

Appendix A

**Determination of Consistency with
Virginia's Coastal Resources Management
Program**

DRAFT

THIS PAGE INTENTIONALLY LEFT BLANK

DRAFT

A-2

Appendix A

Determination of Consistency with Virginia's Coastal Resources Management Program

Pursuant to Section 307 of the Coastal Zone Management Act of 1972, as amended, this is a Federal Consistency Determination for the construction and operation of the National Museum of the United States Army. The Army is required to determine the consistency of its activities affecting Virginia's coastal resources or coastal uses with the Virginia Coastal Resources Management Program (CRMP).

This document represents an analysis of project activities in light of established Virginia CRMP Enforceable Policies and Programs. Furthermore, submission of this consistency determination reflects the commitment of the Army to comply with those Enforceable Policies and Programs. The proposed project would be constructed and operated in a manner that is consistent with the Virginia CRMP. The Army has determined that the construction and operation of the National Museum of the United States Army would have a negligible impact on any land and water uses or natural resources of the Commonwealth of Virginia's coastal zone.

1 Description of Proposed Action

Under the Proposed Action, the Army would construct and operate the National Museum of the United States Army that would include a main museum building, memorial garden, parade ground and grandstand, amphitheater, drop-off and arrival plaza, screened service court, a building to store cannons or serve as a temporary stable, macro-gallery, outdoor education center, and parking areas. Two potential sites for the museum (the Pence Gate Site and the Gunston Site) are evaluated in the Environmental Assessment along with the No Build Alternative. Construction at either site would require: clearing and grading, excavating and trenching for utilities, and construction of buildings and other improvements.

2 Assessment of Probable Effects

The Army intends to obtain all applicable permits required for implementation of the Proposed Action Alternative. A review of the permits and/or approvals required under the enforceable policies is being conducted. The Army has evaluated the construction and operation of the National Museum of the United States Army for its foreseeable effects on the following enforceable policies:

Fisheries - The Proposed Action Alternative has no foreseeable impacts on fish or shellfish resources and would not affect the promotion of commercial or recreational

DRAFT

fisheries at either project site. The Gunston Site is located approximately 2.6 miles northwest of the Potomac River and 1.4 miles from Accotink Bay. The closest water features are two perennial streams located adjacent east and west of the proposed building site. Both of these streams discharge to Accotink Creek, which is located approximately 1,500 feet south of the proposed building site. The Pence Gate Site is located approximately 2 miles north of the Potomac River and 1.3 miles from Accotink Bay. The closest surface water features are two intermittent streams located adjacent east of the proposed building location. These streams discharge to Dogue Creek, which is located approximately 1,600 feet east of the proposed building site. Both Accotink and Dogue Creeks discharge to the Potomac River. The contractor would be required to implement best management practices (BMPs) recommended by the Virginia Departments of Conservation and Recreation (DCR) and Forestry (DOF).

Subaqueous Lands Management –The Virginia Marine Resources Commission (VMRC), pursuant to Virginia Administrative Code (VAC) Section 28.2-1204, has jurisdiction over encroachments in, on, or over any State-owned rivers, streams and creeks. The project would have no foreseeable impact on subaqueous resources.

Tidal and Non-tidal Wetlands Management – The Proposed Action Alternative would involve minor effects on tidal and non-tidal wetlands. No wetlands are located within the project footprint for the Pence Gate Site. Construction of the Proposed Action Alternative at the Pence Gate Site has been configured to avoid wetlands and streams. Wetlands could be impacted at the Gunston Site, by permanently filling and/or draining the resource. Minimal impacts are likely from the construction of access roads and utility corridors. The Army would try to avoid these impacts as much as possible during siting of the access road and utilities. In areas where avoidance is not possible, the contractor would use bridging, culverts or other methods to minimize impacts, or mitigations would be identified during the permitting process. The Army would obtain permits from the U.S. Army Corps of Engineers (USACE) and the Virginia Department of Environmental Quality (DEQ) prior to the start of construction. The Army would provide compensation as required by the USACE and the VDEQ for unavoidable impacts.

Dunes Management –The Proposed Action Alternative would not affect any coastal primary sand dunes.

Non-Point Source Water Pollution Control – Land disturbing activities during construction would affect more than one acre and would require a Virginia Stormwater Management Program (VSMP) permit, and a Storm Water Pollution Prevention Plan (SWPPP). The Army would follow the Virginia erosion and sediment control standards of Title 10.1 Chapter 5, Article 4 of the Virginia Code to ensure that non-source pollution control impacts are minimized during construction. The Army would also follow the Fairfax County Chesapeake Bay Preservation Area regulations (Chapter 118 of the Fairfax County Code) to minimize long-term impacts on water quality. Construction activities would be monitored to ensure that erosion and stormwater management practices are adequate to prevent sediment and pollution migration into nearby surface waters. Stormwater management ponds would be designed to provide compliance with

DRAFT

BMP nutrient reduction goals. From these ponds, stormwater would be discharged into tributaries of Dogue or Accotink Creek, depending on which alternative is selected. Implementation of the Proposed Action at either site would have a negligible impact on non-point source pollution.

Point Source Water Pollution Control –The Proposed Action Alternative would be connected to the on-post sanitary sewer system. The Army would comply with the Virginia Pollutant Discharge Elimination System (VPDES) Stormwater General Permit for associated construction activities. Construction and operation of the Museum would therefore have negligible impact on point source pollution.

Shoreline Sanitation – Neither of the proposed sites for the Museum are near a shoreline, and neither site would be equipped with a septic system. The Proposed Action Alternative would therefore have no impact on shoreline sanitation.

Air Pollution Control – Adverse impacts would be minimal. Construction and operation of the Museum would be subject to Virginia DEQ Regulations 9 VAC 5-50-60, Control and Abatement Air Pollution, such as:

- | | |
|------------------|--|
| 9 VAC 5-50-80/90 | Visible and fugitive dust emissions. |
| 9 VAC 5-40-55120 | Restricting the use of cut-back asphalt (liquefied asphalt cement, blended with petroleum solvents) for paving during the months of April through October. |

Both project sites are located within an ozone and PM2.5 non-attainment area, triggering the need to analyze emissions and determine the applicability of General Conformity Rule under the Clean Air Act (CAA). A construction emissions estimate indicates that the construction activity would not generate sufficient emissions to trigger a need for a full General Conformity Analysis. No changes to the Fort Belvoir’s Title V air permit would be required.

Coastal Lands Management – Construction and operation of the Museum would have no impact on any coastal lands.

Chesapeake Bay Preservation Areas –Fort Belvoir must be consistent with the performance criteria of the Chesapeake Bay Local Assistance Department Regulations to meet the enforceable policies of VCMP. Construction and operation of the Museum would have no impact on any Chesapeake Bay Preservation Areas (CBPAs). The project would include BMPs to comply with Chesapeake Bay Resource Management Area Requirements.

DRAFT

3 Summary of Findings

Based on the above analysis, which is elaborated on in the EA, Fort Belvoir personnel would: ensure that the construction contractor uses and maintains appropriate BMPs; obtain the requisite permits and approvals; and implement measures to mitigate potential environmental impacts. With the proposed mitigation measures, Fort Belvoir finds that the proposed installation and operation of the National Museum of the United States Army would be consistent to the maximum extent practicable with the federally approved enforceable provisions of Virginia CRMP, pursuant to the Coastal Zone Management Act of 1972, as amended and in accordance with 15 CFR 930.30.

By certification that the proposed action is consistent with Virginia CRMP Enforceable Policies, the Commonwealth of Virginia is hereby notified that it has six months from receipt of this letter to concur with, or object to, this Consistency Determination. However, pursuant to 15 CFR 930.62(b), if the Commonwealth of Virginia has not issued a decision within three months from receipt of this determination, it shall notify Fort Belvoir the status of the matter and the basis for further delay. The State's concurrence, objection, or notification of review status shall be sent to:

**Commander
U.S. Army Garrison Fort Belvoir
9430 Jackson Loop Suite 100
ATTN: IMNE-BEL-ELE
Fort Belvoir, VA 22060-5116**

DRAFT

THIS PAGE INTENTIONALLY LEFT BLANK

DRAFT

Appendix B

Coordination Letters and Natural Resources

DRAFT

THIS PAGE INTENTIONALLY LEFT BLANK

DRAFT

L. Preston Bryant, Jr.
Secretary of Natural Resources



Joseph H. Maroon
Director

COMMONWEALTH of VIRGINIA
DEPARTMENT OF CONSERVATION AND RECREATION

217 Governor Street
Richmond, Virginia 23219-2010
(804) 786-7951 FAX (804) 371-2674

February 19, 2008

Bill Kirby
Paciulli, Simmons and Associates
11212 Waples Mill Road, Suite #10
Fairfax, VA 22030

Re: Army Museum Gunston Site

Dear Mr. Kirby:

The Department of Conservation and Recreation's Division of Natural Heritage (DCR) has searched its Biotics Data System 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 Chris Hobson, DCR zoologist, there is potential for the northern Virginia well amphipod (*Stygobromus phreaticus*, G2G3/S1/NL/NL) to occur within the project site. The Northern Virginia well amphipod is a distinctive species of subterranean crustacean that has a very limited range. It has been documented at only three sites, including historical collections obtained from wells in Alexandria (1921) and Vienna (1948) in northern Virginia (suburbs of Washington, D.C.). The exact locations of both collection sites are unknown, but they are presumed to have been destroyed by subsequent urbanization. The only recent collections (1996 and 2003) are from a ravine seepage habitat on the Fort Belvoir Military Reservation in Fairfax County, Virginia.

To minimize adverse impacts to the aquatic ecosystem as a result of the proposed activities, DCR recommends the implementation of and strict adherence to applicable state and local erosion and sediment control/storm water management laws and regulations. DCR also recommends to avoid impacts to springs and seeps and to maintain forested buffers along slopes to protect groundwater recharge areas.

Our files do not indicate the presence of any State Natural Area Preserves under DCR's jurisdiction in the project vicinity.

Under a Memorandum of Agreement established between the Virginia Department of Agriculture and Consumer Services (VDACS) and the Virginia Department of Conservation and Recreation (DCR), DCR represents VDACS in comments regarding potential impacts on state-listed threatened and endangered plant and insect species. The current activity will not affect any documented state-listed plants or insects.

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

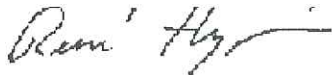
DRAFT

A fee of \$125.00 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 423D, Richmond, VA 23219, ATTN: Cashier. Payment is due within thirty days of the invoice date. Please note late payment may result in the suspension of project review service for future projects.

The Virginia Department of Game and Inland Fisheries maintains a database of wildlife locations, including threatened and endangered species, trout streams, and anadromous fish waters, that may contain information not documented in this letter. Their database may be accessed from www.dgif.virginia.gov/wildlife/info_map/index.html, or contact Shirl Dressler at (804) 367-6913.

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,

A handwritten signature in black ink, appearing to read "S. Rene' Hypes", with a stylized flourish extending to the right.

S. Rene' Hypes
Project Review Coordinator

DRAFT

L. Preston Bryant, Jr.
Secretary of Natural Resources



Joseph H. Maroon
Director

COMMONWEALTH of VIRGINIA
DEPARTMENT OF CONSERVATION AND RECREATION

217 Governor Street
Richmond, Virginia 23219-2010
(804) 786-7951 FAX (804) 371-2674

February 19, 2008

Bill Kirby
Paciulli, Simmons and Associates
11212 Waples Mill Road, Suite #10
Fairfax, VA 22030

Re: Army Museum Pence Gate Site

Dear Mr. Kirby:

The Department of Conservation and Recreation's Division of Natural Heritage (DCR) has searched its Biotics Data System 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 Chris Hobson, DCR zoologist, there is potential for the northern Virginia well amphipod (*Stygobromus phreaticus* G2G3/S1/NL/NL) to occur within the project site. The Northern Virginia well amphipod is a distinctive species of subterranean crustacean that has a very limited range. It has been documented at only three sites, including historical collections obtained from wells in Alexandria (1921) and Vienna (1948) in northern Virginia (suburbs of Washington, D.C.). The exact locations of both collection sites are unknown, but they are presumed to have been destroyed by subsequent urbanization. The only recent collections (1996 and 2003) are from a ravine seepage habitat on the Fort Belvoir Military Reservation in Fairfax County, Virginia.

Due to the potential for this site to support populations of this natural heritage resource, DCR recommends an inventory for the resource in the seeps and springs that will be directly impacted by the construction. 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.

In addition, DCR recommends the implementation of and strict adherence to applicable state and local erosion and sediment control/storm water management laws and regulations, to minimize adverse impacts to the aquatic ecosystem as a result of the proposed activities. DCR also recommends to avoid impacts to springs and seeps and to maintain forested buffers to protect groundwater recharge areas.

Our files do not indicate the presence of any State Natural Area Preserves under DCR's jurisdiction in the project vicinity.

Under a Memorandum of Agreement established between the Virginia Department of Agriculture and

*State Parks • Soil and Water Conservation • Natural Heritage • Outdoor Recreation Planning
Chesapeake Bay Local Assistance • Dam Safety and Floodplain Management • Land Conservation*

DRAFT

Consumer Services (VDACS) and the Virginia Department of Conservation and Recreation (DCR). DCR represents VDACS in comments regarding potential impacts on state-listed threatened and endangered plant and insect species. The current activity will not affect any documented state-listed plants or insects.

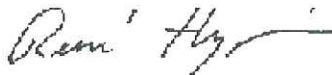
New and updated information is continually added to Biotics. Please contact DCR for an update on this natural heritage information if a significant amount of time passes before it is utilized.

A fee of \$125.00 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 423D, Richmond, VA 23219, ATTN: Cashier. Payment is due within thirty days of the invoice date. Please note late payment may result in the suspension of project review service for future projects.

The Virginia Department of Game and Inland Fisheries maintains a database of wildlife locations, including threatened and endangered species, trout streams, and anadromous fish waters, that may contain information not documented in this letter. Their database may be accessed from www.dgif.virginia.gov/wildlife/info_map/index.html. or contact Shirl Dressler at (804) 367-6913.

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,



S. Rene' Hypes
Project Review Coordinator

DRAFT



COMMONWEALTH of VIRGINIA

L. Preston Bryant, Jr.
Secretary of Natural Resources

Department of Game and Inland Fisheries

G. Michael Bise
Acting Director

February 15, 2008

Cara Turner
Environmental Scientist
Paciulli Simmons & Associates
11212 Waples Mill Road, Suite 100
Fairfax, Virginia 22030-7404

RE: Re-review of ESSLOG #20159, Construction of the National Museum of the U.S. Army, Fort Belvoir, Fairfax County, VA.

Dear Ms. Turner:

This letter is in response to your request for updated information related to the presence of threatened or endangered species in the vicinity of the above referenced project.

The following *state threatened* species have been documented at approximately the given distances from the given portions of the project:

- bald eagle (*Haliaeetus leucocephalus*) at 0.25 mile from the Pence Gate Site and 1.5 miles from the Gunston Site;
- wood turtle (*Glyptemys insculpta*) at 0.75 mile from the Gunston Site and 1 mile from the Pence Gate Site; and
- peregrine falcon (*Falco peregrinus*) at 2 miles from the Pence Gate Site.

As well, the Pence Gate Site occurs either within 0.25 mile of a portion of Dogue Creek that is designated a Confirmed Anadromous Fish Use Area, and the Gunston Site is within 0.25 mile of a portion of Accotink Creek that is also designated a Confirmed Anadromous Fish Use Area. The Dogue Creek designation is due to documented occurrences of the following anadromous and semi-anadromous species: alewife, striped bass, blueback herring, and yellow perch. The Accotink Creek designation is due to documented occurrences of the following anadromous and semi-anadromous species: alewife and yellow perch. Additionally, Dogue Creek and Accotink Creek are tributaries to a portion of the Potomac River that is also designated a Confirmed Anadromous Fish Use Area. This designation is due to documented occurrences of the following anadromous and semi-anadromous species: alewife, striped bass, blueback herring, yellow perch, American shad, and hickory shad.

In addition, the Pence Gate Site is within 0.5 mile of a portion of Dogue Creek that is designated a Threatened and Endangered Species' Water. This designation is due to

DRAFT

documented occurrences of the *state threatened* wood turtle (*Glyptemys insculpta*). Therefore, the applicant should coordinate with the VDGIF Environmental Services Section (804-367-6913) concerning potential impacts to these species and resources.

Additionally, the following *state special concern* species have been documented approximately 2 miles, or less, from the project areas:

bridle shiner (*Notropis bifrenatus*),
least tern (*Sterna antillarum*),
winter wren (*Troglodytes troglodytes*),
northern harrier (*Circus cyaneus*),
glossy ibis (*Plegadis falcinellus*),
yellow-crowned night-heron (*Tyto alba*),
brown creeper (*Certhia americana*),
purple finch (*Carpodacus purpureus*),
alder flycatcher (*Empidonax alnorum*),
golden-crowned kinglet (*Regulus satrapa*),
red-breasted nuthatch (*Sitta canadensis*),
long-eared owl (*Asio otus*),
Caspian tern (*Sterna caspia*),
hermit thrush (*Catharus guttatus*),
magnolia warbler (*Dendroica magnolia*), and
mourning warbler (*Oporornis philadelphia*).

As well, a block survey of an area encompassing a portion of the Pence Gate Site documented the *state special concern* great egret (*Ardea alba*) during the breeding season. However, the classification of *state special concern* is not a legal designation and does not require further coordination. In addition, please note that portions of the project are within 2 miles of the following properties: Jackson Mile Abbott Wetland Refuge, a U.S. Department of the Army property, and George Washington Grist Mill State Park, a Virginia Department of Conservation and Recreation property.

Information about fish and wildlife species was generated from our agency's computerized Fish and Wildlife Information System, 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.

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 occurring at the project site should be directed to Keith Tignor at (804) 786-3515.

The Virginia Department of Conservation and Recreation, Natural Heritage Program, maintains a

DRAFT

Cara Turner
ESSLog #20159 (re-review)
2/15/2008
Page 3

database of natural heritage resources, including the habitat of rare, threatened, or endangered plant and animal species, unique exemplary natural communities, and significant geologic formations, that may contain information not documented in this letter. Their database may be accessed from <http://www.dcr.state.va.us/dnh/nhrinfo.htm>, or by contacting S. Rene Hypes at (804) 371-2708.

This letter summarizes the likelihood of the occurrence of endangered or threatened animal species at the project site. If you have more questions in this regard, please contact me at (804) 367-1185.

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 insure proper credit to your account, please address your payment envelope directly to MaryBeth Murr at the address listed in the letterhead.

Please note that this response does not constitute consultation or management recommendations regarding endangered or threatened wildlife, or 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 the Environmental Services Section at (804) 367-6913.

Please note that the data used to develop this response are continually updated. Therefore, if significant changes are made to your project or if the project has not begun within 6 months of receiving this letter, then the applicant should request a new review of our data.

For your reference, if you do not receive a response from our office within 30 days, this does not constitute a finding of “no adverse impact” to wildlife or wildlife resources. If you need an expedited response to your request, please call Shirl Dressler at (804) 367-6913.

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 provides 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.virginia.gov, choose the hyperlink

titled “Virginia Fish and Wildlife Information Service”. For more information about the service, please contact Shirl Dressler at (804) 367-6913.

DRAFT

Cara Turner
ESSLog #20159 (re-review)
2/15/2008
Page 4

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

Sincerely,



Susan H. Watson
Information Specialist

cc: R.T. Fernald, VDGIF
R. Hypes, VDCR-NH

DRAFT



United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
6669 Short Lane
Gloucester, VA 23061



February 29, 2008

Ms. Cara Turner
Paciulli Simmons & Associates, Ltd.
11212 Waples Mill Road, Suite 100
Fairfax, Virginia 22030-7404

Re: National Museum of the US Army
Ft. Belvoir, Fairfax County, Virginia

Dear Ms. Turner.:

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 above referenced project. This letter is submitted in accordance with provisions of the Endangered Species Act (ESA) of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*).

Based on the information you sent, the Service recommends that surveys be conducted for the following species:

- Small whorled pogonia (*Isotria medeoloides*) - Federally listed threatened. Appropriate habitat for this orchid is mixed-deciduous or mixed deciduous/coniferous forests with an open understory on terrain that is almost level or gently to moderately sloping, but it has been found on steep slopes. Although the pogonia may be found more often on slopes with northerly or easterly exposures, all aspects with appropriate habitat may contain the pogonia. Small whorled pogonia sites can be generally characterized by their proximity to canopy openings, the presence of dead standing trunks, little herbaceous ground cover, and wood litter on the ground. The Service recommends a survey within appropriate habitat at the project site. Surveys should be conducted from June 1 through July 20 in Caroline County and counties to the north.

The small whorled pogonia is protected under the Virginia Endangered Plant and Insect Act, which is administered by the Virginia Department of Agriculture and Consumer Services (VDACS). Under the Memorandum of Agreement established between VDACS and the Virginia Department of Conservation and Recreation (VDCR), VDCR has the authority to report for VDACS on state-listed plant and insect species. You should contact VDCR at the address below:

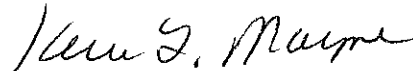
DRAFT

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

The attached list(s) contains individuals who are qualified to conduct surveys for the species listed above. These lists do not include all individuals qualified or authorized to survey for these species. If you select someone not on the pre-approved surveyor list, please provide the proposed surveyor's qualifications to this office 30 days prior to the start of the survey. To ensure that an adequate survey is conducted, the surveyor names and proposed survey design should be submitted to this office prior to the survey. Send copies of all survey results to this office or inform this office if a survey will not be conducted. If the survey determines that any rare species are present, please contact this office to allow us the opportunity to work with you to ensure that this project avoids or minimizes adverse effects to rare species and their habitats.

Upon receipt of the surveys and a detailed project description, we can provide additional recommendations on this species. The Service also recommends that you consider survey needs of and potential effects to state listed endangered and threatened species. You can find species information, qualified surveyors and other pertinent information on project reviews within Virginia at our website http://www.fws.gov/northeast/virginiafield/Project_Reviews.html. If you have any questions or need further assistance, please contact Sumalee Hoskin of this office at (804) 693-6694, extension 136.

Sincerely,



Karen L. Mayne
Supervisor
Virginia Field Office

Enclosures

DRAFT

FAIRFAX COUNTY, VIRGINIA
Federally Listed, Proposed, and Candidate Species

<u>SCIENTIFIC NAME</u>	<u>COMMON NAME</u>	<u>STATUS</u>
<u>VASCULAR PLANTS</u>		
Aeschynomene virginica ²	Sensitive joint-vetch	LT
Isotria medeoloides	Small whorled pogonia	LT
Species of Concern (No official Federal status)		
<u>BIRDS</u>		
Haliaeetus leucocephalus ¹	Bald eagle	G5
<u>INVERTEBRATES</u>		
Elliptio lanceolata	Yellow lance	G2G3
Sphalloplana holsingeri	Holsinger's groundwater planarian	G1G2
Sphalloplana subtilis	Bigger's groundwater planarian	G1G2
Stygobromus kenki	Rock Creek groundwater amphipod	G2G3
Stygobromus phreaticus	Northern Virginia well amphipod	G2G3
Stygobromus sp. 15	A groundwater amphipod	G1
<u>VASCULAR PLANTS</u>		
Pycnanthemum torrei	Torrey's mountain-mint	G2

¹Nesting occurs in this county; concentrated shoreline use has been documented on the Potomac River.

²This species has been documented in an adjacent county and may occur in this county.

Small Whorled Pogonia

Isotria medeoloides



© D.D. Tyler

Description - The small whorled pogonia is a herbaceous perennial orchid. It has a widely scattered distribution in the eastern United States along the Atlantic coast from Maine to Georgia with outlying occurrences in the midwest and Canada. This species has pale green, elliptical leaves, usually five or six, that grow in a single whorl at the top of a hairless, grayish-green stem. The one or two flowers per plant are yellowish-green, unscented, and form in the center of the whorl.

Life History - In Virginia, the small whorled pogonia is found in ordinary looking third-growth upland forests with an open understory and a closed canopy where the topography is typically moderately sloping or almost level. The plants are usually associated with decaying vegetative matter such as fallen trunks and limbs, leaf litter, bark, and tree roots. The pogonia is found in soils that are acidic sandy loams with low nutrient

content. The flowers appear in late April to mid-May. The small whorled pogonia reproduces primarily through self-pollination and occasionally vegetatively. It is often confused with the Indian cucumber-root (*Medeola virginiana*) and the large whorled pogonia (*Isotria verticillata*). The Indian cucumber-root has deep green leaves with a stem that is thin, hairy, and wiry. The large whorled pogonia has a reddish-purple stem and dark green leaves; its flower is reddish-purple.

Conservation - The small whorled pogonia was federally listed as an endangered species on September 10, 1982. It was reclassified as threatened on November 7, 1994. This was possible because at the time of reclassification 61% of the viable populations had been protected. The small whorled pogonia and its habitat continue to be threatened, directly and indirectly, by residential and commercial development. The upland habitat where it is found is seldom protected by federal or state laws unless it occurs on federally-owned property. Without voluntary landowner protection many pogonia populations have been and will be destroyed. Other threats to this species are collection by plant enthusiasts and browsing by white-tailed deer and invertebrates.

What You Can Do To Help - If you find a plant that appears to be the small whorled pogonia, take note of the location and photograph the plant, if possible. Please do not remove the plant!

Contact one of the following agencies for assistance:

Virginia Department of Agriculture and Consumer Services
Office of Plant Protection
P.O. Box 1163
Richmond, Virginia 23209
(804) 786-3515

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

U.S. Fish and Wildlife Service
Virginia Field Office
6669 Short Lane
Gloucester, Virginia 23061
(804) 693-6694

References

U.S. Fish and Wildlife Service. 1992. Small whorled pogonia (*Isotria medeoloides*) recovery plan, first revision. Newton Corner, Massachusetts.

Ware, D.M.E. 1991. Small whorled pogonia. Pages 95-97 in K. Terwilliger, ed. Virginia's Endangered Species, Proceedings of a Symposium. McDonald and Woodward Publishing Company, Blacksburg, Virginia.



U.S. Fish and Wildlife Service
Virginia Field Office
6669 Short Lane
Gloucester, Virginia 23061
(804) 693-6694
<http://www.fws.gov>
August 1999

DRAFT

SMALL WHORLED POGONIA
(Isotria medeoloides)
SURVEY CONTACTS IN VIRGINIA

This list contains individuals who we have already determined are qualified to conduct surveys for the species listed above. This list does not include all individuals qualified or authorized to survey for this species. If you select someone not on this pre-approved surveyor list, please provide the proposed surveyor's qualifications to this office 30 days prior to the start of the survey. Please send copies of all survey results to this office. If the survey determines that any rare species are present, please contact this office to allow us the opportunity to work with you to ensure that a project avoids or minimizes adverse effects to rare species and their habitats. Inclusion of names on this list does not constitute endorsement by the U.S. Fish and Wildlife Service or any other U.S. Government agency. Listed alphabetically. The Service recommends surveys within appropriate habitat be conducted from June 1 through July 20 in Caroline County and counties to the north **OR** from May 25 through July 15 in counties south of Caroline County. Outside of these months, a site visit by a qualified individual can determine if appropriate habitat exists at the project site. January 15, 2008

Phil Abell
44154 Joy Chapel Road
Hollywood, MD 20636
(301) 373-2906
prabell@worldnet.att.net

Sandra Brinson
Integrity Environmental
206 North Avenue
Newport News, VA 23601
(757) 596-4109
integrityenv@cavtel.net

John Brooks
Resource International
9560 Kings Charter Drive
PO Box 6160
Ashland, VA 23005-6160
(804) 550-9212
jbrooks@resourceintl.com

Kristine Brown
DPW-Environmental Office
19952 N Range Rd, Bldg 1220
Fort AP Hill, VA 22427-3123
(804) 633-8417
kristine.l.brown@us.army.mil

Amy Connelly
Wetland Studies & Solutions
5300 Wellington Branch Dr, Suite
100
Gainesville, VA 20155
(703) 679-5600
aconnelly@wetlandstudies.com

Adam Crary
Golder Associates, Inc.
3719 Saunders Ave.
Richmond, VA 23227
(p) 804-358-7900
(m) 804-380-9697
(f) 804-358-2900
Adam.Crary@golder.com

Dave Davis
3208 West Grace Street
Richmond, VA 23221
(804) 358-3873
dldavis7@verizon.net

Douglas DeBerry
Vanasse Hangen Brustlin, Inc.
351 McLaws Circle, Suite 3
Williamsburg, VA 23185
(757) 220-0500
ddeberry@vhb.com

Christine Geist
Wetland Studies and Solutions
5300 Wellington Branch Dr, Suite
100
Gainesville, VA 20155
(703) 679-5600
cgeist@wetlandstudies.com

Laura Giese
Wetland Studies and Solutions
5300 Wellington Branch Dr, Suite
100
Gainesville, VA 20155
(703) 679-5600
lgiese@wetlandstudies.com

Keith Goodwin
Williamsburg Environmental Grp
5209 Center St.
Williamsburg, VA 23188
(757) 220-6869
kgoodwin@wegnet.com

Lawton Grinter
DPW-ENRD
19952 North Range Road
Fort AP Hill, VA 22427-3123
(804) 633-8753
lawton.grinter@us.army.mil

Elaine Haug
14814 Dillon Avenue
Dale City, VA 22193
(202) 633-0907
haug.elaine@nmmh.si.edu

Thaddeus Kraska
Resource International
9560 Kings Charter Drive
PO Box 6160
Ashland, VA 23005-6160
(804) 550-9233
tkraska@resourceintl.com

John Lowenthal
Landmark Design Group
5544 Greenwich Rd, Suite 200
Virginia Beach, VA 23462
(757) 473-2000
jlowenthal@landmarkdg.com

DRAFT

Chris Ludwig
Division of Natural Heritage
217 Governor St., 3rd Floor
Richmond, VA 23219
(804) 371-6206
icludwig@dcr.state.va.us

Edward Milhous
P.O. Box 1025
Haymarket, VA 20168
(703) 927-2048
ed@treesplease.com

Susan Murdock
Malcolm Pirnie
701 Town Center Drive, Suite 600
Newport News, VA 23606-4296
(757) 873-4425
smurdock@pirnie.com

Alan Neumann
ATC Associates Inc.
211 Expressway Court
Virginia Beach, VA 23462
(757) 467-2100
neumann88@atc-enviro.com

Paul D. Oldt
Williamsburg Env. Group
5705 Salem Run Blvd., Suite 105
Fredericksburg, VA 22407
(p) 540-785-5544
(f) 540-785-1742
poldt@wegnet.com

Paul Pitera
Angler Environmental
12811 Randolph Ridge Lane
Manassas, VA 20109
(703) 393-4844
ppitera@anglerenvironmental.com

Ben Rosner
Wetland Studies and Solutions
5300 Wellington Branch Dr, Suite
100
Gainesville, VA 20155
(703) 679-5600
brochner@wetlandstudies.com

Stephen Rottenborn
Wetland Studies and Solutions
5300 Wellington Branch Dr, Suite
100
Gainesville, VA 20155
(703) 679-5600
srottenborn@wetlandstudies.com

Garrie Rouse
Rouse Environmental Services
P.O. Box 146
Aylett, VA 23009
(804) 769-0846
res.gdr@att.net

William Sipple
Sipple Wetland & Env. Consulting
512 Red Bluff Court
Millersville, MD 21108
(410) 987-4083
bsip333@aol.com

Bob Smiley
Resource International, Ltd.
9560 Kings Charter Drive
Ashland, VA 23005-6160
(804) 550-9214
bsmiley@resourceintl.com

Lenwood Smith
7325 Goodwill Church Road
Greensboro, NC 27284
(336) 644-6864
lsmith_botanist@hotmail.com

Taylor Sprengle
Wetland Studies and Solutions
5300 Wellington Branch Dr, Suite
100
Gainesville, VA 20155
(703) 679-5600
tsprengle@wetlandstudies.com

Kory Steele
Environmental
Specialties Group
11836 Fishing Point Drive
Newport News, VA 23606
(757) 599-7501
ksteele@envspgroup.com

Mark Strong
Dept. Botany, P.O. Box 37012
Nat'l Museum of Natural History
MRC-166
Smithsonian Institution
Washington, DC 20013-7012
(202) 633-2563
strong.mark@nrmnh@si.edu

Kathryn Sweeney
Malcolm Pirnie
701 Town Center Drive, Suite 600
Newport News, VA 23606-4296
(757) 873-4425
ksweeney@pirnie.com

Catharine Tucker
302 Danray Drive
Richmond, VA 23227-1923
(804) 264-6941
cath.tucker@alumni.duke.edu

Craig Tumer
Wetland Studies and Solutions
5300 Wellington Branch Dr, Suite
100
Gainesville, VA 20155
(703) 679-5600
ctumer@wetlandstudies.com

Meegan Wallace
Geo-Marine
11846 Rock Landing Dr., Suite C
Newport News, VA 23606
(757) 873-3702
mwallace@geo-marine.com

Donna Ware
Department of Biology
College of William and Mary
Williamsburg, VA 23187
(757) 221-2799
dmeware@mns.com

Carrie Williams
Wetland Studies and Solutions
5300 Wellington Branch Dr, Suite
100
Gainesville, VA 20155
(703) 679-5600
cwilliams@wetlandstudies.com

Robert Wright
Wetland Studies and Solutions
5300 Wellington Branch Dr, Suite
100
Gainesville, VA 20155
(703) 679-5600
rwright@wetlandstudies.com

DRAFT

Regional Geology in the Fort Belvoir Area

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

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

DRAFT

**Wildlife Species Typical of
Upland Hardwood Habitats on Fort Belvoir**

Scientific Name	Common Name
Mammals	
<i>Sylvilagus floridanus</i>	Eastern cottontail rabbit
<i>Sorex longirostris</i>	Southeastern shrew
<i>Blarina brevicauda</i>	Northern Short-tailed shrew
<i>Peromyscus leucopus</i>	White-footed Mouse
<i>Microtus pinetorus</i>	Pine Vole
<i>Sciurus carolinensis</i>	Eastern Gray Squirrel
<i>Glaucomys volans</i>	Southern Flying Squirrel
<i>Tamias striatus</i>	Eastern Chipmunk
<i>Marmota monax</i>	Woodchuck
<i>Odocoileus virginianus</i>	White-tailed Deer
<i>Procyon lotor</i>	Raccoon
<i>Didelphis virginiana</i>	Virginia possum
<i>Mephitis mephitis</i>	Striped shunk
<i>Vulpes vulpes</i>	Red fox
<i>Felis catus</i>	Feral cats
Birds	
<i>Corvus brachyrhynchos</i>	American crow
<i>Turdus migratorius</i>	American robin
<i>Sturnus vulgaris</i>	European starling
<i>Passer domesticus</i>	House sparrow
<i>Cyanocitta cristata</i>	Blue jay
<i>Otus asio</i>	Eastern Screech Owl
<i>Strix varia</i>	Barred Owl
<i>Melanerpes carolinus</i>	Red-billed Woodpecker
<i>Picodes pubescens</i>	Downy Woodpecker
<i>Picodes villosus</i>	Hairy Woodpecker
<i>Colaptes auratus</i>	Northern Flicker
<i>Sayornis phoebe</i>	Eastern Phoebe
<i>Myiarchus crinitus</i>	Great crested Flycatcher
<i>Parus carolinensis</i>	Carolina Chickadee
<i>Parus bicolor</i>	Tufted Titmouse
<i>Sitta carolinensis</i>	White-breasted Nuthatch
<i>Thryothorus ludovicianus</i>	Carolina Wren
<i>Regulus calendula</i>	Ruby-crowned Kinglet
<i>Catharus fuscescens</i>	Veery
<i>Hylocichla mustelina</i>	Wood Thrush
<i>Catharus minimus</i>	Gray-cheeked Thrush
<i>Catharus ustulatus</i>	Swainson's Thrush
<i>Vireo olivaceus</i>	Red-eyed Vireo
<i>Vermivora peregrina</i>	Tennessee Warbler
<i>Dendroica magnolia</i>	Magnolia Warbler
<i>Dendroica coronata</i>	Yellow-rumped Warbler
<i>Wilsonia citrina</i>	Hooded Warbler
<i>Helmitheros vermivorus</i>	Worm-eating Warbler
<i>Dendroica magnolia</i>	Magnolia Warbler
<i>Cardinalis cardinalis</i>	Northern cardinal
<i>Carpodacus mexicanus</i>	House Finch
<i>Buteo Jamaicensis</i>	Red-tailed Hawk

DRAFT

Scientific Name	Common Name
<i>Accipiter cooperii</i>	Cooper's Hawk
<i>Catharus guttatus</i>	Hermit Thrush
<i>Regulus satrapa</i>	Golden-crowned Kinglet
<i>Seiurus noveboracensis</i>	Northern Waterthrush
<i>Sphyrapicus varius</i>	Yellow-bellied Sapsucker
<i>Troglodytes troglodytes</i>	Winter Wren
<i>Piranga olivacea</i>	Scarlet Tanager
<i>Carduelis tristis</i>	American Goldfinch
<i>Junco hyemalis</i>	Dark-eyed junco
<i>Larus delawarensis</i>	Ring-billed gull
<i>Zonotrichia albicollis</i>	White-throated sparrow
Amphibians	
<i>Plethodon cinereus</i>	Red-backed Salamander
<i>Plethodon glutinosus</i>	Slimy Salamander
<i>Bufo americanus</i>	American Toad
<i>Bufo woodhousei fowleri</i>	Fowler's Toad
<i>Rana catesbeiana</i>	American Bullfrog
<i>Rana clamitans</i>	Green Frog
<i>Rana palustris</i>	Pickerel Frog
Reptiles	
<i>Coluber constrictor</i>	Northern black racer (Snake)
<i>Elaphe obsoleta</i>	Rat Snake
	Eastern garter snake
	Eastern Box Turtle
<i>Thamnophis sirtalis</i>	Northern black racer snake
<i>Terrapene Carolina</i>	Five-lined skink
<i>Eumeces fasciatus</i>	
Insects	
	Common water strider
<i>Gerris remigis</i>	Mayfly
<i>Baetis spp.</i>	
Benthic invertebrates	
	Midges
<i>Chironimidae spp.</i>	Snails
<i>Gastropoda spp.</i>	Amphipods
<i>Gammarus spp.</i>	Worms
<i>Oligochaeta spp.</i>	

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

DRAFT

THIS PAGE INTENTIONALLY LEFT BLANK

DRAFT

Appendix C

Air Conformity Analysis and Emissions Calculations

DRAFT

THIS PAGE INTENTIONALLY LEFT BLANK

DRAFT

**NATIONAL MUSEUM OF THE
UNITED STATES ARMY
ENVIRONMENTAL ASSESSMENT**

**U.S. ARMY GARRISON FORT BELVOIR
FAIRFAX COUNTY, VIRGINIA**

Appendix C: Air Quality Discipline Report

DRAFT

Contents

Contents	2
Acronyms and Abbreviations	3
1.0 Introduction	4
2.0 Affected Environment	4
2.1 National Ambient Air Quality Standards and Local Ambient Air Quality.....	4
2.2 Attainment Status	5
2.3 Installation Wide and Regional Emissions.	5
3.0 Environmental Consequences	6
3.1 Pence Gate Site “Structured Parking” and “On Grade” Alternatives	6
3.1.1 General Conformity.....	6
3.1.2 Regulatory Review and Air Permit Requirements	7
3.1.3 Mobile Emissions	8
3.2 Gunston Site “Structured Parking” and “On Grade” Alternatives	9
3.2.1 General Conformity.....	9
3.2.2 Regulatory Review and Air Permit Requirements	9
3.2.3 Mobile Emissions	9
3.3 No Action Alternative	10
4.0 BMPs/Mitigation.....	10
References.....	11
Attachment A: Emissions Estimations and Methodology	13
A.1 Emissions Estimations and Methodology	14
A.1.1 Demolition and Construction Emissions.....	14
A.1.1.1 Heavy Construction Equipment.....	15
A.1.1.2 Construction Worker Vehicle Operations	16
A.1.1.3 Emissions from Architectural Coatings.....	16
A.1.1.4 Asphalt Curing Emissions	17
A.1.1.5 Surface Disturbance.....	18
A.1.2 Operational Emissions	18
A.1.2.1 Heating Boiler Emissions	19
A.1.2.2 Vehicular Emissions	19
Attachment B: Emissions Calculations.....	20
Attachment C: Draft Record of Non-Applicability (RONA) to the General Conformity Rule	26

DRAFT

Acronyms and Abbreviations

AQCR	Air Quality Control Region
AQCR 47	National Capital Interstate Air Quality Control Region
AST	Aboveground Storage Tank
BACT	Best Available Control Technology
BRAC	Base Realignment and Closure
CAA	Clean Air Act
CFR	Code of Federal Regulations
DOE	Department of Energy
GCR	General Conformity Rules
GSA	General Services Administration
HAP	Hazardous Air Pollutants
MACT	Maximum Achievable Control Technology
MSAT	Mobile Source Air Toxics
MWCOG	Metropolitan Washington Council of Governments
NAAQS	National Ambient Air Quality Standards
NESHAP	National Emission Standards for Hazardous Air Pollutants
NNSR	nonattainment new source review
NSPS	new source performance standards
NSR	New Source Review
NO ₂	Nitrogen Dioxide
NO _x	nitrogen oxides
O ₃	ozone
OTR	Ozone Transport Region
PM	particulate matter
PM ₁₀	particulate matter less than 10 microns in diameter
PM _{2.5}	particulate matter less than 2.5 microns in diameter
PPM	Parts Per Million
PSD	prevention of significant deterioration
PTE	potential to emit
RONA	Record of Non-Applicability
SIP	State Implementation Plan
SO ₂	sulfur dioxide
TF	transportable fraction
tpy	tons per year
ULSD	ultra low sulfur diesel
U.S.C.	United States Code
USEPA	U.S. Environmental Protection Agency
UST	Underground Storage Tank
VAC	Virginia Administrative Code
VDEQ	Virginia Department of Environmental Quality
VOC	volatile organic compounds

DRAFT

1.0 Introduction

This air quality analysis includes a description of the existing air quality conditions, a general conformity analysis, and a regulatory review.

2.0 Affected Environment

2.1 National Ambient Air Quality Standards and Local Ambient Air Quality

U.S. Environmental Protection Agency (USEPA) Region 3 and VDEQ regulate air quality in Virginia. The Clean Air Act (CAA) (42 U.S.C. 7401-7671q), as amended, gives the USEPA responsibility to establish the primary and secondary National Ambient Air Quality Standards (NAAQS) (40 CFR Part 50) that set acceptable concentration levels for seven criteria pollutants: particulate matter (PM₁₀), fine particulate matter (PM_{2.5}), sulfur dioxide (SO₂), carbon monoxide (CO), nitrous oxides (NO_x), ozone (O₃), and lead. Short-term NAAQS (1-, 8-, and 24-hour periods) have been established for pollutants contributing to acute health effects, while long-term NAAQS (annual averages) have been established for pollutants contributing to chronic health effects. While each state has the authority to adopt standards stricter than those established under the federal program, the Commonwealth of Virginia accepts the federal standards.

Existing ambient air quality conditions can be estimated from measurements conducted at nearby air quality monitoring stations (Table 2-1). With the exception of the 8-hour O₃ NAAQS, most recent air quality measurements are below the NAAQS (USEPA, 2008). The reported measurement for Fairfax County of 0.125 parts per million (ppm) for the 8-hour O₃ level exceeds the primary NAAQS of 0.08 ppm. This exceedence was not surprising considering the nonattainment status of the region.

**Table 2-1.
2006 Local Ambient Air Quality Monitoring**

Pollutant and Averaging Time	Primary NAAQS ^a	Secondary NAAQS ^a	Monitored Data ^b	Location Where Maximum Was Recorded
CO				
8-hour maximum ^c (ppm)	9	(None)	2.5	Arlington County
1-hour maximum ^c (ppm)	35	(None)	2.9	Fairfax County
NO_x				
Annual arithmetic mean (ppm)	0.053	0.053	0.018	Arlington County
O₃				
8-hour maximum ^d (ppm)	0.08	0.12	0.125	Fairfax County
PM_{2.5}				
Annual arithmetic mean ^e (µg/m ³)	15	15	13.2	Arlington County
24-hour maximum ^f (µg/m ³)	65	65	46	Fairfax County
PM₁₀				
Annual arithmetic mean ^g (µg/m ³)	50	50	23	Alexandria City
24-hour maximum ^c (µg/m ³)	150	150	70	Alexandria City
SO₂				
Annual arithmetic mean (ppm)	0.03	(None)	0.006	Fairfax County
24-hour maximum ^c (ppm)	0.14	(None)	0.036	Alexandria City
3-hour maximum ^c (ppm)		0.5	0.067	Alexandria City

ppm = parts per million; µg/m³ = micrograms per cubic meter; NO₂ = Nitrogen dioxide

DRAFT

Notes:

^a Source: 40 CFR 50.1-50.12.

^b Source: USEPA, 2008.

^c Not to be exceeded more than once per year.

^d The 3-year average of the fourth highest daily maximum 8-hour average ozone concentrations over each year must not exceed 0.08 ppm.

^e The 3-year average of the weighted annual mean PM_{2.5} concentrations from must not exceed 15.0 µg/m³.

^f The 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor must not exceed 65 µg/m³.

^g The 3-year average of the weighted annual mean PM₁₀ concentration at each monitor within an area must not exceed 50 µg/m³.

2.2 Attainment Status

Federal regulations designate Air-quality Control Regions (AQCRs) in violation of the NAAQS as *nonattainment* areas. Federal regulations designate AQCRs with levels below the NAAQS as *attainment* areas. *Maintenance* AQCRs are areas that have previously been designated nonattainment and have been redesignated to attainment for a probationary period through implementation of maintenance plans. According to the severity of the pollution problem, nonattainment areas can be categorized as marginal, moderate, serious, severe, or extreme.

Fairfax County (and therefore Fort Belvoir) is within the National Capital Interstate AQCR (AQCR 47) (40 CFR 81.12). AQCR 47 is in the O₃ transport region (OTR) that includes 12 states and Washington, DC. The USEPA has designated Fairfax County as the following:

- Moderate nonattainment for the 8-hour O₃ NAAQS
- Nonattainment for the PM_{2.5} NAAQS
- Attainment for all other criteria pollutants (40 CFR 81.347)

2.3 Installation Wide and Regional Emissions.

Fort Belvoir tracks air emissions from the significant stationary emission sources on the installation. These include more than 30 boilers, 50 generators, 2 incinerators, a lithographic printing facility, a gasoline dispensing facility, degreasers, a soil vapor extraction system, and firefighter training equipment. Fort Belvoir also has hundreds of insignificant emission sources including closed sanitary landfills, fuel storage tanks, spray painting operations, woodworking activities, oil-water separators, small boilers, and small emergency generators. The emissions from the insignificant sources are not tracked. Concurrently, the Metropolitan Washington Council of Governments (MWCOG) compiles an emissions inventory for AQCR 47 and sets regional emissions budgets. Table 2-2 lists the total emissions from significant sources at Fort Belvoir and the estimated total emissions for AQCR 47.

Table 2-2.
Existing Air Emissions for Fort Belvoir and AQCR 47

Criteria Pollutants	Annual Emissions (Tons per Year)	
	Fort Belvoir ¹	AQCR 47 ^{2,3}
VOC	3.4	81,190
NO _x	39.8	117,102
SO ₂	24.6	231,898
PM _{2.5}	2.2	23,364

Notes:

1 - Source: U.S. Army Fort Belvoir 2008.

2 - Source: MWCOG 2007, 2009 Projected Levels of VOC.

3 - Source: MWCOG 2008, 2009 Projected Levels of NO_x, SO₂, and PM_{2.5}.

DRAFT

3.0 Environmental Consequences

3.1 Pence Gate Site “Structured Parking” and “On Grade” Alternatives

Implementing either the “Structured Parking” and “On Grade” Pence Gate Alternatives would have both short- and long-term minor adverse effects to air quality. However, increases in emissions would not exceed the applicability threshold values, and would not violate federal, state, or local air regulations.

Implementing either alternative could affect air quality in three ways: generating emissions during construction; introducing new stationary sources of emissions, such as heating boilers and standby generators; and changes in vehicular traffic that could raise vehicle emission levels locally.

The overall building size and construction phasing would be similar for all alternatives in this EA. Therefore, all alternatives would have similar levels of emissions. When compared to other alternatives, the Pence Gate “Structured Parking” Alternative would include demolition of existing structures, additional excavation, and the fabrication of a structured parking garage. Although only slight variation in the overall emissions would be expected with the different alternatives, this alternative is considered the “worst case” scenario, and represents the upper bound of potential emissions associated with any of the alternatives within this EA. All direct and indirect emissions associated with the Pence Gate “Structured Parking” Alternative were estimated (Table 3-1). The construction emissions were generated by estimating equipment use for site preparation, construction, and landscaping for the new facilities, including:

- Demolition of existing structures,
- Main museum building (155,000 gsf),
- Memorial Garden (1.4-ac) ,
- Parade Ground and Grandstand (5.6-ac),
- Amphitheater (6,700-sf),
- Drop-off and Arrival Plaza (0.9-ac),
- Structured Parking Facility,
- Bus and RV parking (0.9-ac),
- Screened Service Court (0.3-ac),
- Access Control Point (ACP),
- Expansion of the Museum (95,000-gsf),
- Expansion of the Memorial Garden (0.9 ac),
- Expansion of the Grandstand (12,000-gsf),
- Additional Building (1,620-gsf),
- Macro Gallery (30,375-gsf),
- Additional Parking (2.4 ac), and
- Encampment Area/Outdoor Education (2.0 ac).

The facility’s operational emissions estimates included emissions from employee vehicles, museum visitors, from boilers, and from emergency generators. Operational emissions would be the same for all alternatives within this EA.

3.1.1 General Conformity

To determine the applicability of the General Conformity Rule (GCR) to the Pence Gate Alternatives, air emissions from construction and proposed stationary and mobile sources were compared to the applicability thresholds and regional emissions budgets (Table 3-1 and 3-2). The requirements of this rule are not applicable because the highest estimated or calculated total annual direct and indirect emissions from these alternatives would not exceed the applicability threshold for any criteria pollutant during any years, and would not be regionally significant.

DRAFT

Detailed emission calculations and a Record of Non-Applicability (RONA) are provided in Attachment B and C respectively.

Table 3-1.
Total Estimated Emissions for the Pence Gate “Structured Parking” Alternative

Year	Estimated emissions (tpy)			
	NO _x	VOC	PM _{2.5}	SO ₂
2010	10.4	0.7	1.3	1.8
2011	8.9	1.1	0.9	1.4
2012	8.3	0.9	1.2	1.5
2013	16.2	2.5	2.1	2.6
Operational	12.6	5.9	1.0	0.4
Applicability threshold	100	50	100	100
Exceeds threshold?	No	No	No	No

tpy = tons per year

Table 3-2.
Annual Emissions Compared to Regional Emissions

	Criteria Pollutant or Precursor			
	NO _x	VOC	PM _{2.5}	SO ₂
Highest Annual Emissions (tpy)	16.2	5.9	2.1	2.6
Regional Emissions (tpy)	117,102	81,190	23,364	231,898
Percent Regional Emissions	<0.01%	<0.01%	<0.01%	<0.01%
Regionally Significant?	No	No	No	No

Source: MWCOG 2007 and 2008

tpy = tons per year

3.1.2 Regulatory Review and Air Permit Requirements

Stationary sources of air emissions associated with this alternative would be subject to federal and state air permitting regulations. These requirements include, but are not limited to, minor new source review (NSR), nonattainment new source review (NNSR), prevention of significant deterioration (PSD), and new source performance standards (NSPS) for selected categories of industrial sources. The new facilities would be equipped with natural gas boilers and emergency generators. No other stationary sources of air emissions are planned. Estimated potential emissions from proposed new sources are outlined in Table 3-3.

Table 3-3.
Estimated Potential to Emit (PTE) for Stationary Sources for All Alternatives

Source	Estimated emissions (tpy)			
	NO _x	VOC	PM _{2.5}	SO ₂
Boilers	4.1	0.6	0.8	0.2
Emergency Generators	14.3	0.0	0.1	0.5
Total	18.4	0.6	0.8	0.2

tpy = tons per year

Exceedence of the major modification thresholds of 40 tpy would not be anticipated. Therefore, a minor NSR permit would be required to construct new stationary sources of emissions. Proposed sources may require a Best Available Control Technology (BACT) review for each criteria pollutant, a MACT review for regulated HAPs, and designated categories and predictive air dispersion modeling, depending upon VDEQ’s requests (Table 3-4).

DRAFT

Table 3-4
Air Quality Regulatory Review for Proposed Stationary Sources
under the Proposed Action for All Alternatives

Regulation	Project Status
NNSR (9 VAC 5-80-2000 to 2240)	The potential emissions would not exceed the NNSR thresholds. Therefore, a NNSR construction permit would not be required.
NSR (9 VAC 5-80-10 and 11)	The potential emissions exceed the minor NSR threshold. Therefore, a minor NSR construction permit would be required.
PSD (9 VAC 5-50-10)	Potential emissions would not exceed the 250-tpy PSD threshold. Therefore, the project would not be subject to PSD review.
Title V Permitting Requirements (9 VAC 5-80-50)	New stationary sources of air emissions would be required to be added to the Title V permit. Recordkeeping requirements may apply.
NSPS	Emergency generators would be subject to NSPS. However, the boilers would only be subject to NSPS if greater than 10 MMBTU/hr which is not anticipated at this time.

tpy = tons per year

In December of 2006, a federal appellate court issued a slip opinion in which the court partially invalidated USEPA's implementation of the 8-hour ozone standard (U.S. Court of Appeals, 2006). On June 8, 2007, the U.S. Court of Appeals for the District of Columbia Circuit reaffirmed its decision stating that the USEPA improperly determined that areas designated as nonattainment under the 1-hour ozone NAAQS would no longer be subject to 1-hour NSR requirements. As of the time of this writing, no changes in effective regulations have been issued based on this court decision. If at the time of permitting the PTE exceeds major new source thresholds, engineering controls or federally enforceable limits on the hours of operation would be established to remain a minor source.

3.1.3 Mobile Emissions

Mobile emissions of concern include primarily automobiles and vehicular traffic. The primary air pollutants from mobile-sources are CO, NO_x, and VOCs. Lead emissions from mobile sources have declined in recent years through the increased use of unleaded gasoline and are extremely small. Potential SO₂ and particulate emissions from mobile sources are small compared to emissions from point sources, such as power plants and industrial facilities. Air quality impacts from traffic are generally evaluated on two scales: *mesoscale* and *microscale*.

Mesoscale analysis is performed at the regional level. NO_x, VOCs, PM_{2.5}, and SO₂ are of regional concern in nonattainment areas for O₃ and PM_{2.5}. Changes in traffic patterns in AQCR 47 resulting from this alternative would introduce very small changes in regional O₃ and PM_{2.5} levels. The Metropolitan Planning Organization, using regional O₃ airshed models, generally evaluates regional effects on O₃. Mesoscale analysis is not generally conducted on a project-specific basis and is not necessary for this EA.

Microscale analysis is performed to identify localized hot spots of criteria pollutants. CO is a site-specific pollutant with higher concentrations found adjacent to roadways and signalized intersections. Microscale analysis is often conducted on a project-specific basis in regions where CO is of particular concern. Fairfax County, and therefore Fort Belvoir, is neither a nonattainment, nor a maintenance area for CO; therefore, micro-scale analysis is not necessary for this EA.

The traffic associated with this alternative is not anticipated to be an air quality concern for particulate matter (PM) because it does not involve any new highways or expressways, and the intersections affected are primarily secondary arterial roads (USEPA, 2006). Mobile Source Air Toxics (MSATs) are a subset of the 188 air toxics emitted from highway vehicles and non-road equipment. As with PM, traffic is not anticipated to be an air quality concern for MSATs because

DRAFT

the intersections affected are primarily secondary arterial roads, and new traffic is expected to be below the threshold that would have potential for meaningful MSAT effects. Quantitative procedures to address PM and MSATs are not standard practice for nontransportation projects on secondary arterials; therefore they are not included in this EA (FHWA, 2006).

3.2 Gunston Site “Structured Parking” and “On Grade” Alternatives

Implementing either the “Structured Parking” or “On Grade” Gunston Alternatives would have both short- and long-term minor adverse effects to air quality. However, increases in emissions would not exceed the applicability threshold values, and would not violate federal, state, or local air regulations.

As with the Pence Gate Alternatives, implementing the Gunston Alternatives could affect air quality in three ways: generating pollutants during construction; introducing new stationary sources of pollutants, such as heating boilers and standby generators; and changes in vehicular traffic that could raise vehicle emission levels locally. The facilities being constructed and the construction phasing would be virtually identical to that outlined under the Pence Gate Alternatives. However, no demolition of existing structures and less excavation would be required, and with the “on-grade” alternative no structured parking facilities would be fabricated. With these exceptions, all direct and indirect emissions associated with this alternative would be identical to those outlined under the Pence Gate Alternative (Table 3-1, 3-2 and 3-3). If these exceptions were included, estimated emissions would be slightly less than that outline under the Pence Gate Alternative; therefore, were not carried forward for detailed analysis.

As with the Pence Gate Alternatives, the facility’s operational emissions estimates included emissions from employee vehicles, museum visitors, from boilers, and from emergency generators. Operational emissions would be the same for all alternatives within these EA. Detailed emissions calculations are reported in Attachment A.

3.2.1 General Conformity

To determine the applicability of the GCR to the Gunston Alternatives, it was conservatively assumed that the upper bound of air emissions from construction and proposed stationary and mobile sources were similar to the Pence Gate “Structured Parking” Alternative. These emissions were compared to the applicability thresholds and regional emissions budgets. The requirements of this rule are not applicable because the highest total annual direct and indirect emissions would not exceed the applicability threshold for any criteria pollutant during any years, and would not be regionally significant (Table 3-1 and 3-2). A Record of Non-applicability (RONA) is provided in Attachment C.

3.2.2 Regulatory Review and Air Permit Requirements

Stationary sources of air emissions associated with the Gunston Alternatives would be similar to those outlined under the Pence Gate Alternatives and subject to federal and state air permitting regulations. The new facilities would be equipped with several dual-fired boilers and diesel generators. No other stationary sources of air emissions would be anticipated. Estimated potential emissions from proposed new sources are outlined in Table 3.3-6. All permitting and regulatory requirements would be similar to those outlined under the Pence Gate Alternatives.

3.2.3 Mobile Emissions

As with the Pence Gate Alternatives, these alternatives are not within a CO nonattainment or maintenance area; therefore, microscale analysis is unnecessary. Traffic associated with the Gunston Alternatives is not anticipated to be an air quality concern for PM because it does not involve any new highways or expressways, and the intersections affected are primarily secondary

DRAFT

arterial roads (USEPA, 2006). In addition, traffic from these intersections is not anticipated to be an air quality concern for MSAT because the intersections affected are primarily secondary arterial roads and new traffic is expected to be below the threshold that would have potential for meaningful MSAT effects (FHWA, 2006).

3.3 No Action Alternative

Under the No Action Alternative, the Proposed Action would not be implemented and no construction or operational activities would take place. Therefore, the changes in ambient air quality conditions otherwise expected from the action would not occur.

4.0 BMPs/Mitigation

BMPs would be required and implemented for both construction emissions and stationary point source emissions associated with the proposed action and alternatives. The construction would be accomplished in full compliance with current and pending Virginia regulatory requirements, with compliant practices and/or products. These requirements include:

- Visible emissions and fugitive dust and emissions (9 VAC 5-40-60)
- Asphalt paving operations (9 VAC 5-40-5490)
- Open burning (9 VAC 5-40-5600)
- Portable fuel containers (9 VAC 5-40-5700)
- Architectural and industrial maintenance coatings (9 VAC 5-40-7120)
- Consumer products (9 VAC 5-40-7240 *et seq.*)

The portable fuel container and consumer products rules are being revised, and more restrictive requirements will be in effect no later than 2009. This listing is not all-inclusive; the Army and any contractors would comply with all applicable air pollution control regulations.

DRAFT

References

DOE (Department of Energy). 1999. *Consumption and Gross Energy Intensity by Census Region for Sum of Major Fuels, Commercial Buildings Energy Consumption Survey*.

FHWA (Federal Highway Administration). 2006. *Interim Guidance on Air Toxic Analysis in NEPA Documents*.

MWCOG (Metropolitan Washington Council of Governments). 2007. *Draft Plan to Improve the Air Quality in the Washington, DC-MD-VA Region - State Implementation Plan (SIP) for 8-Hour Ozone Standard and 2002 Base Year Inventory for the Washington, DC-MD-VA Nonattainment Area*. February 2007.

MWCOG (Metropolitan Washington Council of Governments). 2008. *Draft Plan to Improve the Air Quality in the Washington, DC-MD-VA Region - State Implementation Plan (SIP) for Fine Particle (PM_{2.5}) Standard and 2002 Base Year Inventory for the Washington, DC-MD-VA Nonattainment Area*. February 2008.

SCAQMD (South Coast Air Quality Management District). 1993. *CEQA Air Quality Handbook*.

U.S. Army Fort Belvoir. 2008. *Calendar Year 2007 Emission Statement*

U.S. Court of Appeals. 2006. *South Coast Air Quality Management District v. Environmental Protection Agency. On Petitions for Review of a Final Rule of the Environmental Protection*. Docket No. 04-1201, et al.

USACE (U.S. Army Corp of Engineers, Mobile District). 2007. *Final General Conformity Determination for Implementation of 2005 Base Realignment and Closure (BRAC) Recommendations and Related Army Actions at Fort Belvoir, Virginia*.

USEPA (U.S. Environmental Protection Agency). 1995. *Compilation of Air Pollutant Emission Factors, AP-42, 5th edition, Vol. I: Stationary Point and Area Sources*. .

USEPA (U.S. Environmental Protection Agency). 2002. *User's Guide to MOBILE6.2: Mobile Source Emission Factor Model*. EPA420-R-02-028.

USEPA (U.S. Environmental Protection Agency). 2004. *Users Guide for the Final NONROAD2005 Model*. EPA420-r-05-013.

USEPA (U.S. Environmental Protection Agency). 2005. *Methodology to Estimate the Transportable Fraction (TF) of Fugitive Dust Emissions for Regional and Urban Scale Air Quality Analyses*.

USEPA (U.S. Environmental Protection Agency). 2006. *Transportation Conformity Guidance for Qualitative Hot-spot Analyses in PM_{2.5} and PM₁₀ Nonattainment and Maintenance Areas*. 2006. EPA420-B-06-902.

USEPA (U.S. Environmental Protection Agency). 2007a. *EPA AirDATA Website*. URL: <http://www.epa/air/data>. Accessed: September 28, 2007.

DRAFT

Waier, Phillip R. 2006. *RMeans Building Cost Construction Data, 64th Annual Edition*, RMeans Construction Publishers and Consultants, Kingston, MA.

DRAFT

Attachment A: Emissions Estimations and Methodology

DRAFT

A.1 Emissions Estimations and Methodology

The Army has considered net emissions generated from all direct and indirect sources of air emission that are reasonably foreseeable. *Direct emissions* are emissions that are caused or initiated by a federal action and occur at the same time and place as the action. *Indirect emissions* are defined as reasonably foreseeable emissions that are caused by the action but might occur later in time and/or be farther removed in distance from the action itself, and that the federal agency can practicably control. More specifically, project-related direct emissions would result from the following:

- *Demolition and construction activities:* the use of non-road equipment (e.g., bulldozers, backhoes), worker vehicles, the use of volatile organic compound (VOC) paints, paving off-gasses, and fugitive particles from surface disturbances
- *Operational activities:* Emergency generators and heating boilers not subject to major new source review, and the use of private motor vehicles

A.1.1 Demolition and Construction Emissions

When compared to other alternatives, the Pence Gate “Structured Parking” Alternative would include demolition of existing structures, additional excavation, and the fabrication of a structured parking garage. Although only slight variation in the overall emissions would be expected with the different alternatives, this alternative is considered the “worst case” scenario, and represents the upper bound of potential emissions associated with any of the alternatives within this EA. All direct and indirect emissions associated with the Pence Gate “Structured Parking” Alternative were estimated. The construction emissions were generated by estimating equipment use for site preparation, construction, and landscaping for the new facilities, including:

- Demolition of existing structures,
- Main museum building (155,000 gsf),
- Memorial Garden (1.4-ac) ,
- Parade Ground and Grandstand (5.6-ac),
- Amphitheater (6,700-sf),
- Drop-off and Arrival Plaza (0.9-ac),
- Structured Parking Facility,
- Bus and RV parking (0.9-ac),
- Screened Service Court (0.3-ac),
- Access Control Point (ACP),
- Expansion of the Museum (95,000-gsf),
- Expansion of the Memorial Garden (0.9 ac),
- Expansion of the Grandstand (12,000-gsf),
- Additional Building (1,620-gsf),
- Macro Gallery (30,375-gsf),
- Additional Parking (2.4 ac), and
- Encampment Area/Outdoor Education (2.0 ac).

Demolition and construction emissions associated with the use of construction equipment (e.g., bulldozers, backhoes), worker vehicles, the use of VOC paints, paving off-gasses, and fugitive particles from surface disturbances are presented in Table A-1 for all the years of construction. This section also outlines all the calculations and assumptions made to derive these construction emission estimations. The overall building size and construction phasing would be similar for all alternatives in this EA. Therefore, all alternatives would have similar levels of emissions.

DRAFT

A.1.1.1 Heavy Construction Equipment

Pollutant emissions resulting from activities associated with constructing the new buildings, parking facilities, and roadways were estimated. The typical demolition and construction would involve such activities as demolition of existing buildings or structures, utility installation, road construction, site clearing and grading, building construction, and asphalt paving.

Demolition and construction would involve the use of various non-road equipment, power generators, and trucks. Pieces of equipment to be used for building construction include, but are not limited to, backhoes, loaders, excavators, air compressors, chain saws, chipping machines, dozers, cranes, pavers, graders, rollers, and heavy trucks. Information regarding the number of pieces and types of construction equipment to be used on the project, the schedule for deployment of equipment (monthly and annually), and the approximate daily operating time (including power level or usage factor) were estimated for each individual construction project based on a schedule of construction activity.

Emissions from construction activities were estimated based on the projected construction activity schedule, the number of vehicles/pieces of equipment, and vehicle/equipment utilization rates. Emission factors for heavy-duty diesel equipment were obtained from EPA's *NONROAD2005 Emissions Model* (USEPA, 2004). The equipment and vehicle operation hours were estimated based on R.S.Means' *Building Cost Construction Data*, 64th annual edition (Waier, 2006), and field experience from similar projects.

**Table A-1.
Estimated Construction Emissions**

Year	Construction Emissions (tpy)			
	NO _x	VOC	PM _{2.5}	SO ₂
2010	10.4	0.7	1.3	1.8
2011	8.9	1.1	0.9	1.4
2012	8.3	0.9	1.2	1.5
2013	16.2	2.5	2.1	2.6
2010 Construction Emissions				
Construction Activity	NO _x	VOC	PM _{2.5}	SO ₂
Heavy Equipment Emissions	10.4	0.7	0.8	1.8
Fugitive Dust Emissions	0.0	0.0	0.6	0.0
Total	10.4	0.8	1.3	1.9
2011 Construction Emissions				
Construction Activity	NO _x	VOC	PM _{2.5}	SO ₂
Heavy Equipment Emissions	8.8	0.7	0.8	1.4
Worker Trip Emissions	0.2	0.2	0.0	0.0
Architectural Coating Emissions	0.0	0.2	0.0	0.0
Fugitive Dust Emissions	0.0	0.0	0.1	0.0
Total	9.0	1.1	0.9	1.4
2012 Construction Emissions				
Construction Activity	NO _x	VOC	PM _{2.5}	SO ₂
Heavy Equipment Emissions	8.1	0.6	0.9	1.5
Worker Trip Emissions	0.1	0.1	0.0	0.0
Architectural Coating Emissions	0.0	0.1	0.0	0.0
Fugitive Dust Emissions	0.0	0.0	0.3	0.0
Total	8.3	0.9	1.2	1.5
2013 Construction Emissions				
Construction Activity	NO _x	VOC	PM _{2.5}	SO ₂
Heavy Equipment Emissions	15.7	1.5	2.0	2.6
Worker Trip Emissions	0.5	0.5	0.0	0.0
Architectural Coating Emissions	0.0	0.6	0.0	0.0
Total	16.2	2.5	2.1	2.6

DRAFT

Emission factors in grams of pollutant per hour were multiplied by the estimated running time to calculate total grams of pollutant from each piece of equipment. Finally, these total grams of pollutant were converted to tons of pollutant. The following formula was used to calculate hourly emissions from non-road engine sources, including cranes, backhoes, and the like:

$$M_i = (N \times EF_i) \times AI$$

where: M_i = mass of emissions of i^{th} pollutant during inventory period

N = source population (units)

EF_i = average emissions of i^{th} pollutant per unit of use (e.g., grams per hour)

AI = anti-idling factor (0.98).

The total annual emissions levels are summarized in Tables A-2.

**Table A-2.
Estimated Annual Emissions from Construction and Demolition Equipment**

Year	Annual Emissions (tpy)			
	NO _x	VOC	PM _{2.5}	SO ₂
2010	10.4	0.7	0.8	1.8
2011	8.8	0.7	0.8	1.4
2012	8.1	0.7	0.9	1.5
2013	15.7	1.5	2.0	2.6
Total	42.9	3.5	4.5	7.4

Source: USEPA, 2004; SQAQMD, 1993.

A.1.1.2 Construction Worker Vehicle Operations

Emissions due to construction worker vehicle use were included in the analysis. Emission factors for motor vehicles were conservatively calculated using the EPA *MOBILE6.2*. MWCOG provided *MOBILE6.2* input files applicable to the project during the years of interest. These emission factors were then multiplied by the vehicle operational hours to determine motor vehicle emissions. The analysis assumed conservatively that the worker's vehicle would drive 30 miles per day on post at an average speed of 35 miles per hour. The total annual emissions levels are summarized in Tables A-3.

**Table A-3.
Estimated Annual Emissions from Construction Worker Vehicles**

Year	Annual Emissions (tpy)			
	NO _x	VOC	PM _{2.5}	SO ₂
2010	0.1	0.1	Less than 0.05	
2011	0.2	0.2		
2012	0.1	0.1		
2013	0.5	0.5		
Total	0.9	0.8		

Source: USEPA MOBILE 6.2 and SQAQMD 1993

A.1.1.3 Emissions from Architectural Coatings

Emission factors relating emissions to total square footage to be built were used to estimate VOC emissions from architectural coating activities – primarily painting activities. For office space, the area to be painted was assumed to be approximately twice the heated area of the facility, and the dry film thickness was assumed to be three millimeters (mm). VOC content in was taken from 9

DRAFT

VAC 5-40-7120 – Architectural and Industrial Maintenance Coatings. The following formula was used to calculate emissions from the painting of the facilities:

$$E = [(F \times G) / 1000] \times H$$

where: E = emissions of VOCs from architectural coatings

F = pounds of VOC emissions per gallon

G = total area to be coated (heated area x 2)

H = paint coverage.

A sample calculation for architectural coating VOC emissions during construction of an example facility is provided below:

$$\text{Heated area} = 100,000 \text{ ft}^2$$

$$E = [(0.83 \text{ [lb/gallon]} / 400 \text{ [ft}^2\text{/gallon]} \times [(100,000 \text{ [ft}^2\text{)} \times 2]] / 2,000 \text{ [lb/ton]}]$$

$$= 0.208 \text{ tons}$$

The total annual emissions levels are summarized in Table A-4. In addition, estimated emissions from the potential demolition and construction are presented in Attachment 1.

Table A-4.
Annual VOC Emissions from Architectural Coatings

Year	Annual VOC Emissions (tpy)
2011	0.2
2012	0.1
2013	0.6

Source: SQAQMD, 1993; and 9 VAC 5-40-7120

A.1.1.4 Asphalt Curing Emissions

Asphalt paving would generate emissions from (1) asphalt curing, (2) operation of onsite paving equipment, and (3) operation of motor vehicles, including paving material delivery trucks and worker commuting vehicles. Because the emissions resulting from the operation of onsite paving equipment, trucks, and vehicles were included in the previous section, only asphalt curing-related emissions are discussed in this section. Asphalt curing-related VOC emissions were calculated based on the amount of paving anticipated for the onsite parking lot and new roadways. The following assumption was used in VOC emission calculations for asphalt curing (SQAQMD 1993):

$$E = \text{area paved} \times 2.62 \text{ lb VOC/acre}$$

A sample calculation is provided below:

$$\text{Paved area} = 100 \text{ acres}$$

$$E = 100 \text{ acres} \times 2.62 \text{ lb VOC/acre} / 2000 \text{ lb/ton}$$

$$= 0.131 \text{ ton}$$

Due to the minimal paving anticipated for all alternatives, negligible off gas emissions are anticipated.

DRAFT

A.1.1.5 Surface Disturbance

The quantity of dust emissions from construction operations is proportional to the area of land being worked and to the level of construction activity. The following assumptions were used in PM_{2.5} emission calculations for fugitive dust emissions (AP-42 Section 13.2.3 (USEPA, 1995); USEPA, 2005).

$$E = \text{open area} \times EF \times \text{PM}_{10}/\text{TSP} \times \text{PM}_{2.5}/\text{PM}_{10} \times \text{capture fraction}$$

where: open area = number of acres open

EF = 80 lb TSP/acre

$\text{PM}_{10}/\text{TSP}$ = 0.45 lb PM₁₀/lb TSP

TSP = total suspended particulates

$\text{PM}_{2.5}/\text{PM}_{10}$ = 0.15 lb PM_{2.5}/lb PM₁₀

Capture fraction = 0.5

A sample calculation is provided below:

Disturbed area = 100 acres

$$E = 100 \text{ ac} \times 80 \text{ lb TSP /acre} \times 0.45 \text{ lb PM}_{10}/\text{lb TSP} \times 0.15 \text{ lb PM}_{2.5}/ \text{lb PM}_{10} \\ \times 2000 \text{ lb/ton} \\ = 1.35 \text{ tons}$$

The total annual emissions levels are summarized in Table A-5.

Table A-5.
Annual PM_{2.5} Emissions from Surface Disturbance

Year	Annual PM _{2.5} emissions (tpy)
2011	0.2
2012	0.1
2013	0.6

Sources: AP-42 Section 13.2.3 (USEPA, 1995), USEPA 2005.

A.1.2 Operational Emissions

Operational emissions occur as a result of the operation of the new facilities. The remaining direct and indirect emissions due to heating boilers, commuter vehicles, and emergency generators constitute a small net decrease in CO emissions when compared to the no-action (no-build) scenario. The total annual operational emissions levels are summarized in Table A-6. Notably, the operating CO emissions are less than the no-build alternative; this is primarily due to the decrease in commuting distance.

Table A-6.
Estimated Net Operating Emissions

	Annual Emissions (tpy)			
	NO _x	VOC	PM _{2.5}	SO ₂
Visitors SOV	4.2	4.7	0.1	0.1
Visitors Busses	1.6	0.1	0.0	0.0
Employees	0.4	0.5	0.0	0.0
Boilers	4.1	0.6	0.8	0.2
Generators	2.3	0.0	0.0	0.1
Total	12.5	5.9	1.0	0.4

DRAFT

A.1.2.1 Heating Boiler Emissions

Each building is assumed to be adequately heated, with heating values based on the U.S. Department of Energy's *Consumption and Gross Energy Intensity by Census Region for Sum of Major Fuels, Commercial Buildings Energy Consumption Survey* (DOE, 1999). It is expected that building boiler emissions from each building would occur immediately after the completion of the project. The total annual emissions levels are summarized in Table A-9. Emissions due to these sources are expected to be the same for all alternatives.

A.1.2.2 Vehicular Emissions

Emission factors for motor vehicles were conservatively calculated for the year 2010 for commuter vehicles (modeled as light-duty gasoline vehicles and light-duty gasoline trucks such as sport utility vehicles [SUVs]) using the EPA *MOBILE6.2* mobile source emission factor model. Metropolitan Washington Council of Governments provided the most current input parameters containing the current planning assumptions for the region. A sample calculation for the annual emission rate for NO_x from new employee vehicles from a sample project is presented below:

Additional employees	=	150
Number of trips per day	=	2
Number of days per year	=	250
Average vehicle commute distance	=	35 miles
<i>MOBILE6.2</i> emission factor	=	0.3 grams/mile

Annual emission level	=	150 x 2 trips/day x 250 days/yr x 35 miles/trip
		x 0.3 grams/mile x 0.0000011 tons/gram
		= 0.87 tpy

The estimated net annual vehicular emissions are presented Table A-9. Emissions due to these sources are expected to be the approximately the same for all alternatives.

DRAFT

Attachment B: Emissions Calculations

DRAFT

**Table B-1.
Project Areas and Durations**

Project Name	Year	Clearing Area [Acres]	Building Area [SqFt]	Paving [Acres]	Days of Clearing	Days of Building	Days of Paving
Grays Hill Family Housing(2010), Demolition	2010	2.3	0	0	230	0	0
30,000 sf Parking Lot(2010), Demolition	2010	0.69	0	0	230	0	0
Old Buildings(2010), Demolition	2010	1.15	0	0	230	0	0
Museum Building (2010), Clearing and Grading	2010	13.8	0	0	230	0	0
Main Museum Building (2011), Building Construction	2011	0	100000	0	0	230	0
Memorial Garden (2011), Clearing and Grading	2011	1.4	0	0	94.52	0	0
Memorial Garden Expansion(2011), Clearing and Grading	2011	1.4	0	0	56.71	0	0
Parade Ground and Grandstand (2011), Clearing and Grading	2011	5.61	0	0	113.42	0	0
Parade Ground and Grandstand (2011), Building Construction	2011	0	6000	0	0	230	0
Drop-off and Arrival Plaza (2011), Clearing and Grading	2011	0.9	0	0	56.71	0	0
Drop-off and Arrival Plaza (2011), Building Construction	2011	0	1000	0	0	56.71	0
Main Museum Building (2012), Building Construction	2012	0	55000	0	0	230	0
Amphitheater (2012), Clearing and Grading	2012	0.31	0	0	113.42	0	0
Amphitheater (2012), Building Construction	2012	0	6700	0	0	113.42	0
Below-grade Parking Garage (2012), Clearing and Grading	2012	7.36	0	0	230	0	0
Access Control Point (ACP) (2012), Clearing and Grading	2012	0.05	0	0	113.42	0	0
Access Control Point (ACP) (2012), Building Construction	2012	0	1000	0	0	113.42	0
Encampment Area/Outdoor Education (2012), Clearing and Grading	2012	2	0	0	56.71	0	0
Additional Roadways and Overflow Parking(2012), Clearing and Grading	2012	3.22	0	0	113.42	0	0
Additional Roadways and Overflow Parking(2012), Paving	2012	0	0	3.22	0	0	28.36
Expansion of the Museum (2013), Building Construction	2013	0	95000	0	0	230	0
Below-grade Parking Garage (2013), Building Construction	2013	0	160000	0	0	230	0
Bus and RV parking(2013), Clearing and Grading	2013	0.9	0	0	56.71	0	0
Bus and RV parking (2013), Paving	2013	0	0	0.9	0	0	18.9
Additional Building(2013), Clearing and Grading	2013	0.07	0	0	56.71	0	0
Additional Building (2013), Building Construction	2013	0	1600	0	0	113.42	0
Macro Gallery (2013), Clearing and Grading	2013	1.4	0	0	56.71	0	0
Macro Gallery (2013), Building Construction	2013	0	30375	0	0	230	0

**Table B-2.
Annual Equipment Use**

Equipment Type	2010	2011	2012	2013	Total Hours
Generator Sets	0	1711	947	4607	7264
Air Compressors	0	978	541	2633	4151
Pavers	0	0	64	12	76
Plate Compactors	0	1955	1118	5272	8346
Rollers	0	0	128	24	152
Scrapers	2888	630	1548	94	5161
Cement & Mortar Mixers	0	3421	1893	9215	14529
Cranes	0	3421	1893	9215	14529
Graders	2888	630	1548	94	5161
Off-highway Trucks	2888	4051	3505	9321	19765
Tractors/Loaders/Backhoes	2888	4051	3442	9309	19689
Crawler Tractor/Dozers	2888	630	1548	94	5161

DRAFT

**Table B-3.
Heavy Equipment Emissions**

Project	NOx [tons]	PM _{2.5} [tons]	SO ₂ [tons]	VOC [tons]
Grays Hill Family Housing(2010), Demolition	1.327	0.0898	0.096	0.2364
30,000 sf Parking Lot(2010), Demolition	0.3981	0.0269	0.0288	0.0709
Old Buildings(2010), Demolition	0.6635	0.0449	0.048	0.1182
Museum Building (2010), Clearing and Grading	7.9619	0.5389	0.5761	1.4182
Main Museum Building (2011), Building Construction	6.2994	0.5439	0.5458	0.9566
Memorial Garden (2011), Clearing and Grading	0.3038	0.0212	0.0282	0.0576
Memorial Garden Expansion(2011), Clearing and Grading	0.1823	0.0127	0.0169	0.0345
Parade Ground and Grandstand (2011), Clearing and Grading	1.4581	0.1019	0.1355	0.2763
Parade Ground and Grandstand (2011), Building Construction	0.378	0.0326	0.0327	0.0574
Drop-off and Arrival Plaza (2011), Clearing and Grading	0.1165	0.0081	0.0108	0.0221
Drop-off and Arrival Plaza (2011), Building Construction	0.0155	0.0013	0.0013	0.0024
Main Museum Building (2012), Building Construction	3.1999	0.2878	0.3432	0.5089
Amphitheater (2012), Clearing and Grading	0.0729	0.0053	0.0086	0.0147
Amphitheater (2012), Building Construction	0.1922	0.0173	0.0206	0.0306
Below-grade Parking Garage (2012), Clearing and Grading	3.5317	0.2554	0.4177	0.7116
Access Control Point (ACP) (2012), Clearing and Grading	0.0109	0.0008	0.0013	0.0022
Access Control Point (ACP) (2012), Building Construction	0.0287	0.0026	0.0031	0.0046
Encampment Area/Outdoor Education (2012), Clearing and Grading	0.2368	0.0171	0.028	0.0477
Additional Roadways and Overflow Parking(2012), Clearing and Grading	0.762	0.0551	0.0901	0.1535
Additional Roadways and Overflow Parking(2012), Paving	0.1086	0.0079	0.0127	0.021
Expansion of the Museum (2013), Building Construction	5.115	0.4808	0.6643	0.8505
Below-grade Parking Garage (2013), Building Construction	8.6147	0.8097	1.1188	1.4324
Bus and RV parking(2013), Clearing and Grading	0.0967	0.0073	0.0142	0.0207
Bus and RV parking (2013), Paving	0.0184	0.0014	0.0027	0.0038
Additional Building(2013), Clearing and Grading	0.0079	0.0006	0.0012	0.0017
Additional Building (2013), Building Construction	0.0425	0.004	0.0055	0.0071
Macro Gallery (2013), Clearing and Grading	0.1512	0.0114	0.0222	0.0324
Macro Gallery (2013), Building Construction	1.6354	0.1537	0.2124	0.2719
Total Non-Road	42.93	3.54	4.49	7.37

Source: USEPA NONROAD2004 and SQAQMD 1993

DRAFT

**Table B-4.
Worker Trip Emissions (tons)**

Project	VMT	EFNO _x [g/mile]	NO _x [tons]	EFPM _{2.5} [g/mile]	PM _{2.5} [tons]	EFSO ₂ [g/mile]	SO ₂ [tons]	EFVOC [g/mile]	VOC [tons]
Grays Hill Family Housing(2010), Demolition	19838	0.32	0.01	0.01	0	0.01	0	0.29	0.01
30,000 sf Parking Lot(2010), Demolition	5951	0.32	0	0.01	0	0.01	0	0.29	0
Old Buildings(2010), Demolition	9919	0.32	0	0.01	0	0.01	0	0.29	0
Museum Building (2010), Clearing and Grading	119025	0.32	0.04	0.01	0	0.01	0	0.29	0.04
Main Museum Building (2011), Building Construction	496800	0.32	0.17	0.01	0.01	0.01	0.01	0.29	0.16
Memorial Garden (2011), Clearing and Grading	4973	0.32	0	0.01	0	0.01	0	0.29	0
Memorial Garden Expansion(2011), Clearing and Grading	2984	0.32	0	0.01	0	0.01	0	0.29	0
Parade Ground and Grandstand (2011), Clearing and Grading	23870	0.32	0.01	0.01	0	0.01	0	0.29	0.01
Parade Ground and Grandstand (2011), Building Construction	29808	0.32	0.01	0.01	0	0.01	0	0.29	0.01
Drop-off and Arrival Plaza (2011), Clearing and Grading	1908	0.32	0	0.01	0	0.01	0	0.29	0
Drop-off and Arrival Plaza (2011), Building Construction	1225	0.32	0	0.01	0	0.01	0	0.29	0
Main Museum Building (2012), Building Construction	273240	0.32	0.1	0.01	0	0.01	0	0.29	0.09
Amphitheater (2012), Clearing and Grading	1311	0.32	0	0.01	0	0.01	0	0.29	0
Amphitheater (2012), Building Construction	16415	0.32	0.01	0.01	0	0.01	0	0.29	0.01
Below-grade Parking Garage (2012), Clearing and Grading	63480	0.32	0.02	0.01	0	0.01	0	0.29	0.02
Access Control Point (ACP) (2012), Clearing and Grading	196	0.32	0	0.01	0	0.01	0	0.29	0
Access Control Point (ACP) (2012), Building Construction	2450	0.32	0	0.01	0	0.01	0	0.29	0
Encampment Area/Outdoor Education (2012), Clearing and Grading	4256	0.32	0	0.01	0	0.01	0	0.29	0
Additional Roadways and Overflow Parking(2012), Clearing and Grading	13696	0.32	0	0.01	0	0.01	0	0.29	0
Additional Roadways and Overflow Parking(2012), Paving	3424	0.32	0	0.01	0	0.01	0	0.29	0
Expansion of the Museum (2013), Building Construction	471960	0.32	0.16	0.01	0.01	0.01	0	0.29	0.15
Below-grade Parking Garage (2013), Building Construction	794880	0.32	0.28	0.01	0.01	0.01	0.01	0.29	0.25
Bus and RV parking(2013), Clearing and Grading	1908	0.32	0	0.01	0	0.01	0	0.29	0
Bus and RV parking (2013), Paving	636	0.32	0	0.01	0	0.01	0	0.29	0
Additional Building(2013), Clearing and Grading	157	0.32	0	0.01	0	0.01	0	0.29	0
Additional Building (2013), Building Construction	3920	0.32	0	0.01	0	0.01	0	0.29	0
Macro Gallery (2013), Clearing and Grading	2984	0.32	0	0.01	0	0.01	0	0.29	0
Macro Gallery (2013), Building Construction	150903	0.32	0.05	0.01	0	0.01	0	0.29	0.05

Source: USEPA MOBILE 6.2 and SQAQMD 1993

DRAFT

**Table B-5.
Architectural Coating Emissions (Paint)**

Project	Heated Area	Wall Surface	EFVOC [lbs/1000 Square Feet]	VOC [tons]
Main Museum Building (2011), Building Construction	100000	200000	55.5	0.21
Parade Ground and Grandstand (2011), Building Construction	6000	12000	55.5	0.01
Drop-off and Arrival Plaza (2011), Building Construction	1000	2000	55.5	0
Main Museum Building (2012), Building Construction	55000	110000	55.5	0.11
Amphitheater (2012), Building Construction	6700	13400	55.5	0.01
Access Control Point (ACP) (2012), Building Construction	1000	2000	55.5	0
Expansion of the Museum (2013), Building Construction	95000	190000	55.5	0.2
Below-grade Parking Garage (2013), Building Construction	160000	320000	55.5	0.33
Additional Building (2013), Building Construction	1600	3200	55.5	0
Macro Gallery (2013), Building Construction	30375	60750	55.5	0.06
Total Architectural Coating Emissions				0.95

Source: SQAQMD 1993

**Table B-6.
Fugitive Dust Emissions**

Project	PM ₁₀ /TSP	PM _{2.5} /PM ₁₀	EFTSP [lbs/acre/day]	Capture Fraction	Duration of Grading [days]	Cleared Area [acres]	PM _{2.5} [tons]
Grays Hill Family Housing(2010), Demolition	0.45	0.15	80	0.5	230	2.3	0.07
30,000 sf Parking Lot(2010), Demolition	0.45	0.15	80	0.5	230	0.69	0.02
Old Buildings(2010), Demolition	0.45	0.15	80	0.5	230	1.15	0.04
Museum Building (2010), Clearing and Grading	0.45	0.15	80	0.5	230	13.8	0.43
Memorial Garden (2011), Clearing and Grading	0.45	0.15	80	0.5	94.52	1.4	0.02
Memorial Garden Expansion(2011), Clearing and Grading	0.45	0.15	80	0.5	56.71	1.4	0.01
Parade Ground and Grandstand (2011), Clearing and Grading	0.45	0.15	80	0.5	113.42	5.61	0.09
Drop-off and Arrival Plaza (2011), Clearing and Grading	0.45	0.15	80	0.5	56.71	0.9	0.01
Amphitheater (2012), Clearing and Grading	0.45	0.15	80	0.5	113.42	0.31	0
Below-grade Parking Garage (2012), Clearing and Grading	0.45	0.15	80	0.5	230	7.36	0.23
Access Control Point (ACP) (2012), Clearing and Grading	0.45	0.15	80	0.5	113.42	0.05	0
Encampment Area/Outdoor Education (2012), Clearing and Grading	0.45	0.15	80	0.5	56.71	2	0.02
Additional Roadways and Overflow Parking(2012), Clearing and Grading	0.45	0.15	80	0.5	113.42	3.22	0.05
Bus and RV parking(2013), Clearing and Grading	0.45	0.15	80	0.5	56.71	0.9	0.01
Additional Building(2013), Clearing and Grading	0.45	0.15	80	0.5	56.71	0.07	0
Macro Gallery (2013), Clearing and Grading	0.45	0.15	80	0.5	56.71	1.4	0.01
Total Fugitive Dust Emissions							1.0

Source: AP-42 Section 13.2.3 and USEPA 2005

DRAFT

**Table B-7.
Emergency Generator Emissions**

Emergency Generators ¹	Total Capacity	Number of Generators	NO _x	NO _x	VOC	VOC	PM	PM	SO _x	SO _x
	(kW)	(units)	(g/hpxhr)	(tpy)	(g/hpxhr)	(tpy)	(g/hpxhr)	(tpy)	(g/hpxhr)	(tpy)
Potential to Emit	1000	4	4.8	14.3	0.0	0.0	0.0	0.1	0.2	0.5
Estimated Actual Emissions			-	2.3	-	0.0	-	0.0	-	0.1

- Although all engines will be Tier II certified, nominal manufacturer's data were used for the NO_x emission factor, CO emission factor, and PM emission factor included in these calculations. Emissions data were not provided for PM₁₀, so it was assumed that PM₁₀ = PM. The emission factor for SO_x was obtained from USAF IERA Air Emissions Inventory Guidance for Stationary Sources at Air Force Installations, 1999, Revised December 2003. The SO_x emission factor uses "S", a sulfur content of 0.05 wt%.
- Assumed 500 hours for potential to emit and 80 hours for actual emissions.

**Table B-8.
Boiler Emissions**

Natural Gas	Total Heat Input	Total Fuel Limit	NO _x	NO _x	VOC	VOC	PM	PM	SO _x	SO _x
	(MMBtu/hr)	(10 ⁶ cf/yr)	(lb/10 ⁶ cf)	(tpy)	(lb/10 ⁶ cf)	(tpy)	(lb/10 ⁶ cf)	(tpy)	(lb/10 ⁶ cf)	(tpy)
Museum	16.8	136	36	2.45	5.5	0.38	7.6	0.52	0.6	0.04
Support Facilities	8.4	68	36	1.23	5.5	0.19	7.6	0.26	0.6	0.02
No. 2 Fuel Oil ²	Total Heat Input	Total Fuel Limit	NO _x	NO _x	VOC	VOC	PM	PM	SO _x	SO _x
	(MMBtu/hr)	(gal/yr)	(lb/10 ³ gal)	(tpy)	(lb/10 ³ gal)	(tpy)	(lb/10 ³ gal)	(tpy)	(lb/10 ³ gal)	(tpy)
Museum	16.8	28,800	20	0.58	0.34	0.01	3.3	0.10	7.2	0.21
Support Facilities	8.4	14,400	20	0.29	0.34	0.00	3.3	0.05	7.2	0.10
Total				4.55		0.58		0.92		0.37

Notes:

- Heat Content 1020 BTU/cf, 345 days per year.
 - Heat Content 140,000 BTU/gallon, 20 days per year.
- ^a Natural gas emission factors for all pollutants except NO_x were obtained from USEPA's AP-42, Section 1.4 (USEPA, 1995). The low NO_x burners reduce NO_x emissions to 30 ppm and 15 ppm according to manufacturer specifications. Using a standard conversion: lb/MMBtu = ppm / 850, the NO_x emission factor appropriate for burning natural gas in the proposed burners is 0.035 lb/MMBtu or 36 lb/MMcf, and 0.018 lb/MMBtu or 18 lb/MMcf. (This conversion assumes that the NO_x concentration reflects 3% oxygen.) Conservatively assume that PM₁₀ = PM.
- ^b No. 2 fuel oil emission factors for all pollutants were obtained from USEPA's AP-42, Section 1.3 (USEPA, 1995). Conservatively assume that PM₁₀ = PM. The SO_x emission factor uses a sulfur content of 0.05 wt%.

DRAFT

Appendix D

Record of Non-Applicability (RONA) to the General Conformity Rule

DRAFT

THIS PAGE INTENTIONALLY LEFT BLANK

DRAFT

Record of Non-Applicability (RONA)
to the General Conformity Rule for the Construction and Operation of the
National Museum of the U.S. Army, Fort Belvoir, VA

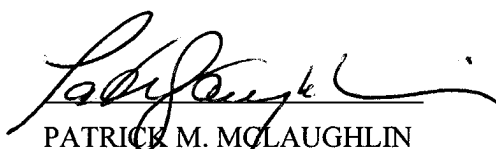
July 25, 2008

Air emissions were estimated for the construction and operation of the proposed construction and operation of the National Museum of the U.S. Army facilities for the proposed Pence Gate and Gunston Alternatives at Fort Belvoir. Emissions from land clearing and grading, construction of buildings, associated parking areas and structures, traffic control upgrades, and stormwater systems and support utility upgrades were assessed. Operational emissions from motor vehicles, emergency generators, and boilers were assessed. General Conformity under the Clean Air Act, Section 176 has been evaluated according to the requirements of 40 CFR 93.153, Subpart B. Regardless of which alternative is ultimately selected, the requirements of this rule are not applicable because:

The highest total annual direct and indirect emissions from this proposed action have been estimated at 16.2 tons NO_x, 5.9 tons VOCs, 2.1 tons PM_{2.5}, and 2.6 tons SO₂ per year, which would be below the conformity threshold values of 50 tons VOCs and 100 tons for SO₂, PM_{2.5}, and NO_x, and would not be *regionally significant*.

Supported documentation and emission estimates:

- Are Attached
- Appear in the NEPA Documentation
- Other (Not Necessary)



PATRICK M. MCLAUGHLIN
Chief
Environmental and Natural Resources Division
US Army Garrison, Fort Belvoir

DRAFT

THIS PAGE INTENTIONALLY LEFT BLANK

DRAFT

Appendix E
Traffic Impact Analysis

DRAFT

THIS PAGE INTENTIONALLY LEFT BLANK

DRAFT

**United States Army Museum
Draft July 9, 2008**

Transportation Technical Documentation Input to the Draft Environmental Assessment

Introduction

The U.S. Army Museum is slated to be located at Fort Belvoir in Fairfax County Virginia. Fort Belvoir, an installation of approximately 8,400 acres, currently accommodates 7,600 residents and 23,000 employees. The BRAC Action will increase the employment levels on Fort Belvoir to over 29,000 employees by the year 2011, and the residential population is expected to expand to nearly 9,400 employees at that same timeframe. Today there are transportation challenges on roadways in and surrounding Fort Belvoir during the AM and PM peak periods, as off-post roadways are congested and queues form at the gates for access into the installation.

For the siting of the United States Army Museum, the team of Berger-SmithGroup, and their sub-consultants, has conducted a feasibility study for each of the two sites under consideration. The draft studies were completed in May 2008 for the Pence Gate site, and early June 2008 for the Gunston Site. The Feasibilities Studies efforts are running concurrently with the EA for the Museum, therefore some findings of the expected future conditions may change as more up-to-date information is completed.

The Feasibility Studies examined two sites at Fort Belvoir, the first being the Gunston Site, located on the North Post Golf Course. Two access points were considered for this location, a direct connection to the Fairfax County Parkway (FCP) and an indirect connection to the FCP via John J. Kingman Road. The second location for the Museum is adjacent to the Pence Gate, specifically on Gray's Hill, opposite of the future Hospital along Belvoir Road. Two access points were also considered for this scenario, the first being a new driveway to intersect with U.S. Route 1, opposite of Woodlawn Road, where there is currently a signal on Route 1. The second would be via a new access off of Belvoir Road, just south of Pence Gate.

The program would include construction of the main building, exterior space and parking areas. The main building would be approximately 155, 000 sq ft, and would include assembly space, exhibit halls, food services, an auditorium, a theater, retail space, administrative space and maintenance facilities. The exterior program includes 5.6 acres of parade grounds, 6,000 sq ft of a grandstand, a memorial garden and an amphitheater. The parking area, depending on site layout, will be either surface or structured (garage) parking, or a combination of the two. The parking will accommodate 575 – 625 spaces for employees and visitors and 20 spaces for buses.

At this time, the Army forecasts an approximately staffing level of 185 employees. The Army anticipates that approximately 740,000 visitors would visit the museum annually, with a peak daily attendance of 2,200 visitors.

Analyses Assumptions

For the Pence Gate Study, the Berger SmithGroup retained Gorove/Slade Associates to perform the operational analysis. Their methodology was to:

1. Data Collection efforts for the Pence Gate Site was completed in March 2008, in addition to obtaining the Synchro network and signal timing files from VDOT. The volumes collected were entered into Synchro to evaluate the existing conditions for the intersections of:
 - A. Route 1 and Belvoir Road (access to Fort Belvoir)
 - B. Route 1 and Woodlawn Road (access into the Meeting House)
 - C. Route 1, Mount Vernon Highway and Old Mill Road

DRAFT

**United States Army Museum
Draft July 9, 2008**

2. The 2013 Baseline Alternative forecasts were prepared by taking the 2008 volumes and accounting for inherent regional growth of 1.5% per year compounded annually till 2013 for Route 1 and Mount Vernon Ave, 1% per year for Old Mill, and 0.5% per year for Belvoir Rd & Woodlawn Rd. Increases of traffic volumes due to the BRAC action at Fort Belvoir were taken from the Environmental Impact Statement for the *Record of Decision for the Implementation of 2005 Base Realignment and Closure (BRAC) Recommendations and Related Army Actions at Fort Belvoir, Virginia*, dated August 7, 2007. The difference between the BRAC Action No-Action and the Preferred Alternative were layered onto the factored volumes. This procedure developed the 2013 Baseline Alternative forecast.
3. Roadway improvements that were incorporated into the 2013 Baseline Alternative
 - A. Realignment of Mount Vernon Highway and Old Mill Road at Route 1 per the Woodlawn Connector Road project (FHWA project)
 - B. Adding the fourth approach to the Route 1/Belvoir Road intersection to account for the construction of the proposed Access Control Point for lower North Post. Includes intersection improvements of adding additional turn lanes on all four approaches – all left turn lanes at this intersection are double left turn lanes. Improvements are being considered here as part of the BRAC Implementation.
 - C. Woodlawn Plantation would have their access point to Route 1 relocated to the existing intersection of Route 1 and Woodlawn Road, they would share this access point with the Meeting House.
4. Site generated traffic was taken from the consultant firm Clark Nexsen's traffic study completed in 2005 for the U.S. Army Museum Study. According to the trip generation analysis performed in this study, in the AM peak hour, 124 employees would drive to the site and in the PM peak hour, 124 employees would leave the site by car. For visitors, no trips would occur during the AM Peak hour, while in the PM peak hour, 73 visitors would arrive at the site and 232 visitors would leave the site.
5. Two access scenarios were considered.
 - A. All visitors and employees would access the site from Belvoir Road, the visitors driveway would be north of the existing Pence Gate, , while the employees driveway would be south of the existing Pence Gate.
 - B. The employee entrance would be located off Belvoir Road, so employees would still have to go through Pence Gate. For visitors, a driveway would be added to the intersection of Route 1 and Woodlawn Road. It would include the necessary turn lanes from Route 1 in both directions of travel.

For the Gunston Site Study, the Berger SmithGroup retained Gorove/Slade Associates to perform the operational analysis. Their methodology was to:

1. Data Collection efforts for the Gunston Site was completed in May 2008, in addition to obtaining the Synchro network and signal timing files from VDOT. The volumes collected were entered into Synchro to evaluate the existing conditions for the intersections of:
 - a. Fairfax County Parkway and Route 1
 - b. Fairfax County Parkway and JJ Kingman Road
 - c. Fairfax County Parkway and the ramps termini at Telegraph Road
2. The 2013 Baseline Alternative forecasts were prepared by taking the 2008 volumes and accounting for inherent regional growth of 1.5% per year compounded annually till 2013. Increases of traffic volumes due to the BRAC action at Fort Belvoir were taken from the Environmental Impact Statement for the *Record of Decision for the Implementation of 2005 Base Realignment and Closure (BRAC) Recommendations and Related Army Actions at Fort Belvoir*,

DRAFT

**United States Army Museum
Draft July 9, 2008**

Virginia, dated August 7, 2007. The difference between the BRAC Action No-Action and the Preferred Alternative were layered onto the factored volumes. This procedure developed the 2013 Baseline Alternative forecast.

3. No roadway improvements at the study area were included in the 2013 Baseline Alternative for this site.
4. Site generated traffic was taken from the consultant firm Clark Nexsen's traffic study completed in 2005 for the U.S. Army Museum Study. According to the trip generation analysis performed in this study, in the AM peak hour, 124 employees would drive to the site and in the PM peak hour, 124 employees would leave the site by car. For visitors, no trips would occur during the AM Peak hour, while in the PM peak hour, 73 visitors would arrive at the site and 232 visitors would leave the site.
5. Two access scenarios were considered.
 - a. All visitors and employees would reach the Museum Site via a direct connection from the Fairfax County Parkway. This connection would be a new signalized intersection, to be located just east of Elhers Road, and west of Kingman Road. It would require closing the median for Elhers Road, such that it would be a right-in right-out only for the southbound direction.
 - b. All visitors and employees would reach the Museum Site via a new roadway off of Kingman Road, so all traffic would turn off of the Parkway onto Kingman Road to reach the driveway for the Museum. This roadway would be located prior to the Kingman Gate, so that visitors do not have to be cleared at Fort Belvoir Gates to reach the Museum.
6. For both access scenarios above, the Museum would have its own internal security, separate from that of Fort Belvoir.

Transportation Network

This section covers the transportation network for the existing conditions, 2013 No-Action and 2013 Action conditions.

Existing Network

Fort Belvoir is well served by the regional roadway network. In the vicinity of Fort Belvoir, the following roadways serve as commuter routes, with I-95 and I-495 serving longer distance, non-commuter traffic as well:

- Interstate 95 (I-95) / I-395 (Shirley Highway) / I-95/I-495 (Capital Beltway) system
- U.S. Route 1 (Richmond Highway)
- State Route 7100 (Fairfax County Parkway)
- State Route 235 (Mount Vernon Memorial Highway)
- State Route 611 (Telegraph Road)
- State Route 613 (Beulah Street)
- George Washington Memorial Parkway

The regional roadways, serving as major commuter routes to employment locations in Fairfax County, Alexandria, Arlington, and the Washington, DC core, also provide access to land uses adjacent to Fort Belvoir.

The roadway system on Fort Belvoir's Main Post includes the following:

DRAFT

**United States Army Museum
Draft July 9, 2008**

- John J. Kingman Road on North Post, which provides access from the Fairfax County Parkway to a number of sites, including the Andrew T. McNamara Headquarters Complex, InsCOM, North Post Golf Course, Mosby Reserve Center, and Davison Army Airfield.
- Beulah Street, which provides access to the North Post from Telegraph Road, and connects to Kingman Road.
- Woodlawn, Meade, Goethals, Abbot, Gorgas, and Meeres Roads provide internal circulation within North Post.
- Gunston Road, the only connector between North and South Post that has a bridge crossing over Route 1, serves as the north-south connection.
- Pohick Road, which provides access to the South Post from U.S. Route 1 via Tulley Gate. Currently, all visitors and trucks to Fort Belvoir must enter the post via Tulley Gate and be processed at the Post Visitor Center.
- Belvoir Road, which provides access to the South Post from U.S. Route 1 via Pence Gate.
- Mount Vernon Road, which provides access to South Post from Mount Vernon Memorial Highway via Walker Gate, and also links to Surveyor Road to provide connections Belvoir Road.
- 9th, 12th, 16th, 18th, 21^s, and 23rd Streets, which provide for east-west movement on South Post and connect Gunston Road with Belvoir Road.

While no rail transit service is provided directly to Fort Belvoir, two rail services—WMATA’s Metrorail and the VRE—have stations within a few miles of Fort Belvoir, as discussed below.

Metrorail has two stations that serve Fort Belvoir. The Franconia-Springfield station on the Blue Line is approximately 3 miles north of Fort Belvoir. The Huntington Station on the Yellow Line is located just south of Alexandria, approximately 7 miles northeast of Fort Belvoir. Both the Blue and Yellow Lines provide service to Ronald Reagan National Airport and the Pentagon as well as the central core area of Washington, DC, with connections to each of the other Metrorail lines. Metrorail operates 7 days a week with weekday service generally available from 5:30 AM to midnight. Service frequency on the Blue and Yellow Lines generally is 6 minutes during peak times and 12 minutes during off-peak times.

The Fort Belvoir area of Fairfax County is served by VRE’s Fredericksburg Line. Two VRE stations are in the general vicinity of Fort Belvoir. The Lorton station is approximately 1.5 miles west of Fort Belvoir, east of I-95, and south of Pohick Road. The Franconia-Springfield VRE station is adjacent to the Franconia-Springfield Metro station, approximately 3 miles north of Fort Belvoir. The Fredericksburg Line operates between Fredericksburg and Union Station in Washington, DC. It serves locations in Stafford County, Prince William County, Fairfax County, Alexandria, and Arlington County. Service frequency at these stations is every 30 minutes from approximately 6:00 AM to 8:30 AM and from 4:00 PM to 7:00 PM.

Six bus routes directly serve portions of Main Post, including one WMATA Metrobus route, four Fairfax Connector routes, and one private bus line. Each route is described briefly below.

- *Metrobus REX* (Richmond Highway Express). The REX route provides express service between Fort Belvoir and the King Street Metro station in Alexandria.
- *Fairfax Connector Route 171* (Richmond Highway Line). Route 171 provides service between the Franconia-Springfield Metro station and the Huntington Metro station.
- *Fairfax Connector Route 301* (Telegraph Road Line). Route 301 also provides local service between the Franconia-Springfield Metro station and the Huntington Metro station.
- *Fairfax Connector Routes 331/332* (I-95 Circulator). These two routes operate in a loop connecting the Franconia-Springfield Metro station, Springfield Mall, the Springfield business district, Fort Belvoir, and various destinations along both sides of the I-95 corridor.

DRAFT

United States Army Museum Draft July 9, 2008

- *Lee Coaches*. A private bus company in Stafford County, Lee Coaches operates one weekday round trip between the Route 208 Commuter Lot in Spotsylvania and Fort Belvoir. It also serves the Route 17 North Commuter Lot near Fredericksburg. At Fort Belvoir, the bus circulates through the South Post and makes a number of stops.

The Fairfax County Parkway and a portion of Telegraph Road are the only roadways around Fort Belvoir that have dedicated shared-use trails or dedicated on-street bike lanes. However, Fairfax County's Countywide Trails Plan envisions an improved network for on-street bike lanes and shared use trails – these include roadways around Fort Belvoir. Such a network would improve the long-range mobility for pedestrian and cyclists. Generally throughout the Post low vehicle volumes and low speeds make pedestrian and bicycle travel feasible. This is especially true of the older areas on South Post. Although trails exist sporadically throughout, there is no organized bike or multi-use trail that traverses the post.

No-Action Network Improvements

By 2013, a number of roadway links both on-post and surrounding the post will be improved, below is a summary of the improvements, some of which is yet to be approved. They are expected to be open by 2013.

- Provide an additional general-purpose lane on I-95 between Route 123 and Fairfax County Parkway,
- Complete the Springfield Interchange, by constructing Phase 8, which provides direct HOV/HOT connection from the existing HOV lanes to/from the Beltway,
- Convert the I-95 HOV lanes into HOT lanes (HOV/bus traffic would still be free, but SOV traffic to pay a toll), and add a third lane,
- Extend the Fairfax County Parkway through EPG and provide direct connections into EPG from I-95,
- Construct the Woodlawn Connector Road between Telegraph Road and Route 1, tying into Route 1 at Mount Vernon Highway,
- Widen Pohick Road from 2 to 4 lanes between Route 1 and Gunston Road on-post,
- Widen Gunston Road from 2 to 4 lanes, with appropriate turn lanes between Pohick Road and Kingman Road,
- Widen Belvoir Road from 2 to 4 lanes between Route 1 and Ninth Street
- Widen Ninth Street from 2 to 4 lanes between Belvoir and Gunston Road
- Improve/construct gates at current locations: Tulley, Pence and Lieber
- Add signals to improve circulation on-post.
- Adding additional left turn lanes at the Route 1 intersection with Belvoir Road to account for the BRAC Implementation and the addition of the lower North Post Access Control Point. It was assumed by the Feasibility Study Team that this intersection will have double left turn lanes on all approaches; currently the intersection has only a single left turn lane on the existing three approaches.

Route 1 is expected to be widened to 6 lanes in some point into the future; however, at this time, the widening is expected to occur in the year 2015, at the earliest. Thus, this will occur after the opening of the Museum, and therefore is not part of the analysis. It should be noted that for the baseline analysis that improvements were assumed by the Feasibility Team to be in place at the Route 1/Belvoir Road intersection. These improvements would indeed provide better operational performance of the intersection. However, funding at this time has yet to be allocated, and the improvements have not been

DRAFT

**United States Army Museum
Draft July 9, 2008**

approved by VDOT. The consequence of this improvement not being in place that the intersection will not perform as indicated. But in terms of analysis of the alternatives, is that it is a relative comparison between the baseline and each proposed scenario that is considered when assessing the impacts of the proposed action.

Improvements to the transit services are not known at this time. Service providers routinely review their operations to improve ridership levels and make adjustments to their service plans. Any changes to their service plans would typically result in improved services and higher ridership levels.

Action Network Improvements

For the Pence Gate Site, two scenarios were considered. Scenario 1 assumes that employees would access the site via a new connection off of Belvoir Road, south of Pence Gate, but visitors would access the site via a new connection constructed at the Route 1 and Woodlawn Road intersection. This would entail adding a driveway (as the fourth leg) as part of the signal controlled operations and adding the turn lanes into the site from Route 1. In Scenario 2, all visitors and employees would access the site via a new connection off of Belvoir Road, south of Pence Gate. This intersection would be unsignalized and the driveway exiting the site would be stop-controlled via a stop-sign.

Two access scenarios were considered for the Gunston Site, so different improvements would need to be included. For the direct connection off of the Parkway, it is proposed to close the median break for Elhers Road to allow for construction of a new signalized intersection into the Museum. The signal will include the needed left and right turn bays from the Parkway into the site, as well as capacity to handle exiting traffic. This new signal would be coordinated with the signal at Kingman, so to not disrupt the progression along the Parkway between the two signals. The second scenario would build a new driveway to tie into an existing signal on Kingman Road, a new left turn bay would be constructed on Kingman to allow traffic to reach the museum and not allow this traffic to block the through movement. The Feasibility Study Team assumed that if the Museum access was made via Kingman Road, improvements would also include adding a second right turn lane on Kingman at the Parkway intersection, to increase capacity for vehicles turning onto the Parkway on this approach. It has not been determined who would pay for these improvements.

Traffic Volumes

The analysis year for the existing conditions was set to 2008 as the data was collected in March 2008 for the Pence Gate site, and May for the Gunston Site. As mentioned previously, the existing volumes were factored accounting for inherent regional growth. The difference between the BRAC Action No-Action and the Preferred Alternative were layered onto the factored volumes. This procedure developed the 2013 Baseline Alternative forecast.

For the Pence Gate analysis, the consultant team performing the Feasibility Study for the U.S. Army Museum referred to a previous study on the site-generated trips. Site generated traffic was taken from the consultant firm Clark Nexsen's traffic study completed in 2005 for a previous study on the siting of the U.S. Army Museum at Fort Belvoir. According to the trip generation analysis performed in this study, in the AM peak hour, 124 employees would drive to the site and in the PM peak hour, 124 employees would leave the site by car. For visitors, no trips would occur during the AM Peak hour, while in the PM peak hour, 73 visitors would arrive at the site and 232 visitors would leave the site.

DRAFT

**United States Army Museum
Draft July 9, 2008**

The same growth factor technique and trip generation described above was also used for the Gunston Site analysis. Volumes illustrating the existing, baseline and the build scenarios volumes, for both sites, are presented in **Appendix A**.

There are several items to note of on-going actions at Fort Belvoir that could affect the future traffic volumes. Currently Fort Belvoir is in the process of developing an overall Transportation Management Plan (travel demand management plan) to reduce single-occupancy vehicle (SOV) trips, but at this time, the program has not been defined. Therefore no trip reductions were assumed for the 2013 traffic volumes. By assuming no trip reductions, it means that the analysis assumes the higher volume scenario, i.e. the “worst case” is assessed. If a TMP program is implemented, then total volume into and out of Fort Belvoir will likely decrease, and could include the Museum as part of the TMP program. This would provide museum employees as a means not to drive to work by themselves. To understand the impact of encouraging people to carpool, an example is included here. For every one high-occupancy vehicle, assuming three people per vehicle, would take two SOV trips of the road. If such a plan is implemented, then it can be expected that peak hour trips to/from Fort Belvoir could decrease.

Operational Analysis

Pence Gate Analysis

The traffic analysis was performed using the traffic operational analysis software Synchro (Version 6). Synchro provides Measures-of-Effectiveness (MOEs) outputs, such as LOS, delay and queue length, based on the geometric features of the intersection. Synchro is a widely used and accepted traffic operational analysis tool in the Washington D.C. Region.

These intersections were analyzed for their operational performance. The following table presents the *Volume-to-Capacity* (V/C) ratio, intersection *Level-of-Service* (LOS), and *Delay* measures of effectiveness (MOEs). The V/C ratio is a quantitative measure of demand versus the capacity of an intersection. LOS is a qualitative measure of an intersection’s performance. LOS is ranked “A” to “F”, where “A” represents free flow or negligible delay, and “F” represents extensive delay and congestion. An intersection’s LOS is typically at LOS F once the control delay at the intersection reaches an average of 80 seconds per vehicle. Synchro follows the guidelines of the 2000 Highway Capacity Manual (HCM) for signalized and unsignalized intersections. In the Washington Region, it is not uncommon for major intersections to operate at LOS E or F during the morning and evening peak hours, and LOS D is considered quite good for this congested region. **Table 1** presents the MOEs for the existing conditions for the study intersections.

Table 1: Intersection Measures of Effectiveness – 2008 Existing

Signalized Intersection Location	AM Peak Hour			PM Peak Hour		
	V/C	LOS	Delay	V/C	LOS	Delay
U.S. Route 1/Belvoir Road	0.69	A	7.7	0.61	B	13.7
U.S. Route 1/Woodlawn Road	0.63	A	2.7	0.54	A	1.6
U.S. Route 1/Old Mill Road	0.99	F	114.6	0.88	E	74.5

Source: Gorove Slade Associates, May 2008 - **DRAFT**

The results of the existing conditions illustrate that the intersection of Route 1, Old Mill Road and Mount Vernon Highway operates at LOS E or worst during the peak periods. This can result in extensive queuing that can affect adjacent signals. Access into Fort Belvoir is not of concern. The improvements described in the Analysis Assumptions to be in place for 2013 Baseline were incorporated into the

DRAFT

**United States Army Museum
Draft July 9, 2008**

Synchro model and evaluated. This includes the reconfiguration of U.S. Route 1, Old Mill Road and Mount Vernon Highway. **Table 2** presents the MOEs for the baseline conditions.

Table 2: Intersection Measures of Effectiveness – 2013 Baseline

Signalized Intersection Location	AM Peak Hour			PM Peak Hour		
	V/C	LOS	Delay	V/C	LOS	Delay
U.S. Route 1/Belvoir Road	0.89	D	39.5	0.84	C	26.8
U.S. Route 1/Woodlawn Road	0.85	B	11.3	0.8	B	10.1
U.S. Route 1/Old Mill Road	1.05	F	84.3	0.95	D	51.5

Source: Gorove Slade Associates, May 2008 - **DRAFT**

The MOEs for the intersection of Route 1 and Belvoir Road decreases compared to the existing conditions, but is still within acceptable performance, as the LOS is D or better. The improvements at this intersection would accommodate the BRAC Implementation. The improvements at the intersection of Route 1, Old Mill Road and Mount Vernon Highway would improve the operations of this intersection compared to existing conditions, thus reducing the length of congestion along this roadway.

Two access scenarios were assumed for the Pence Gate Site. Scenario 1 assumes that employees would access the site via a new connection off of Belvoir Road, south of Pence Gate, but visitors would access the site via a new driveway to tie into the Route 1 and Woodlawn Road intersection, and adding the turn lanes into the site from Route 1. **Table 3** and **Table 4** present the MOEs for the study area intersections for the Pence Gate Scenario 1, both signalized and unsignalized intersections.

Table 3: Intersection Measures of Effectiveness – Pence Gate Site Scenario 1 – Signalized

Signalized Intersection Location	AM Peak Hour			PM Peak Hour		
	V/C	LOS	Delay	V/C	LOS	Delay
U.S. Route 1/Belvoir Road	0.89	D	40	0.87	D	36.4
U.S. Route 1/Woodlawn Road	0.88	C	23.1	0.86	C	34.3
U.S. Route 1/Old Mill Road	1.05	F	82.4	1.01	E	68.6

Source: Gorove Slade Associates, May 2008 - **DRAFT**

Table 4: Intersection Measures of Effectiveness - Pence Gate Site Scenario 1 – Unsignalized

Unsignalized Intersection Location	Time Period	Worst Approach Delay	Worst Approach LOS	Overall Intersection Delay	Overall Intersection LOS
Belvoir Rd./employee access (TWSC)	AM	1.4	A	0.9	A
	PM	10.3	B	2.6	A

Source: Gorove Slade Associates, May 2008 - **DRAFT**

Note that this intersection does not exist in the existing nor baseline conditions

As shown above, access to the site will not deteriorate the intersection performance along Route 1. The intersections that provide access into Fort Belvoir and the Museum would still operate at LOS D or better. The intersection of Route 1, Old Mill Road and Mount Vernon Highway would operate similarly to the Baseline conditions. In Scenario 2, all visitors would access the Museum via a driveway on Belvoir Road to be located between Route 1 and the existing Pence Gate. The employees would access the site via a new driveway off of Belvoir Road, south of the existing Pence Gate. These new intersections would be unsignalized and the two driveways exiting the site would be stop-controlled via a stop-sign. **Table 5** and **Table 6** present the MOEs for the study area intersections for the Pence Gate Scenario 2, both signalized and unsignalized intersections.

DRAFT

**United States Army Museum
Draft July 9, 2008**

Table 5: Intersection Measures of Effectiveness – Pence Gate Site Scenario 2 – Signalized

Signalized Intersection Location	AM Peak Hour			PM Peak Hour		
	V/C	LOS	Delay	V/C	LOS	Delay
U.S. Route 1/Belvoir Road	0.88	D	40.8	0.92	D	42.3
U.S. Route 1/Woodlawn Road	0.80	A	9.4	0.73	B	11.7
U.S. Route 1/Old Mill Road	1.05	F	83.6	1.03	E	63.4

Source: Gorove Slade Associates, May 2008 - **DRAFT**

Table 6: Intersection Measures of Effectiveness – Pence Gate Site Scenario 2 – Unsignalized

Unsignalized Intersection Location	Time Period	Worst Approach Delay	Worst Approach LOS	Overall Intersection Delay	Overall Intersection LOS
Belvoir Rd./employee access (TWSC)	AM	1	A	0.7	A
	PM	12.5	B	2.9	A

Source: Gorove Slade Associates, May 2008 - **DRAFT**

Note that this intersection does not exist in the existing nor baseline conditions

As shown above, access to the site will not deteriorate the intersection performance along Route 1. The intersections that provide access into Fort Belvoir and the Museum would still operate at LOS D or better. The intersection of Route 1, Old Mill Road and Mount Vernon Highway would operate similarly to the Baseline conditions. However, the Feasibility Study for the Pence Gate site found that Scenario 2 is likely not feasible for several reasons. The existing Pence Gate cannot be relocated further south as desired, as the criteria for access control points require a certain distance from the Gate to the first intersection downstream. For this reason, the visitor driveway becomes too close to both Route 1 and Pence Gate, which would complicate the operations for traffic accessing either the Museum or Fort Belvoir.

Similar operational analysis was completed for the intersections affected by the Museum for the Gunston Site. **Table 7** presents the MOEs for the study area intersections for the Gunston Site under existing conditions.

Table 7: Intersection Measures of Effectiveness – 2008 Existing

Signalized Intersection Location	AM Peak Hour			PM Peak Hour		
	V/C	LOS	Delay	V/C	LOS	Delay
Fairfax County Parkway/Route 1	0.93	D	39.8	0.92	D	42.1
FCP/Kingman/Farrar	0.70	C	33.3	0.82	E	61.7
Telegraph/NB FCP ramps	0.44	B	14.5	0.66	C	20.5
Telegraph/SB FCP ramps	0.54	C	22.5	0.87	D	37.6

Source: Gorove Slade Associates, June 2008 - **DRAFT**

One intersection, per the operational analysis performed by Gorove/Slade, performs at a less than desired level of service (LOS). It is the intersection of Fairfax County Parkway and Kingman Road. Ideally, in a region such as Northern Virginia, an intersection's LOS would be "D" or better. All other intersections perform at an acceptable level of service. Using the technique to factor traffic to 2013 conditions as described previously, the 2013 baseline conditions were assessed. **Table 8** presents the MOEs for the 2013 Baseline conditions (No-Build) for the Gunston Site.

DRAFT

**United States Army Museum
Draft July 9, 2008**

Table 8: Intersection Measures of Effectiveness – 2013 Baseline

Signalized Intersection Location	AM Peak Hour			PM Peak Hour		
	V/C	LOS	Delay	V/C	LOS	Delay
Fairfax County Parkway/Route 1	1.17	F	103.6	1.05	E	64.9
FCP/Kingman	0.86	E	65.4	1.1	F	127
Telegraph/NB FCP ramps	0.61	B	17.3	0.68	C	22.3
Telegraph/SB FCP ramps	0.56	C	22.1	0.94	E	56.8

Source: Gorove Slade Associates, June 2008 - **DRAFT**

The analysis shows that intersection operational performance will deteriorate over existing conditions as no improvements are currently slated for these intersections. This deterioration is due to the background growth and not the Museum. To access the traffic impacts due to the Museum, the site traffic was layered onto the Baseline (No-Build) network, and the new roadways were added, depending on the access scenario. The signal timings were optimized with the additional site traffic, which would be appropriate as timings are routinely optimized considering the traffic flow. **Table 9** presents the MOEs for the scenario that includes the roadway that ties directly into the Fairfax County Parkway, while **Table 10** presents the MOEs for the scenario which all traffic uses Kingman Road.

Table 9: Intersection Measures of Effectiveness – Gunston Site Scenario 1

Signalized Intersection Location	AM Peak Hour			PM Peak Hour		
	V/C	LOS	Delay	V/C	LOS	Delay
Fairfax County Parkway/Route 1	1.17	F	106.1	1.1	E	76.4
FCP/Kingman	0.87	E	63.6	1.19	F	108.6
Telegraph/NB FCP ramps	0.61	B	18.6	0.7	C	23.6
Telegraph/SB FCP ramps	0.57	C	22.2	0.95	E	60.7
FCP/Museum Entrance	0.98	C	25.5	0.89	B	17.8

Source: Gorove Slade Associates, June 2008 - **DRAFT**

Table 10: Intersection Measures of Effectiveness – Gunston Site Scenario 2

Signalized Intersection Location	AM Peak Hour			PM Peak Hour		
	V/C	LOS	Delay	V/C	LOS	Delay
Fairfax County Parkway/Route 1	1.17	F	102.3	1.1	E	76.2
FCP/Kingman	0.88	D	41.4	0.97	E	61.4
Telegraph/NB FCP ramps	0.61	B	18	0.7	C	23.6
Telegraph/SB FCP ramps	0.57	C	22.1	0.95	E	60.7
Kingman/Museum Entrance	0.53	B	15.8	0.7	C	30.6

Source: Gorove Slade Associates, June 2008 - **DRAFT**

The analysis shows that the additional museum traffic would have some impact to the overall intersection MOEs along the Fairfax County Parkway, however the increases are marginal over the Baseline network. The LOS ratings does not change from Baseline to either Build scenarios. The one exception is for the intersection of Fairfax County Parkway and Kingman Road; the MOEs improve in the PM, as it was assumed that a second right turn lane would be added on the Kingman leg for exiting traffic from Fort Belvoir (only included in Scenario 2). The Feasibility Study did not indicate who would pay for this improvement. If the improvement is not included, it is expected that this intersection would operate at LOS F in the PM peak hour, as in the Baseline conditions, but with a slightly higher delay, given the additional traffic.

DRAFT

Other Information

Other studies are ongoing, that will provide further information for the site selection. The Berger-SmithGroup Team, with their subconsultant Gorove/Slade, has been conducting other analysis as identified as being needed by VDOT to ensure that the scenario of the direct connection to the Fairfax County Parkway will not be detrimental to the operations of the corridor. This study is on-going, and has not yet been completed at this time. As this would be a new signal on the Parkway, which is a limited access facility, VDOT has final say whether the proposed signal would be allowed.

Currently, on-going designs are being completed for the improvements for Route 1 and Belvoir Road to incorporate the proposed access control point for North Post, and provide intersection improvements to accommodate the BRAC Action at Fort Belvoir. At this time, the designs have not been completed, nor submitted to VDOT for approval.

Scenario 2 for the Pence Gate site is likely not feasible. Criteria for access control points need a set distance downstream from any control point to the first intersection or driveway to maintain security. Thus Pence Gate most likely cannot be relocated due to this requirement. This means that the proposed driveway for Museum visitors is too close to the existing Pence Gate, and would cause some security concerns. Therefore the driveway will not likely be able to be located at the proposed location.

Findings

Overall, the proposed action of the Museum at either site will not have detrimental impacts to operational performance of the Route 1 or Fairfax County Parkway intersections. It is expected that the intersection delays will increase slightly with the additional traffic caused by the proposed action of the Museum. The increases to the intersection delay are within acceptable ranges.

The intersection improvements identified for each of the scenarios would need to be included to ensure that operational performance of the intersections performs to the level as indicated by the Feasibility Study. Scenario 2 at Pence Gate will not be able to be implemented due to the proximity of the proposed driveway for the visitors to the existing Pence Gate and the intersection of Route 1 and Belvoir Road.

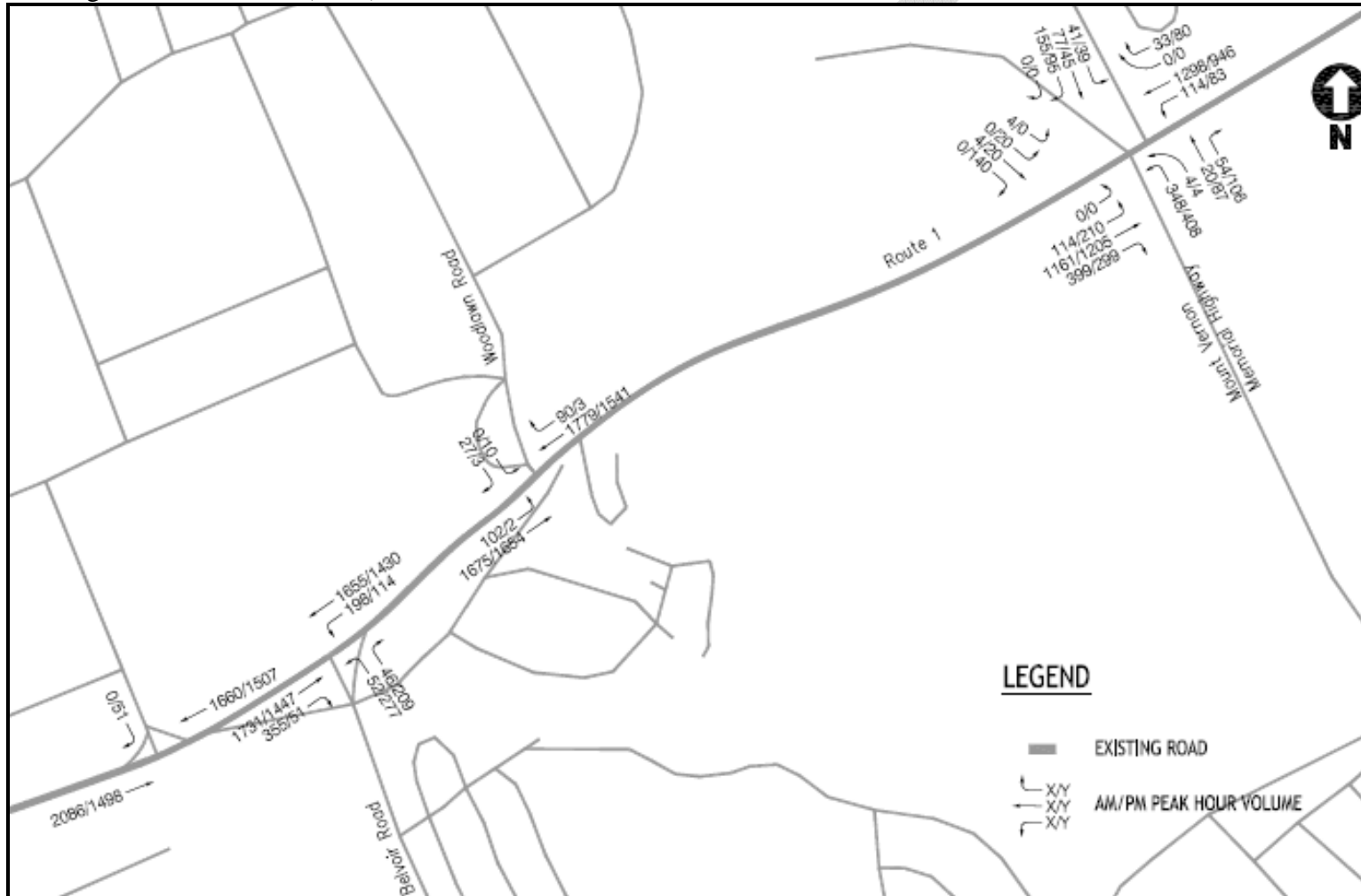
In terms of comparing one scenario to another, none of the scenarios is more of a clear front-runner over the other sites. This is due to the low volumes that the Museum site will generate during the AM and PM peak hour, as the Museum traffic represents less than 10% of the overall flow of the traffic stream.

DRAFT

United States Army Museum
Draft July 9, 2008

Appendix - Turning Movement Volumes

Pence Gate Site
Existing Traffic Volumes (2008)

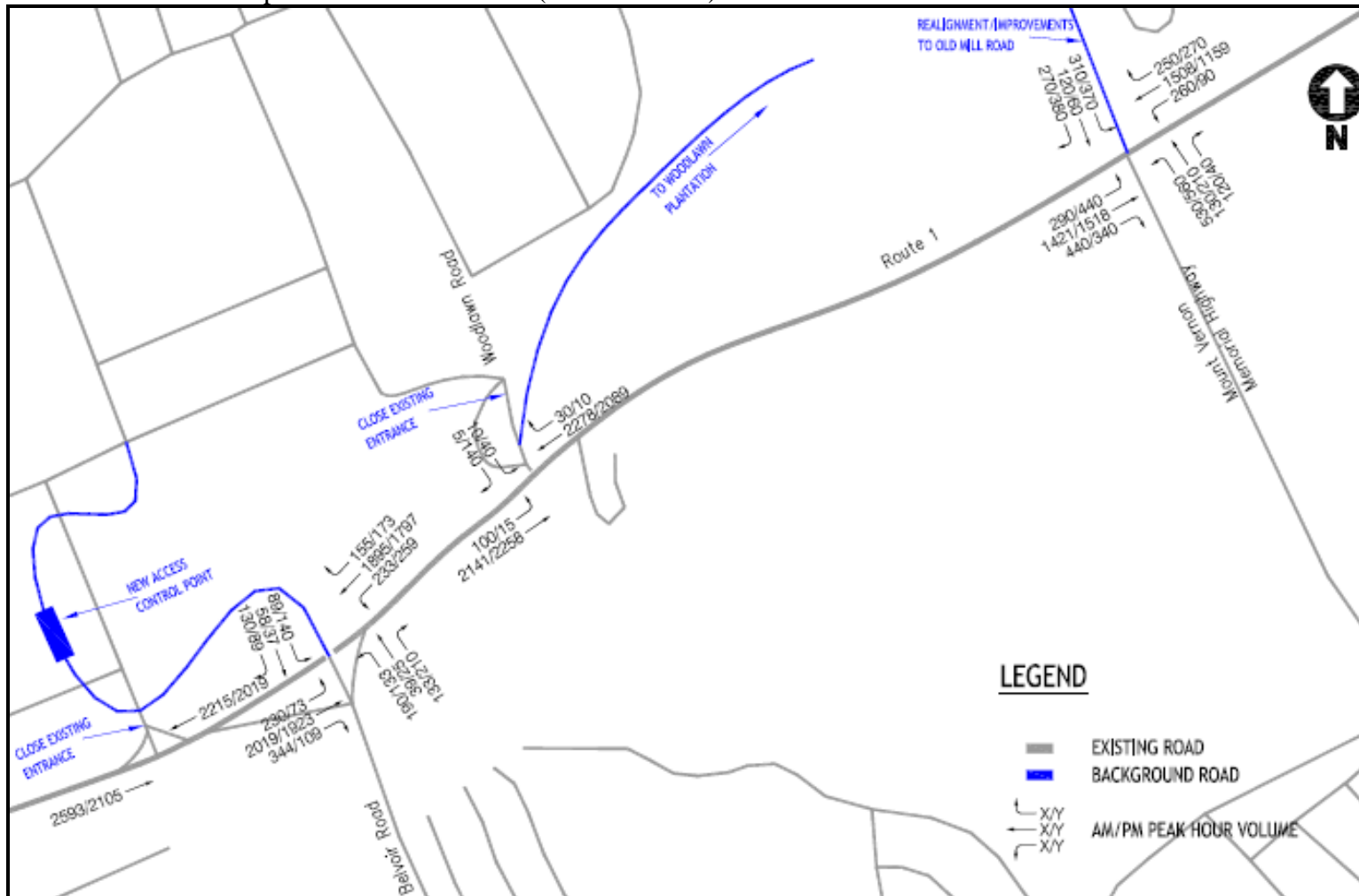


Source: Gorove Slade Associates, May 2008 - DRAFT

DRAFT

**United States Army Museum
Draft July 9, 2008**

Future without Development Traffic Volumes (2013 Baseline)

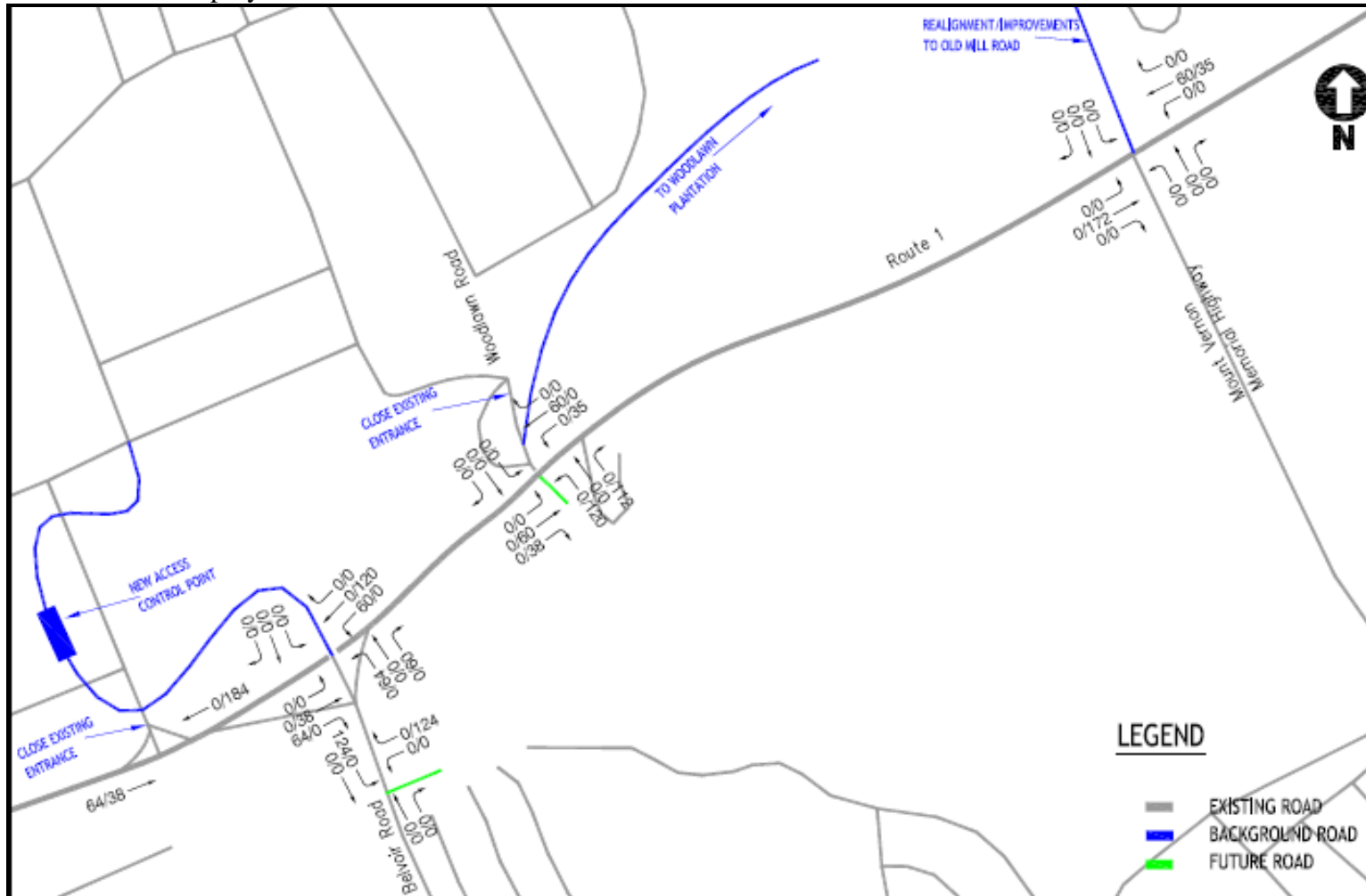


Source: Gorove Slade Associates, May 2008 - **DRAFT**

DRAFT

United States Army Museum
Draft July 9, 2008

Site Generated Traffic Volumes (2013 Pence Gate Scenario 1)
Alternative 1: Employee Access from Belvoir Road and Visitor Access from Route 1

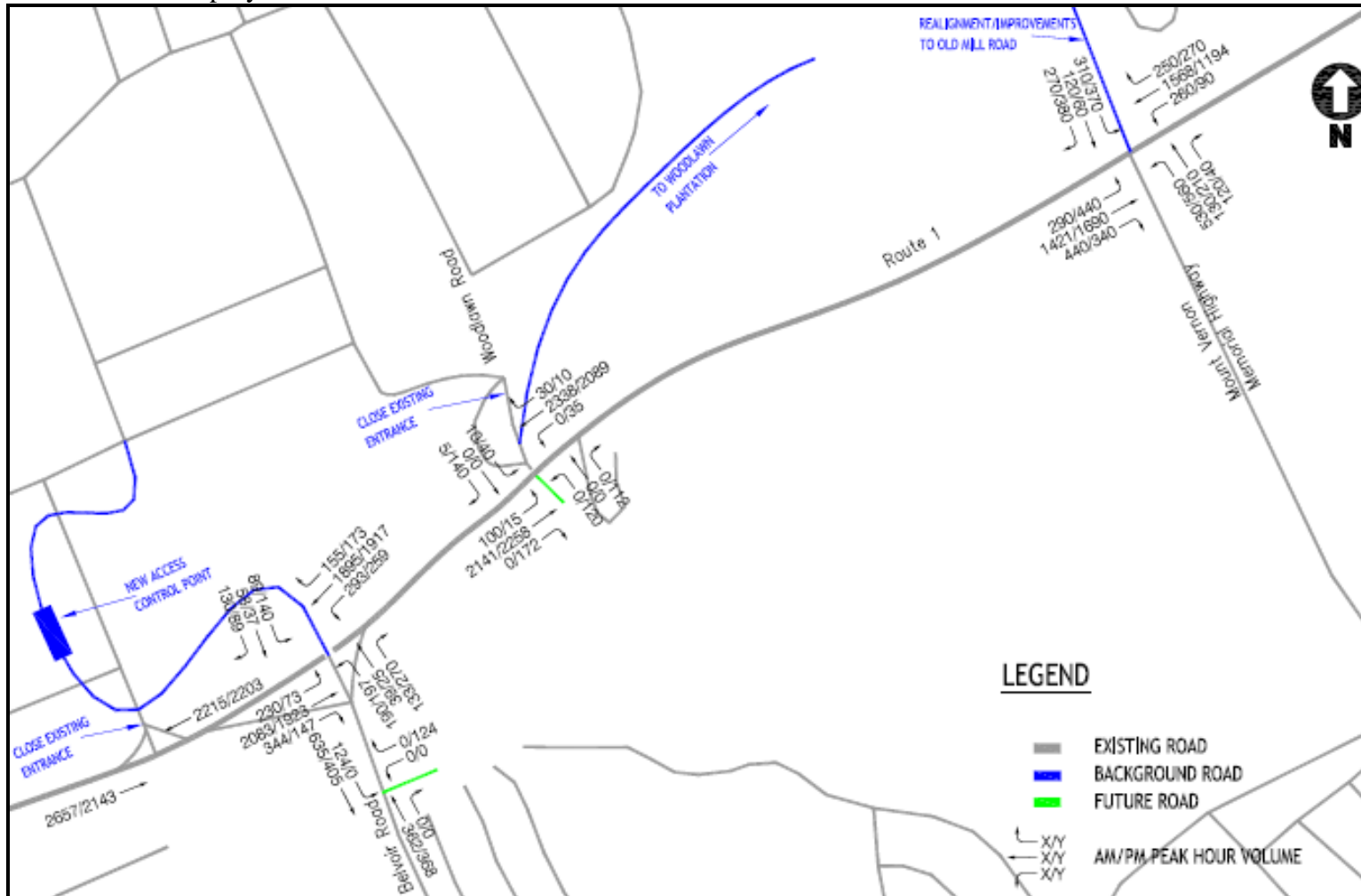


Source: Gorove Slade Associates, May 2008 - DRAFT

DRAFT

**United States Army Museum
Draft July 9, 2008**

Future with Development Traffic Volumes (2013 Pence Gate Scenario 1)
Alternative 1: Employee Access from Belvoir Road and Visitor Access from Route 1

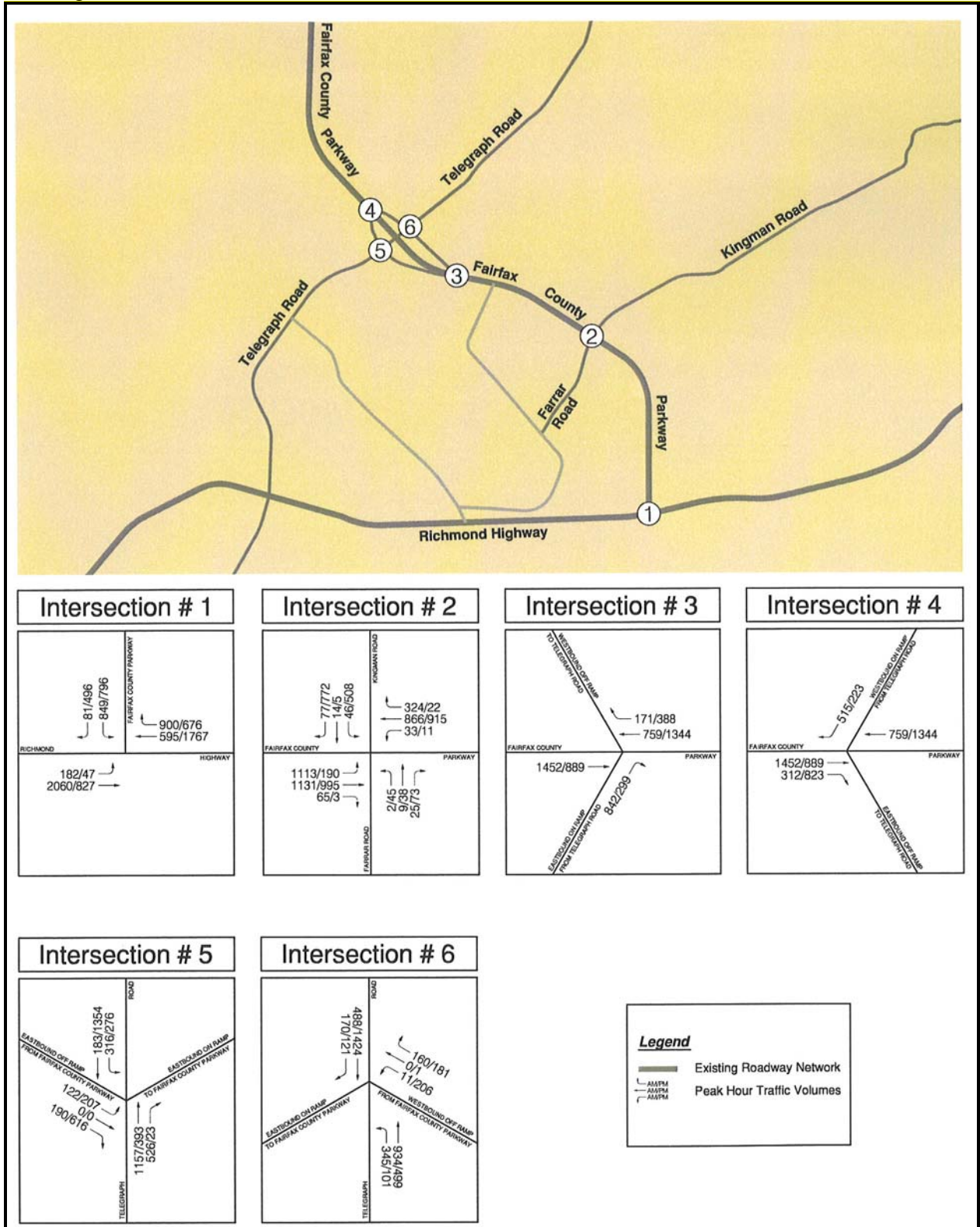


Source: Gorove Slade Associates, May 2008 - **DRAFT**

DRAFT

**United States Army Museum
Draft July 9, 2008**

Gunston Site Turning Movement Volumes
Existing Traffic Volumes (2008)

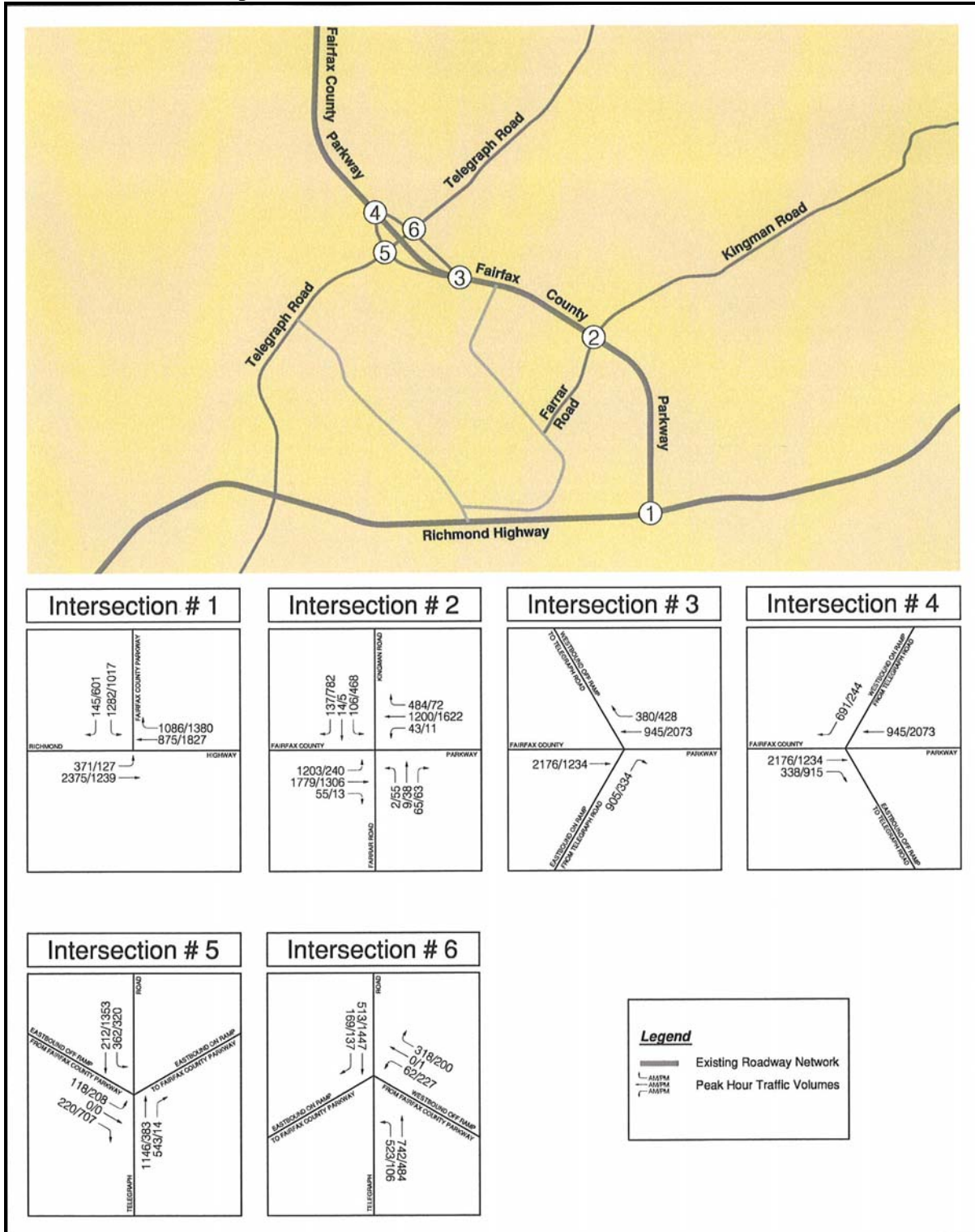


Source: Gorove Slade Associates, June 2008 - DRAFT

DRAFT

**United States Army Museum
Draft July 9, 2008**

Future without Development Traffic Volumes (2013 Baseline)

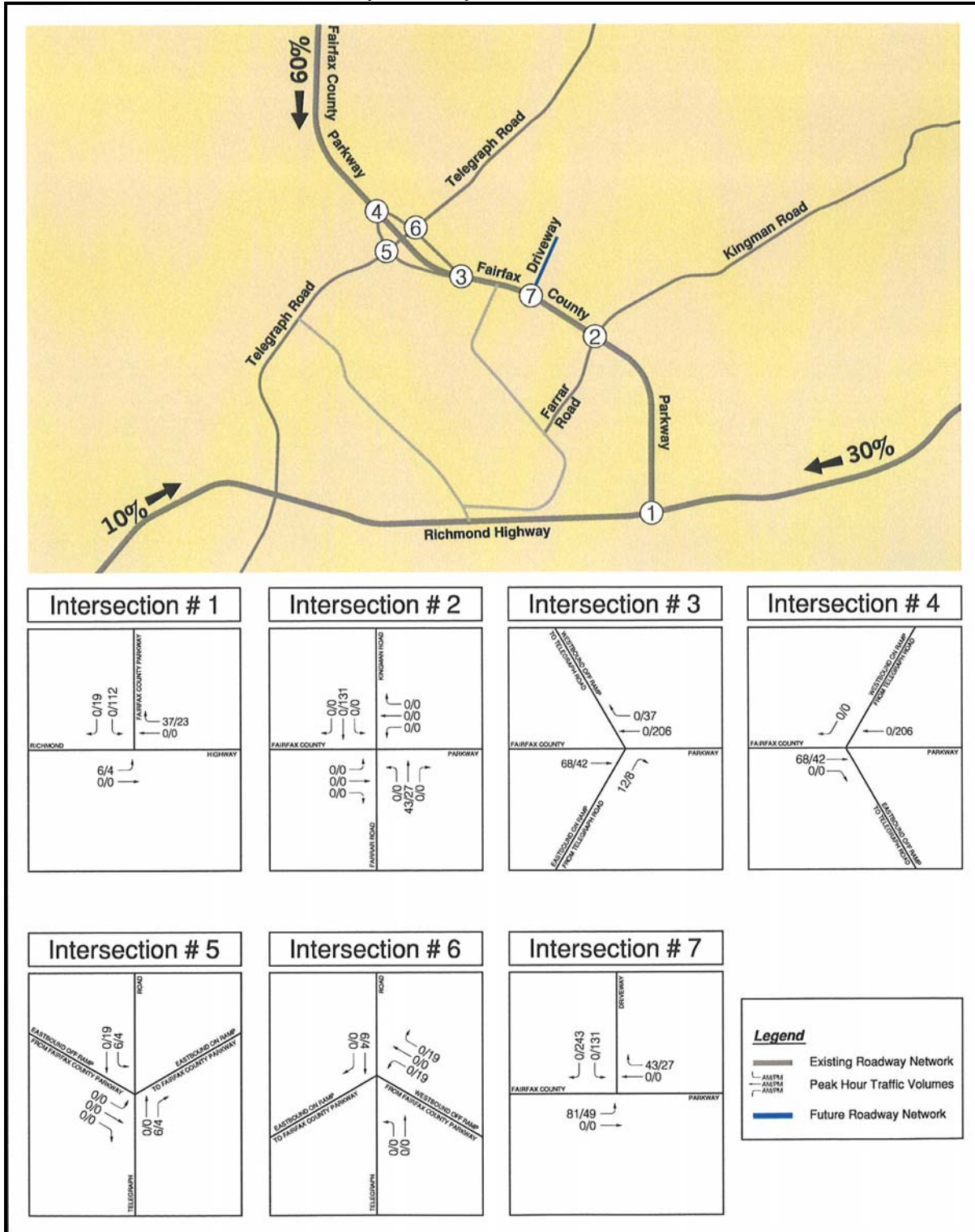


Source: Gorove Slade Associates, June 2008 - DRAFT

DRAFT

**United States Army Museum
Draft July 9, 2008**

Site Generated Traffic Volumes (2013 Gunston Site Scenario 1)
Direct connection to Fairfax County Parkway

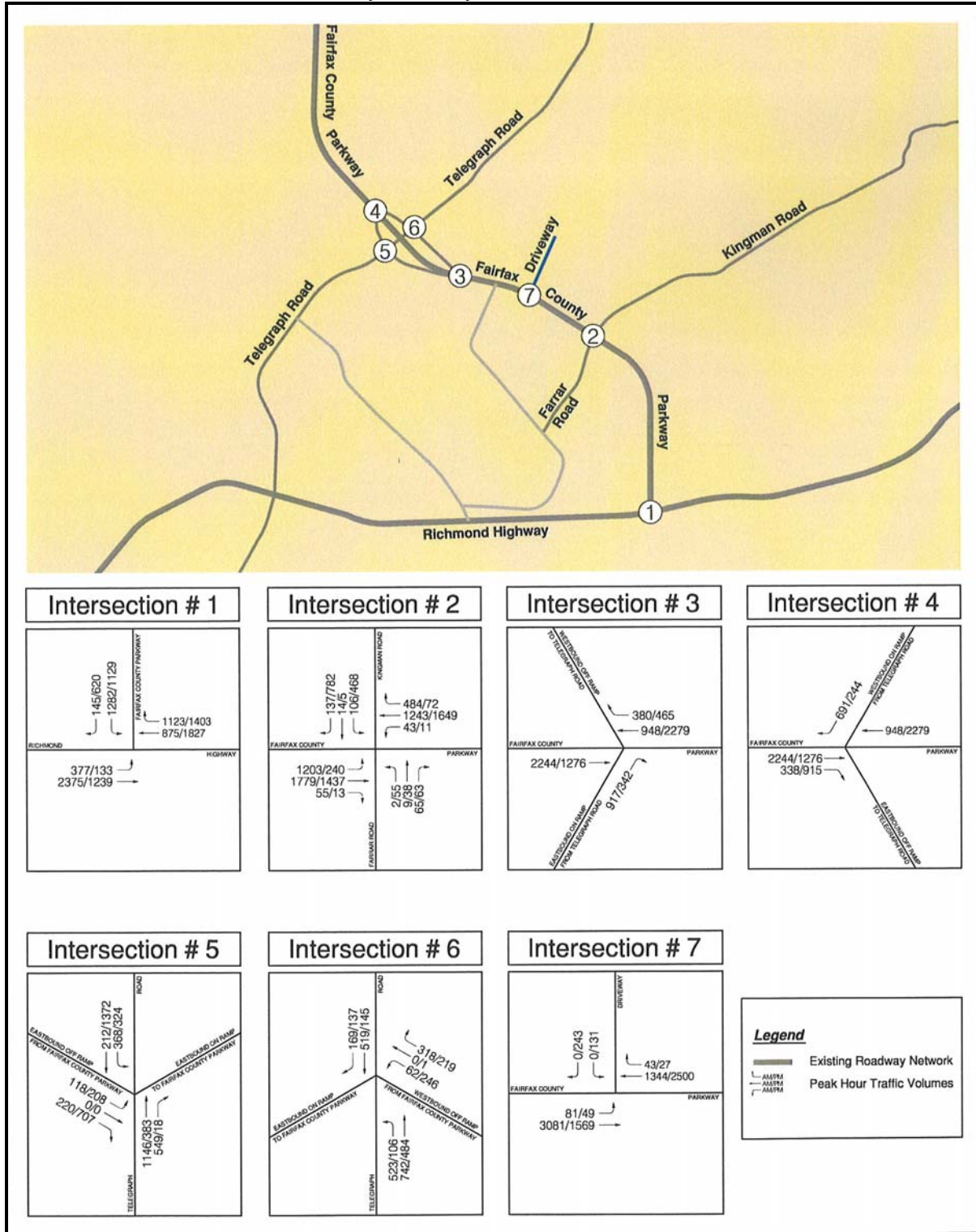


Source: Gorove Slade Associates, June 2008 - DRAFT

DRAFT

**United States Army Museum
Draft July 9, 2008**

Future with Development Traffic Volumes 2013 Gunston Site Scenario 1)
Direct connection to Fairfax County Parkway

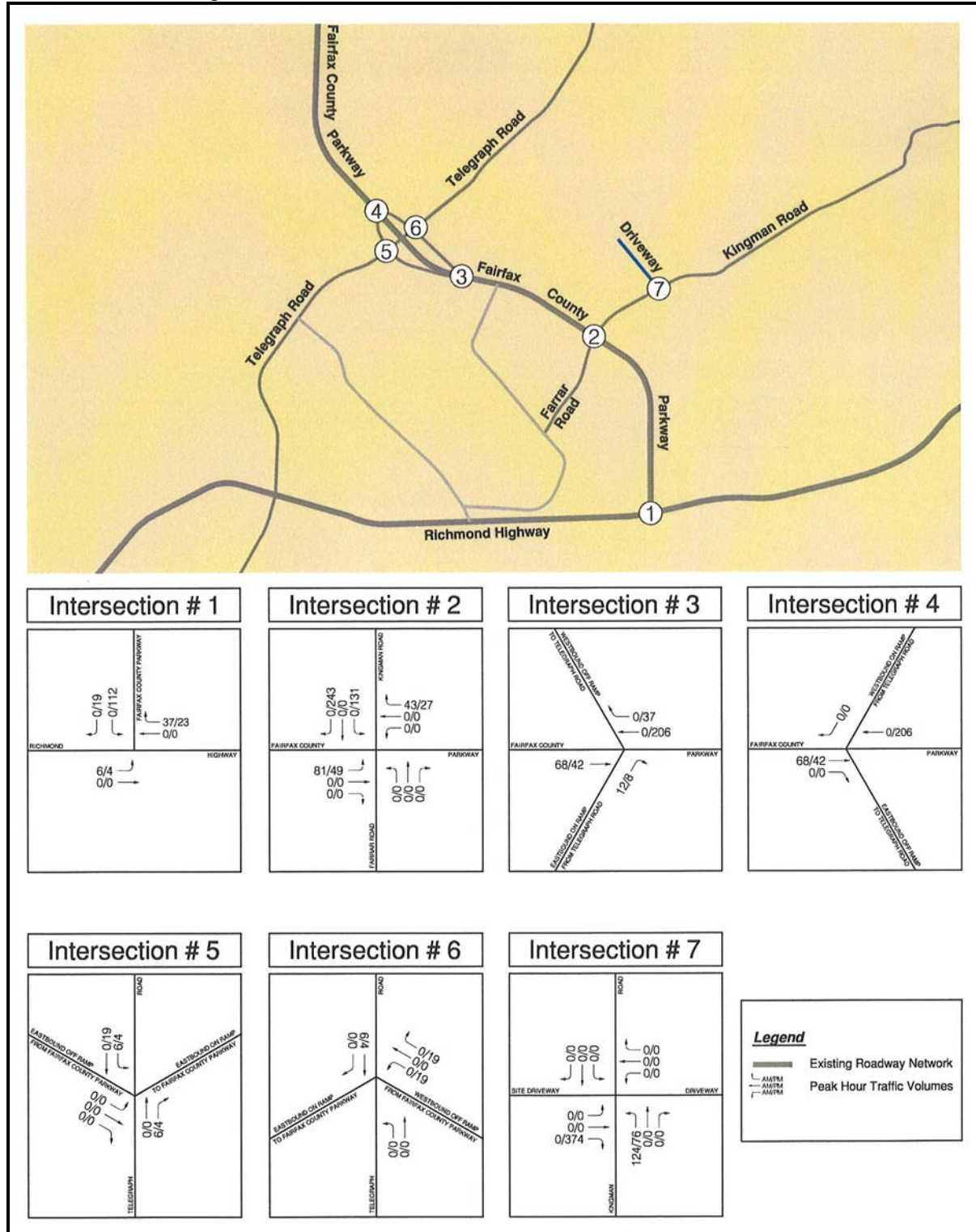


Source: Gorove Slade Associates, June 2008 - DRAFT

DRAFT

**United States Army Museum
Draft July 9, 2008**

Site Generated Traffic Volumes (2013 Gunston Site Scenario 2)
Connection via Kingman

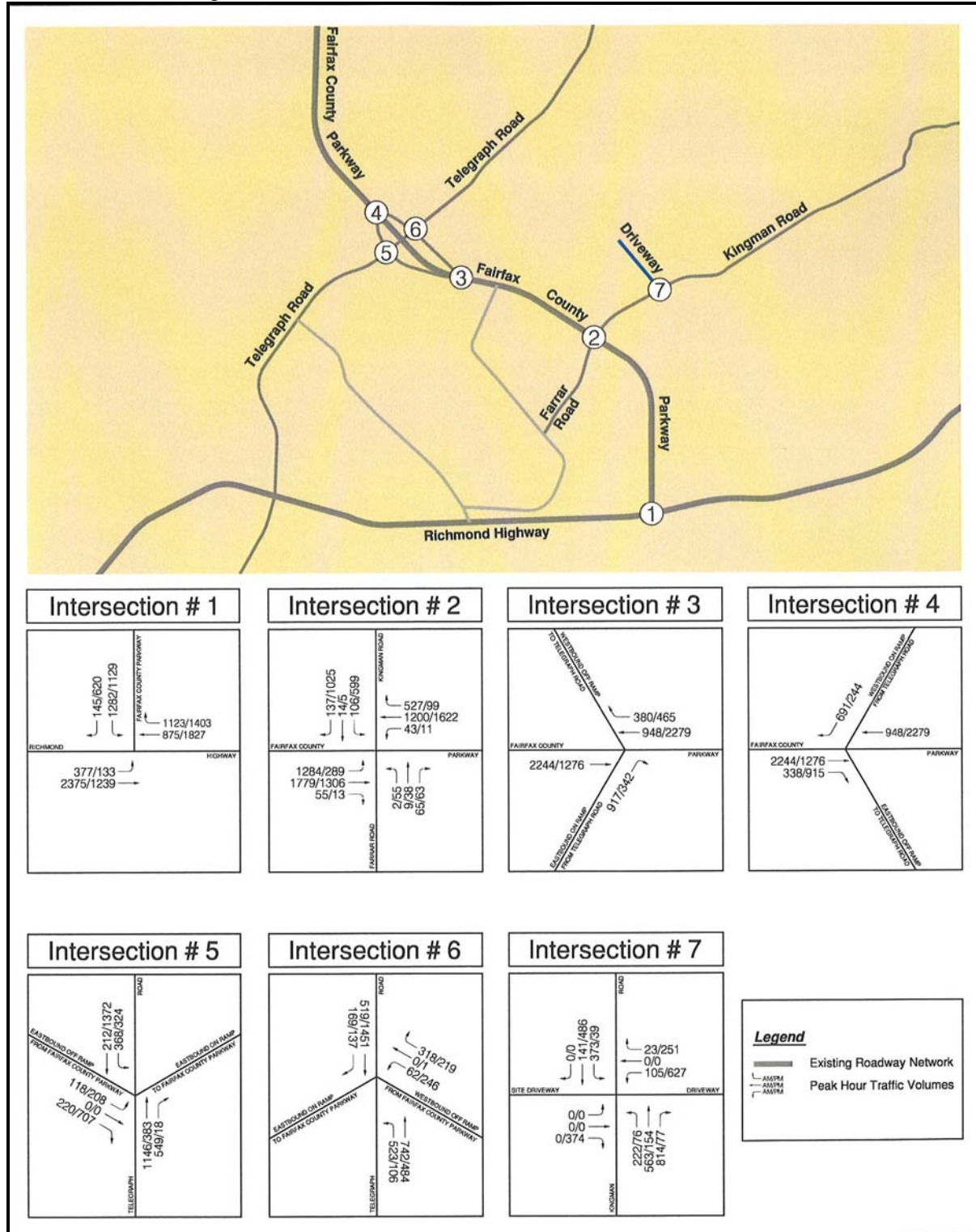


Source: Gorove Slade Associates, June 2008 - DRAFT

DRAFT

**United States Army Museum
Draft July 9, 2008**

Site Generated Traffic Volumes (2013 Gunston Site Scenario 2)
Connection via Kingman



Source: Gorove Slade Associates, June 2008 - DRAFT

DRAFT

THIS PAGE INTENTIONALLY LEFT BLANK

DRAFT