rd., Suite 321
Silver Spring, MD 20903
Tel: (301)439-7722 Fax: (301)439-7759

Counted by :ORGA-JAA
Board :D1-0933
City/County:Quantico/Prince William
Weather :Warm/Cloudy/Dry

Study Name: FUR@FULH
Site Code : 03081933
Start Date: 10/07/98

Total Traffic

End Time	Fuller Heights From North Left	Right	Apprch. Total	Fuller Road From East Thru	Right	Apprch. Total	Fuller Road From West Left	Thru	Apprch. Total	Intrvl. Total
Peak Hour Analysis By Entire Intersection for the Period: 15:30 on 10/07/98 to 17:15 on 10/07/98										
Time	16:30			16:30			16:30			
Vol.	1	158	16	1094	0		245	289		
Pct.	0.6	99.3		100.0	0.0		45.8	54.1		
Total	159			1094			534			
High	16:30			16:45			17:15			
Vol.	0	49		303	0		57	96		
Total	49			303			153			
PHF	0.811			0.902			0.872			



Volume Count Report

Generated by MSC3000 Version 2.01 Copyright 1990-1992 Mitron Systems Corporation

Location ..... Russell Road, W. of I-95, Westbound
Location Code ..... Loc 14
County ..... Prince Williams, VA
Recorder Set 10/05/98 10:56
Recording Start ... 10/05/98 11:00
Recording End 10/09/98 08:00
Sample Time ..... 15 Minutes
Operator Number ... 97
Machine Number 38
Channel 2
Divide By 2
Summation ..... No
Two-Way ..... Yes

Monday 10/05/98 Channel: 2 Direction: W

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
											118	151	118	114	113	117	147	70	37	37	23	21	13	1079
											31	25	28	28	36	24	48	15	10	4	7	7	4	
											31	36	29	37	22	29	28	22	10	11	7	6	5	
											22	38	32	27	27	34	32	19	11	12	6	2	2	
											34	52	29	22	28	30	39	14	6	10	3	6	2	

AM Peak Hour ..... 11:00 to 12:00 (118 vehicles)
AM Peak Hour Factor 86.8%
PM Peak Hour ..... 12:15 to 13:15 (154 vehicles)
PM Peak Hour Factor 74.0%

Tuesday 10/06/98 Channel: 2 Direction: W

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
7	6	3	4	16	205	349	410	205	128	128	170	154	143	143	142	122	114	53	63	45	35	20	14	2679
2	3	0	1	1	21	83	123	59	36	26	43	44	37	37	32	31	44	13	17	12	14	5	3	
2	1	0	0	1	16	84	102	46	22	37	37	31	43	40	31	42	25	16	9	12	11	4	5	
2	1	2	2	4	53	90	90	46	33	30	53	44	27	31	39	27	21	14	17	12	5	6	4	
1	1	1	1	10	115	92	95	54	37	35	37	35	36	35	40	22	24	10	20	9	5	5	2	

AM Peak Hour ..... 07:00 to 08:00 (410 vehicles)
AM Peak Hour Factor 83.3%
PM Peak Hour ..... 12:30 to 13:30 (159 vehicles)
PM Peak Hour Factor 90.3%

24-Hour Moving Total

01:00-	N/A	02:00-	N/A	03:00-	N/A	04:00-	N/A	05:00-	N/A	06:00-	N/A	07:00-	N/A	08:00-	N/A
09:00-	N/A	10:00-	N/A	11:00-	N/A	12:00-	2540	13:00-	2592	14:00-	2595	15:00-	2620	16:00-	2649
17:00-	2678	18:00-	2683	19:00-	2650	20:00-	2633	21:00-	2659	22:00-	2667	23:00-	2679	24:00-	2678

Volume Count Report

Generated by MSC3000 Version 2.01 Copyright 1990-1992 Mitron Systems Corporation

Location ..... Russell Road, W. of I-95, Eastbound
Location Code ..... Loc 12
County ..... Prince Williams, VA
Recorder Set 10/05/98 10:56
Recording Start ... 10/05/98 11:00
Recording End 10/09/98 08:00
Sample Time ..... 15 Minutes
Operator Number ... 97
Machine Number 38
Channel 1
Divide By 2
Summation ..... No
Two-Way ..... Yes

Monday 10/05/98 Channel: 1 Direction: E

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
											167	112	125	186	207	292	344	195	78	30	53	9	14	1812
											38	26	27	38	50	78	95	78	32	6	14	4	4	
											38	25	32	47	51	55	85	57	25	12	27	4	1	
											58	32	28	48	59	95	79	30	14	4	10	1	5	
											33	29	38	53	47	64	85	30	7	8	2	0	4	

AM Peak Hour ..... 11:00 to 12:00 (167 vehicles)
AM Peak Hour Factor 72.0%
PM Peak Hour ..... 17:00 to 18:00 (344 vehicles)
PM Peak Hour Factor 90.5%

Tuesday 10/06/98 Channel: 1 Direction: E

0100	0200	0300	0400	0500	0600	0700	0800	0900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	Totals
15	7	0	0	3	18	43	62	92	104	122	200	115	155	278	269	329	281	211	155	50	29	9	8	2555
0	2	0	0	1	1	8	16	21	22	33	46	32	39	96	69	75	65	50	59	23	12	1	3	
1	3	0	0	0	5	12	10	30	27	36	50	26	48	68	81	62	84	61	40	12	10	0	2	
10	1	0	0	1	8	11	17	17	25	27	59	27	37	58	78	109	70	51	40	12	4	7	2	
4	1	0	0	1	4	12	19	24	30	26	45	30	31	56	41	83	62	49	16	3	3	1	1	

AM Peak Hour ..... 11:00 to 12:00 (200 vehicles)
AM Peak Hour Factor 84.7%
PM Peak Hour ..... 16:30 to 17:30 (341 vehicles)
PM Peak Hour Factor 78.2%

24-Hour Moving Total

01:00-	N/A	02:00-	N/A	03:00-	N/A	04:00-	N/A	05:00-	N/A	06:00-	N/A	07:00-	N/A	08:00-	N/A
09:00-	N/A	10:00-	N/A	11:00-	N/A	12:00-	2278	13:00-	2311	14:00-	2314	15:00-	2344	16:00-	2436
17:00-	2498	18:00-	2535	19:00-	2472	20:00-	2488	21:00-	2565	22:00-	2585	23:00-	2561	24:00-	2561

11/9/98

MCV ASSOCIATES, INC.

Date: 11-13-96 Int.#: 1 Job NO.:
Weather: Cloudy Supvsr.:
NS.Road: Russell Road Input by: bd
EW.Road: V637 & MCB1

<Peak hour>
AM: 7:00-8:00
PM: 4:30-5:30

NORTH

Turning Movemnt	SOUTHBOUND RIGHT <-|	SOUTHBOUND THRU ||	SOUTHBOUND LEFT |->	WESTBOUND RIGHT /|\ |---	WESTBOUND THRU <---	WESTBOUND LEFT |--- ||	NORTHBOUND RIGHT |->	NORTHBOUND THRU /|\ |	NORTHBOUND LEFT <-| |	EASTBOUND RIGHT --| ||	EASTBOUND THRU --->	EASTBOUND LEFT /|\ --|	15 MIN. Total	Hourly Total	
Time AM	*A*	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*K*	*L*			
6:00-6:15													0		
6:15-6:30													0		
6:30-6:45													0		
6:45-7:00													0	0	6:00-7:00
7:00-7:15	94		2	0	12						5	11	124	124	6:15-7:15
7:15-7:30	117		1	0	24						0	15	157	281	6:30-7:30
7:30-7:45	123		0	4	10						3	15	155	436	6:45-7:45
7:45-8:00	98		3	0	11						2	15	129	565	7:00-8:00
8:00-8:15	43		0	1	10						3	22	79	520	7:15-8:15
8:15-8:30	34		1	2	4						2	14	57	420	7:30-8:30
8:30-8:45	26		1	1	5						3	28	64	329	7:45-8:45
8:45-9:00	44		1	1	6						6	22	80	280	8:00-9:00
9:00-9:15													0	201	8:15-9:15
9:15-9:30													0	144	8:30-9:30
9:30-9:45													0	80	8:45-9:45
9:45-10:00													0	0	9:00-10:00
AM peak hr.	432	0	6	4	57	0	0	0	0	0	10	56	565	565	
Total aprch		438			61			0			66				
Time PM	*A*	*B*	*C*	*D*	*E*	*F*	*G*	*H*	*I*	*J*	*K*	*L*			
3:00-3:15													0		
3:15-3:30													0		
3:30-3:45	16		3	2	6						8	48	83		
3:45-4:00	20		7	5	2						11	32	77	160	3:00-4:00
4:00-4:15	22		0	2	3						9	67	103	263	3:15-4:15
4:15-4:30	20		1	3	3						11	74	112	375	3:30-4:30
4:30-4:45	23		0	4	4						23	98	152	444	3:45-4:45
4:45-5:00	18		1	1	2						21	80	123	490	4:00-5:00
5:00-5:15	20		0	0	1						15	79	115	502	4:15-5:15
5:15-5:30	17		5	3	4						29	98	156	546	4:30-5:30
5:30-5:45	14		5	7	5						28	77	136	530	4:45-5:45
5:45-6:00	10		2	8	3						11	60	94	501	5:00-6:00
6:00-6:15													0	386	5:15-6:15
6:15-6:30													0	230	5:30-6:30
6:30-6:45													0	94	5:45-6:45
6:45-7:00													0	0	6:00-7:00
PM peak hr.	78	0	6	8	11	0	0	0	0	0	88	355	546	546	
Total aprch		84			19			0			443				

M PHF = 0.9 M PHF = 0.88

<AM PEAK HOUR INTERSECTION TURNING MOVEMENTS>

Russell Road

```
AM PEAK HOU |          |          60     | /|\
7:00-8:00   |          Ψ        /|\      | NORTH
            |          438      |        | |
            |   |      |   |             | /|\
------ ------ --| <-| Ψ |-> |-  ------ ------
                  432  0   6    /|\
489 <---                     4  |---
            /|\                57 <---   61 <---
            --|     56          0 |---
---> 66     -->    10              Ψ/
            --|     0                     --->   16
            Ψ        0   0   0
------ ------ --| <-| /|\ |-> |-  ------ ------
                  |   |   |   |
Int.#:   1  |   |       0     | V637 & MCB1
            |  Ψ        /|\   |
            |    0      |     |
```

<PM PEAK HOUR INTERSECTION TURNING MOVEMENTS>

Russell Road

```
            |          |          363    | /|\
PM PEAK HOU |          Ψ        /|\     | NORTH
4:30-5:30   |          84       |       | |
            |   |      |   |             | /|\
------ ------ --| <-| Ψ |-> |-  ------ ------
                  78   0   6    /|\
89 <---                      8  |---
            /|\                11 <---   19 <---
            --|    355          0 |---
---> 443    -->    88              Ψ/
            --|     0                     --->   94
            Ψ        0   0   0
------ ------ --| <-| /|\ |-> |-  ------ ------
                  |   |   |   |
Int.#:   1  |   |       0     | V637 & MCB1
            |  Ψ        /|\   |
            |    0      |     |
```

NFIGURATION"

LEG	L	LT	LR	LTR	T	RT	R
SB	1	0	0	0	2	1	0
WB	2	0	0	0	0	1	0
NB	1	0	0	0	2	1	0
EB	2	0	0	0	0	1	0

MCV ASSOCIATES, INC.

Appendix C – Observations

Traffic Observations at Quantico MCB
Tuesday, October 6, 1998 and Wednesday, October 7, 1998

General observations were made during the traffic count period to determine how the intersection and gate operations interact. The following was observed:

<u>I-95 SB off-ramp and Russell Road</u>

The vehicles on the off ramp created two exclusive turning lanes during the morning peak period, although stripped as one.

2. -95 SB mainline shoulder, for a 5 minute period, between 7:15 AM

3. During non- -ramp, stopped for average of 3.4 seconds eft stopped for an average of 4.1 seconds. During the same period a maximum of 3 vehicles were observed in the queue.
4. eastbound to I-

<u>-95 northbound off ramp and Russell Road</u>

Approximately 12 vehicles can queue on the ramp from the intersection to the diverge gore (single lane).

2. queue was 6 vehicles, and the maximum queue extended beyond the off ramp on to I- northbound mainline shoulder.

The traffic director was in radio communication with traffic directors at the US 1 northbound off ramp intersection with Russell Road.

4. -ramp, although it is stripped as one lane.
5. -peak hours the vehicles turning right from the off ramp stopped for an average of 3.5 seconds and vehicles turning left stopped for an average of 4.7 seconds.

<u>I 95 northbound on-</u>

1. During the afternoon peak hour, a few conflicts were observed at the on- turning vehicles and the westbound right turning vehicles.
   During the afternoon peak hour, the eastbound left turning vehicles used an average acceptable gap of 5.9
3. During the afternoon peak hour, eastbound left turning vehicles took advantage of the platooning characteristics of the westbound through ve
4. Sight distance is limited for eastbound left turning vehicles.

<u>Russell Road Gate and US 1 Northbound SB off- -ramps</u>

1. -off and -off, inside the gate. Vehicles slow to
2. Three traffic directors controlled the US 1 northbound off-
3. **Traffic on the US 1 northbound off ramp appeared to queue on the US 1 mainline shoulder, during the most of the morning peak period.**
4. hour.
   During the afternoon peak period, a constant flow of traffic was observed for two 10 minute periods on Russell Road and the remaining portion of the hour was characterized as having "few" or "some" gaps. A off- period, 30 percent of which were oriented to Russell Road westbound.
   During the afternoon peak period, a maximum queue of 3 vehicles was observed off-

Fuller Road Gate

1. The gate was under THREATCON A. Almost all vehicles slow to go through the gate but do not stop.
2. During the non-peak periods a maximum of 5 vehicles and an average of 2 vehicles were queued to be checked by MP's in one lane while the other lane was free flowing.
3. Approximately, 6 percent of westbound traffic is oriented to VA 619 eastbound (Triangle side streets/ Fuller Heights area), during the afternoon peak period.
4. During the morning peak hour there was a maximum of 4 vehicles queuing to turn left onto Fuller Heights Road.
5. During the morning peak hour eastbound traffic did not queue into the US 1/VA 619 intersection. Very few vehicles and trucks were stopped at the gate.

Overall Comments

The intersections in the study generally operate at acceptable levels of service and will little delay. Operations at the gate did not appear to create congestion, under the current conditions. During the morning peak hour however, the intersections along Russell Road are oversaturated and create serious safety issues.
.
The observations of the intersections along the Russell Road Corridor, between I-95 and the Russell Road gate, are oversaturated in the morning peak period. This creates a dangerous safety hazard on the I-95 and US 1 mainline and creates an unacceptable level of service condition for traffic on the off-ramps. The use of traffic directors provides a free flowing condition at the control points and the traffic was not stopped at the gates. Therefore, the situation appears to be caused by the volume of traffic during this time period.

The existing congestion at the I-95 and US 1 mainline issue is compounded by the following:

- The MCB schedule of events was reviewed so that the traffic counts used in this study were not skewed by a special event or a combination of events. Special events such as, graduations at the University or Academy currently occur on a periodic basis. Special training exercises or conferences also occur frequently. These events attract additional traffic to the base then was accounted for in the existing traffic counts. This will worsen the congested conditions that were observed.

- The gates were operating under THREATCON A during the traffic counts. The level of security is warranted by international events and other military concerns. The level of security may change at any time and may be in force for any length of time. If a more restricted security level is required, both the Russell Road and VA 619 corridors will be severely congested.

Suggestions based on observations:

- Traffic directors could start earlier and be more aggressive in moving traffic through the intersections. However, the condition would still occur because the capacity of the roadway can not accommodate the volume of traffic.

- An acceleration lane at the I-95 northbound off-ramp will help minimize the unsafe condition but traffic directors will still be needed to control the traffic.

- Russell Road requires widening to a four-lane cross section and the major turning movements at I-95 and US 1 need to be free-flowing. The gate operations should be located to provide sufficient queue lengths as not to impede the proposed free-flowing US 1 ramps.

Appendix D Rationale

Rationale for establishing vehicle numbers for the proposed Marine Corps Heritage Center.

The impacts to traffic from development of the MCHC are based on the anticipated increase in vehicle numbers associated with the facility. Vehicles can be attributed to three types of activities. They include museum visitors, personnel employed at the facilities (staff), and those who will attend meetings/workshops at the conference center. In order to analyze the impacts to commuter traffic, a reasonable number of vehicles associated with these three activities must be identified and the proportion of those vehicles that would interact with commuter traffic determined. The following rational was used to arrive at these figures.

VISITORS

The following information is based on the research and market analysis prepared for the project. The data is derived from "FEASIBILITY STUDY FOR THE PUBLIC/PRIVATE DEVELOPMENT OF A MARINE CORPS HERITAGE CENTER AT QUANTICO". February 1998.

This report projected the annual number of visitors to be between 305,000 and 417,000. These numbers were based on data for similar visitor attractions and visitor surveys. The report indicates that an intensive marketing program would be required to achieve these levels of attendance, and that attendance associate with the IMAX Theater tends to wane with time. The following analysis uses the upper level of this attendance range in calculating anticipated effects to traffic.

The report estimates that approximately 50,000 visitors could be expected to attend the center during special events such as Armed Forces Day. This figure could represent attendance over more than one day, but would typically associated with a holiday and/or weekend. The special occasion figure is a component of the total projected annual attendance and should not be considered in calculating the effects to typical weekday traffic.

417,000-50,000= 367,000.

The report indicates approximately 15,000 to 17,000 visitors per year would be associated with the proposed conference center (3,000 to 5,000) and hotel (12,000). It is important that we recognize that these numbers reflect visitor to the museum BY conference center attendees and hotel guests. Unlike typical visitors to the museum the timing and distribution would differ, particularly for the conference center attendees. For that reason the portion of the visitor numbers associated with the conference center will be removed from the overall total and discussed later in the rationale. The hotel visitors are included in the total.

367,000 – 5,000 = 362,000

The report also shows an existing annual attendance of 30,000 for the air-ground museum at Quantico, which would be replaced by the MCHC. The net increase in annual visitors, however, varies by several factors and is proportionally reduced from the projected totals for both the existing and anticipated visitors.

362,000 – 30,000 = 332,000

The report shows that the highest level of attendance (41%) occurs during the months of June, July and August. The remaining 59% would attend over a longer nine-month period.

New 332,000 * .41 = 136,120. Existing 30,000 * .41 = 12,300

There are 13 weeks within this three-month period.

New 136,120 / 13 = 10,471. Existing 12,300 / 13 = 946

The report shows that 27% of patrons visit during the weekdays. This is important if our concern is for impacts to commuter traffic.

New 10,471 * .27 = 2,827. Existing 946 * .27 = 255

There are five weekdays.

New 2,827 /5 = 565. Existing 255 / 5 = 51

The study shows that visitors typically travel in small groups.(percentages are an average of survey data)

6% 1 per vehicle	New 565 * .06 = 34/ 1 = 34	Existing 51 * .06 = 3/ 1 = 3
55% 2 per vehicle	New 565 * .55 = 311/ 2 = 155	Existing 51 * .55 = 28/ 2 = 14
14% 3 per vehicle	New 565 * .14 = 79/ 3 = 26	Existing 51 * .14 = 7/ 3 = 2
19% 4 per vehicle	New 565 * .19 = 107/ 4 = 27	Existing 51 * .19 = 10/ 4 = 2
6% (5 to 40)	New 565 * .06 = 34/10 = 3	Existing 51 * .06 = 3/10= 1
100% Total	245	22

The projected level of vehicle numbers minus the proportional number of existing traffic.

New 245 – Existing 22 = 223 vehicles per weekday

These types of attraction typically operate between 9AM and 5 PM (Quantico 10-5). Visitor related traffic is expected to occur primarily during mid-day, and would therefore not interact with AM peak commuter traffic. A small overlap of commuter/visitor traffic could be expected to occur during the PM commuter peak approximately 25%.

223 * .25 = 56 vehicles added to PM weekday commuter peak volume.

EMPLOYEES

Based on the information provided there will be 95 employees working at the MCHC. There are 22 personnel currently located at Quantico and 41 will be relocated from the Washington Navy yard. That would leave 32 for new hires and/or volunteers. A net increase of 73 personnel would be added to commuter traffic. Employee arrival and departure may vary due to staffing requirements (full time, part time, shift workers, etc.)

73 new employees 22 existing employees

CONFERENCE CENTER

The impacts to commuter traffic from the conference center are directly related to the design capacity of the facility. The numbers from the marketing survey reflect visits to the museum by persons attending conferences (5,000 per year). These projections were intended to identify museum visitors, and were based on 20 % of conference attendees. The report identified 50 visitors per day, which represents 20 % of attendees. This would compute to 250 conference center attendees per day. These attendees would typically visit the museum during mid-day breaks in conference session or after meeting for that day. Therefore, the more important vehicle numbers for conference center attendees would be those associated with arriving and departing the conference center. Traffic associated with the 250 daily attendees would typically be during the late part of AM peak and distributed throughout the PM peak commuter periods.

250 conference center attendees

Rationale for Traffic Assessment Factors for the Heritage Center

Traffic Generation

Design assumptions for the Heritage Center include: 400,000 annual attendance and 95 employees.

1. From Hank Riek assumptions:

Type	AM Peak Hour	PM Peak Hour
Employees	73	73
Museum Visitors	0	57[1]
Conference Center Visitors	250	250
Total Trips	323	380

2. Based on counts performed in October 1998 peak hours occur at:

Period	Hour
AM	6:45 AM-7:45 AM
PM	4:15 PM-5:15 PM

3. Direction of travel during the peak hours is estimated to be 90 percent travel with the flow of commuter traffic and 10 percent against the flow of traffic. (Based on traffic engineering experience.)

Type	AM Peak Hour	PM Peak Hour
Inbound	291	38
Outbound	32	342

4. From the Market Survey of museum visitors (February 1998): Approximately 10% live on the base, were visiting people on the base or were attending other functions on the base and assumed to be oriented to the base. Visitors who live along the east coast were assumed to drive, others were assumed to fly into Washington, DC. Approximately 15% live south of the base. Approximately 47% live north of the base and 23% fly. (Based on the Market Survey, February 1998.). Approximately 5% were assumed to be oriented west of the base.

To/From	Percent
Quantico	10%
Manassas	5%
Richmond	15%
Washington, DC	70%

Traffic Assessment Information

1. The Traffic Assessment will consider the Build-Out Scenario of the Heritage Center.
2. The Traffic Assessment will analyze traffic conditions for:
    - Year 1998 - Existing Traffic Conditions

[1] 56-2 buses + (1.5 Passenger Car Equivalents per bus*2)=57

        - Existing traffic volumes.
        - Existing roadway geometrics
    - Year 2015 - Background Traffic Conditions (No-Build)
        - Regional growth in traffic volumes consists of a 4 percent increase per year on US 1 and 1 percent increase per year on other roads. (From US 1 Corridor Study projections.)
        - Acceleration lane at I-95 NB off-ramp) and the improvements described in the US 1 Corridor Study.
    - Year 2015 - Total Traffic Conditions (consisting of Background Traffic Conditions plus traffic generated by the Heritage Center).
3. Five sites will be analyzed:

    - Mainside North Site - located east of US 1 and south of Fuller Road.
    - Mainside South Site - located east of US 1 and north of VA 637.
    - Russell Road Site - located near Russell Road and MCB-1.
    - Locust Shade Park Site - located west of US 1 and south of VA 619.
    - Northern Combined Site - Includes the Mainside North Site and the Locust Shade Park Site
4. The Traffic Assessment analyzed two time periods: AM and PM weekday commuter peak hour traffic. Counts were performed between 6:30 AM and 8:30 AM and 3:30 PM and 5:30 PM to determine any change in peak hours. Peak hours were determined to be 6:45 AM to 7:45 AM and 4:15 PM to 5:15 PM.
5. Traffic counts were performed during a "typical" Marine Corps Base attendance, weekday on a Tuesday through Thursday.
    - Turning movement counts were performed for a two hour period during the commuter peak periods (between 6:30 AM- 8:30 AM and 3:30 PM and 5:30 PM). The turning movement counts were performed at the following locations:
        - ⇒ I-95 off and on ramps and Russell Road.
        - ⇒ US 1 and Fuller Road (VA 619).
        - ⇒ US 1 and VA 637.
        - ⇒ US 1 and VA 610.
    - Machine counts were performed on a twenty-four hour period on a weekday between Tuesday and Thursday at the following locations:
        - ⇒ US 1 and Russell Road.
        - ⇒ I-95 off and on ramps and Fuller Road (VA 619).
6. Observations were performed at the gates on Fuller and Russell Road.
    - Inbound during the morning peak period.
    - Outbound during the afternoon peak period.

APPENDIX G:
EIFS Data

CONSTRUCTION

```
Project name:  Quantico, Va

Enter    d    to enter your own price deflators
      RETURN  to use the default price deflators (latest year): d
Price deflator for baseline year (ex b.v.) (CPI - 1987) : (100.0)
Price deflator for output  (ex b.v.)       (CPI - 1995) :  133.3
Price deflator for baseline year (construction) (ENR-const - 1987) : (100.0)
Price deflator for output (construction)  (ENR-const - 1995) : 126.0
If entering total expenditures, enter  1
            local expenditures, enter  2  : 1
Dollar volume of construction project:  $5,100,000 (annual for 20 years)
Local expenditures of project:  2,576,094.12 (calculated)
  price deflator (ENR-const - 1995) : 126.0
Percent for labor (enter new value or <cr> to accept default):  (34.2)
Percent for materials (enter new value or <cr> to accept default):  (57.8)
Percent allowed for other:  8.00 (calculated)
Percent of construction workers expected to migrate into the area
    (enter <cr> to accept default):  (30.0) 0
```

********** CONSTRUCTION IMPACT FORECAST FOR Quantico, Va ************

Export income multiplier:	2.0207	
Change in local		
Sales volume ..... Direct:	$2,197,000	
Induced:	$2,243,000	
Total:	$4,440,000	(0.138%)
Employment ..... Direct:	19	
Total:	67	(0.063%)
Income ..... Direct:	$321,000	
Total (place of work):	$1,580,000	
Total (place of residence):	$1,580,000	(0.026%)
Local population .....:	0	(0.000%)
Local off-base population .....:	0	
Number of school children .....:	0	
Demand for housing ..... Rental:	0	
Owner occupied:	0	
Government expenditures.....:	$78,000	
Government revenues .....:	$73,000	
Net Government revenues .....:	-$5,000	
Civilian employees expected to relocate:	0	
Military employees expected to relocate:	0	

```
Project name:  Quantico, Va

Enter    d    to enter your own price deflators
      RETURN  to use the default price deflators (latest year): d
Price deflator for baseline year (ex b.v.) (CPI - 1987) : (100.0)
Price deflator for output  (ex b.v.)       (CPI - 1995) :  133.3
Price deflator for baseline year (business volume) (PPI - 1987) : (100.0)
Price deflator for output (business volume)        (PPI - 1995) :  121.6
(Enter decreases as negative numbers)
If entering total expenditures, enter  1
            local expenditures, enter  2  : 1
Change in expenditures for services and supplies:  $750,000
Change in expenditures for local services and supplies:  378,837.38
(calculated)
  price deflator (PPI - 1995) : 121.6
Change in civilian employment:  90
Average income of affected civilian personnel:  $32,000
  price deflator (CPI - 1995) : 133.3
Percent expected to relocate (enter <cr> to accept default):  (0.0) 50
Change in military employment:  0
```

********** **STANDARD EIFS MODEL FORECAST FOR Quantico, Va** **********

Export income multiplier:	2.0207	
Change in local		
Sales volume ..... Direct:	$2,491,000	
Induced:	$2,543,000	
Total:	$5,034,000	(0.162%)
Employment ..... Direct:	22	
Total:	135	(0.127%)
Income ..... Direct:	$377,000	
Total (place of work):	$3,641,000	
Total (place of residence):	$3,641,000	(0.059%)
Local population .....:	131	(0.048%)
Local off-base population .....:	131	
Number of school children .....:	17	
Demand for housing ..... Rental:	12	
Owner occupied:	33	
Government expenditures.....:	$310,000	
Government revenues .....:	$245,000	
Net Government revenues .....:	-$66,000	
Civilian employees expected to relocate:	45	
Military employees expected to relocate:	0	