CAPITAL BELTWAY STUDY

Final ENVIRONMENTAL IMPACT STATEMENT SECTION 4(f) EVALUATION

DEPARTMENT OF TRANSPORTATION
COMMONWEALTH OF VIRGINIA

FEDERAL HIGHWAY ADMINISTRATION
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CAPITAL BELTWAY STUDY

FAIRFAX COUNTY, VIRGINIA
From: I-95/I-395/I-495 Interchange
To: American Legion Bridge

FINAL ENVIRONMENTAL IMPACT STATEMENT
FINAL SECTION 4(f) EVALUATION

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By:
U.S. Department of Transportation
Federal Highway Administration
and
Virginia Department of Transportation

Cooperating Agencies:
National Park Service
U.S. Army Corps of Engineers
U.S. Environmental Protection Agency

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Date of Approval

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The Capital Beltway Study final environmental impact statement has been prepared to determine the impact of the proposed improvements to the 14-mile section of the Capital Beltway (I-495) between the I-95/I-395/I-495 Interchange and the American Legion Bridge in Fairfax County, Virginia. The primary goals of the improvements are to provide safer and more efficient travel on the Beltway and to complete the regional HOV network.

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A Federal agency may publish a notice in the Federal Register, pursuant to 23 USC §139(l), indicating that one or more Federal agencies have taken final action on permits, licenses, or approvals for a transportation project. If such notice is published, claims seeking judicial review of those Federal agency actions will be barred unless such claims are filed within 180 days after the date of publication of the notice, or within such shorter time period as is specified in the Federal laws pursuant to which judicial review of the Federal agency action is allowed. If no notice is published, then the periods of time that otherwise are provided by the Federal laws governing such claims will apply.

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SUMMARY

S.1 PROJECT DESCRIPTION AND LOCATION

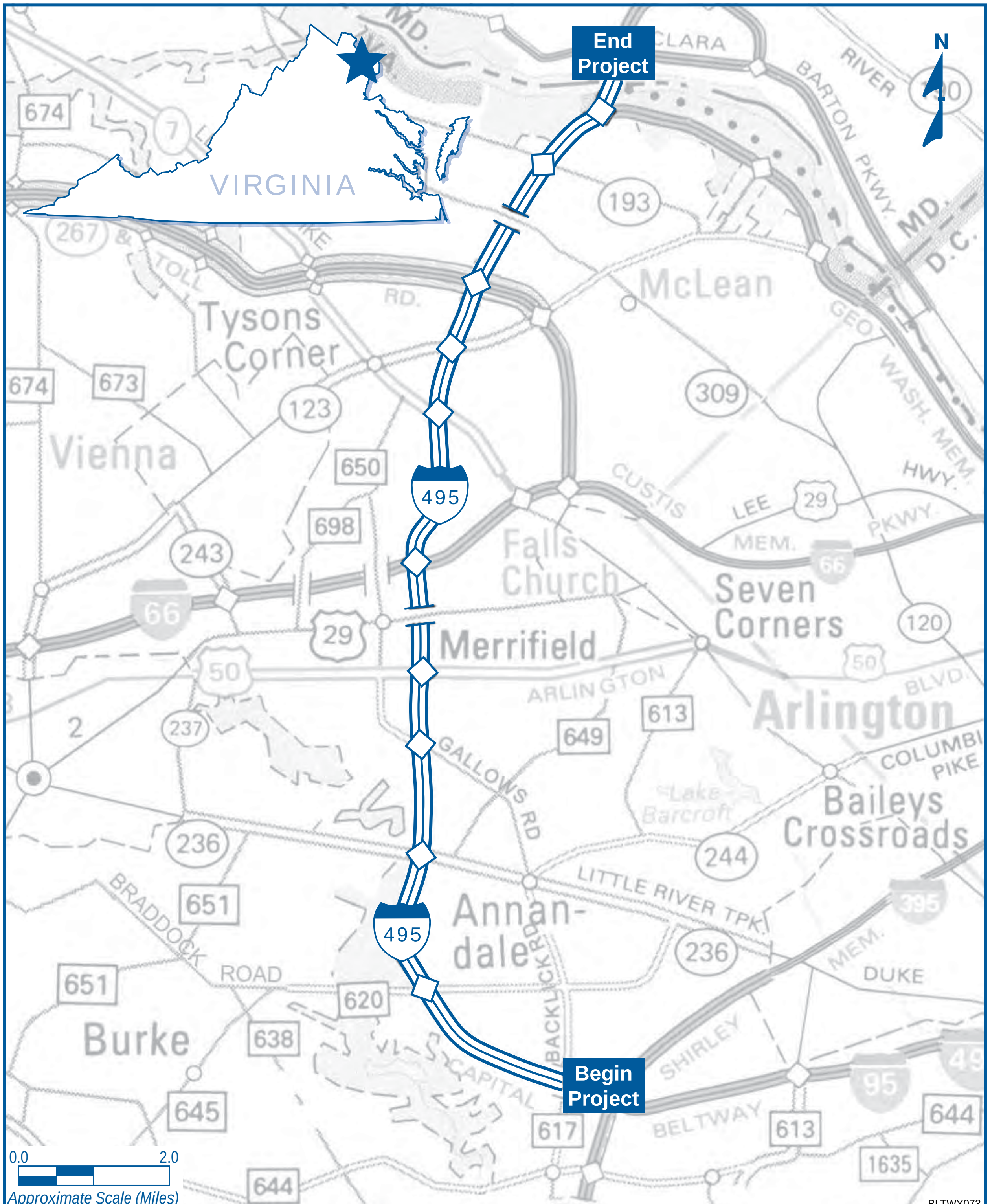
The Federal Highway Administration (FHWA), in conjunction with the Virginia Department of Transportation (VDOT), proposes to improve the Capital Beltway (I-495) in Fairfax County, Virginia, between the I-95/I-395/I-495 interchange and the American Legion Bridge. The project is located in Northern Virginia, as shown in **Figure S-1**. Improvements are needed to increase the Beltway's capacity to accommodate expected growth in daily traffic volumes and remedy current congestion, operational, and safety problems on this critical link in the region's transportation system.

S.1.1 Background

Constructed as part of the interstate highway system, the Beltway was originally designed to serve through traffic bypassing Washington, D.C. However, since its completion in 1964, the growth of the Washington, D.C. metropolitan area and changes in travel patterns have made the Beltway an integral part of the regional transportation system. Instead of functioning as a bypass, the Beltway is now used primarily for travel to and from destinations within the region. Each day hundreds of thousands of local residents use the Beltway to get to work, shop, and travel throughout the metropolitan area.

S.1.2 Project Termini

The proposed improvements to the Beltway and its interchanges would extend for about 14 miles from Backlick Road to the American Legion Bridge over the Potomac River. The FHWA has determined that these termini are logical and that improving this portion of the Beltway has independent utility. The project also would include improvements to portions of 10 roadways that intersect and connect to the Beltway via existing interchanges at Braddock Road, Little River Turnpike, Gallows Road, Arlington Boulevard, Interstate 66, Leesburg Pike, Chain Bridge Road, Dulles Access/Toll Road, Georgetown Pike, and the George Washington Memorial Parkway. Modifications to these roadways would be necessary to properly integrate the proposed Beltway and interchange improvements with existing (or planned) roadway designs and traffic patterns. Improvements to the remainder of the Beltway in Virginia and to the Maryland Beltway are not included as part of this project.



PROJECT LOCATION Figure S-1

CAPITAL BELTWAY STUDY

S.2 PURPOSE AND NEED FOR ACTION

The Beltway provides connections to other major roadways within the Washington, D.C. region and carries more traffic than any other road in Virginia. Although there have been incremental improvements to correct specific safety and operational problems during its 42 years of operation, the last major improvements to the Beltway were completed in 1977, when it was widened from four to eight lanes. Because of its role as a key link in the region's transportation system, major improvements to the Beltway have been recommended in local, regional, and state transportation plans for almost a decade. Factors contributing to the need for Beltway improvements are listed in **Table S-1**.

Table S-1
PURPOSE AND NEED FOR BELTWAY IMPROVEMENTS

Purpose of the Beltway Improvements	Why Improvements Are Needed
1. Provide safer and more efficient travel on the Beltway.	▪ Accidents on the Beltway are increasing. ▪ Congestion and the current roadway design are the cause of many accidents. ▪ Beltway travel speeds are decreasing. ▪ Travel times and the length of back-ups on the Beltway are increasing.
2. Correct substandard roadway and interchange design.	▪ Beltway and interchanges were not designed to handle current traffic volumes. ▪ Many interchanges and portions of Beltway do not meet current engineering and safety standards.
3. Ease Beltway congestion and reduce "cut-through" traffic on local roadways and neighborhood streets.	▪ Expansion of the regional roadway network has not kept pace with population and employment growth. ▪ Major capacity improvements to the Beltway have not been made in almost 25 years. ▪ Beltway congestion spills over to adjacent roadways. ▪ Congestion levels will worsen in the future.
4. Complete the regional HOV roadway network and enhance connections with other regional roadways.	▪ Beltway serves both local and through traffic. ▪ Regional HOV system is incomplete; Beltway link between existing HOV facilities is missing. ▪ Beltway is important to regional freight movement.
5. Expand availability of mass transit options and improve access to other transportation modes.	▪ Transit on the Beltway would increase its capacity and enhance mobility. ▪ Existing Beltway does not support effective express bus operations. ▪ Beltway provides access to other transportation modes and facilities.
6. Accommodate growing travel demand and changes in regional trip characteristics.	▪ Changing demographics and employment patterns are increasing the number of trips made each day. ▪ Suburb-to-suburb trips are on the rise. ▪ Combined trips (with intermediate stops) are increasing. ▪ Most trips in the region are made by automobile.

Table S-1
PURPOSE AND NEED FOR BELTWAY IMPROVEMENTS

Purpose of the Beltway Improvements	Why Improvements Are Needed
7. Better serve the diverse mix of land uses and improve access to regional activity centers in Fairfax County.	▪ Fairfax County has urbanized rapidly since 1975. ▪ New development is occurring primarily in suburban areas. ▪ Non-residential land uses are increasing. ▪ Density of suburban activity centers is increasing. ▪ Additional development is already approved to take place as provided for in Fairfax County's land use plan.
8. Preserve key link in transportation system that sustains regional economy.	▪ Fairfax County is major employment center. ▪ Most new jobs and businesses are being created in the suburbs. ▪ Work force changes are increasing travel demand. ▪ Congestion has economic costs. ▪ Regional employment to grow substantially over the next 20 years.
9. Meet the transportation needs of a growing population.	▪ Population of Northern Virginia has increased 50 percent since 1980. ▪ Center of region's population has shifted to Fairfax County. ▪ Population will grow another 40 percent by 2020. ▪ Number of households is growing even faster than the population.
10. Upgrade the region's transportation infrastructure in accordance with local and regional plans.	▪ Improvements to the Beltway have been recommended for more than a decade by local governments, regional planning agencies, and state transportation officials.

S.3 ALTERNATIVES

A wide range of improvement alternatives was considered throughout the course of this study. The alternatives were identified and evaluated through an iterative screening process in cooperation with citizens, local and regional planning agencies, and a technical study team. Except for the No-Build Alternative, alternatives deemed not reasonably capable of meeting the identified needs were eliminated from further consideration. While required by National Environmental Policy Act regulations, the No-Build Alternative was also studied in detail because it illuminates the need for improvements and serves as a baseline for comparing the other alternatives. Alternatives that were deemed too disruptive in comparison to the transportation benefits they would provide were also eliminated from further consideration. Thus, the range of alternatives considered in detail in the Draft EIS included the No-Build (or no-action) Alternative and three Candidate Build Alternatives for expanding and reconfiguring the total number of lanes on the Beltway: the Concurrent HOV Alternative (10 through lanes), the Express/Local with HOV Alternative (10 through lanes), and the Barrier-Separated HOV Alternative (12 through lanes). Multiple options for interchange configurations along the length of the mainline alternatives were also examined.

Based on the comments received from the general public and local government about the Draft EIS, the three Candidate Build Alternatives, as well as the various interchange options, were substantially revised to reduce their costs and impacts. The required right-of-way for mainline improvements was reduced by minimizing shoulders and utilizing painted buffer strips where barrier medians had been proposed before. The footprints of proposed interchange improvements were reduced as much as feasibly possible without undermining the effectiveness of those improvements. Finally, each of the three revised Candidate Build Alternatives was re-evaluated, both on its own and with High Occupancy Toll (HOT) lane operations, resulting in a six "new" alternatives. These six alternatives were narrowed to the two most promising, and the Preferred Alternative was selected from these.

S.3.1 Alternatives Development

The Major Investment Study (MIS) findings were summarized in the January 1997 *MIS Results Report: The Framework for Beltway Improvements* (see Executive Summary in Appendix A). The report described the identification and evaluation of a number of approaches, or strategies, for achieving four primary goals with respect to the Capital Beltway. Reasonable alternatives for further study were identified by translating the general MIS strategies into specific physical improvements, entailing a complex interplay among engineering, traffic, and environmental considerations, while also keeping in mind the identified transportation needs in the Beltway corridor. First, better management of the overall Beltway was explored. Second, it was necessary to establish the amount of additional capacity needed to fully accommodate projected traffic volumes, and the amount that could reasonably be added before the level of community disruption would become unacceptable. Third, existing design features would need to be updated in accordance with current design standards. Fourth, direct access to the Beltway had to be provided for HOV traffic. **Table S-2** summarizes the factors considered in developing the three-part improvement concepts consisting of mainline roadway, interchanges, and direct HOV access.

Table S-2
FACTORS CONSIDERED IN THE DEVELOPMENT OF ALTERNATIVES

Roadway Configurations	Interchange Improvements	Direct HOV Access
▪ Type of Lanes and Lane Configuration (Layout)	▪ Travel Patterns and Interchange Capacity	▪ Interchange Locations for Direct HOV Ramps
▪ Total Number of Lanes	▪ Connections with Intersecting Roadways	▪ HOV/Express Bus to General Purpose Lane Connections
▪ Traffic Operations and Safety	▪ Compatibility with Roadway Modifications	▪ Express to Local Lane Connections
▪ Environmental and Community Concerns	▪ Safety Enhancements	▪ Environmental and Community Concerns
	▪ Environmental and Community Concerns	

***Roadway Configurations*.** Four different roadway configurations were found to meet the design criteria: Concurrent HOV, Express/Local with HOV, Express/Local, and Barrier-Separated HOV, Fourteen variations of mainline alternatives with different lane configurations were developed from these four mainline options, as listed in **Table S-3**. Through a multi-level screening process, the mainline concepts were reduced in iterative steps to a manageable and representative number that was evaluated in the Draft EIS. Eliminated were those concepts that were clearly inferior to similar alternatives based on operations, cost of construction, and impact to the surrounding environment.

Table S-3
MAINLINE IMPROVEMENT CONCEPTS

Concept	Mainline Improvement Concepts Considered in the Draft EIS		Draft EIS Candidate Build Alternatives		Revised Mainline Improvement Concepts		Preferred Alternative	
	Number of Through Lanes	Lane Config.	Number of Through Lanes	Lane Config.	Number of Through Lanes	Lane Config.	Number of Through Lanes	Lane Config.
Concurrent HOV	10	5-5	10	5-5	-	-	-	-
Revised 10-Lane HOV	-	-	-	-	10	4-1-1-4	-	-
Barrier-Separated HOV	10	4-1-1-4	-	-	-	-	-	-
	12	4-2-2-4	12	4-2-2-4	12	4-2-2-4	-	-
	12	5-1-1-5	-	-	-	-	-	-
Express/Local	10	2-3-3-2	-	-	-	-	-	-
	10	3-2-2-3	-	-	-	-	-	-
	12	2-4-4-2	-	-	-	-	-	-
	12	3-3-3-3	-	-	-	-	-	-
	12	4-2-2-4	-	-	-	-	-	-
Express/Local with HOV	10	3-2-2-3	-	-	-	-	-	-
	10	2-3-3-2	10	2-3-3-2-	10	2-3-3-2	-	-
	12	2-4-4-2	-	-	-	-	-	-
	12	3-3-3-3	-	-	-	-	-	-
	12	4-2-2-4	-	-	-	-	-	-
High Occupancy Toll Lanes	-	-	-	-	10	4-1-1-4	-	-
	-	-	-	-	10	3-2-2-3	-	-
	-	-	-	-	12	4-2-2-4	12	4-2-2-4

Interchange Options. The 14-mile segment of the Beltway between Springfield and the American Legion Bridge provides connections to a major interstate highway (I-66), limited access highways (Dulles Access/Toll Road and George Washington Memorial Parkway), and local primary roads via ten interchanges. Modifications to these interchanges and intersecting roadways would be needed to accommodate and enhance the proposed Beltway improvements. For each interchange, existing conditions were analyzed and various ways to improve traffic operations and safety were developed. A range of improvements was considered, as shown in **Table S-4**. The same multi-level screening process that was applied to the mainline concepts was also used to select the most viable interchange concepts.

Table S-4
INTERCHANGE IMPROVEMENT CONCEPTS

Interchange	Interchange Concepts Considered in the Draft EIS	Interchange Concepts Considered for Inclusion in Preferred Alternative*	Preferred Concept
Braddock Road	▪ A – Cloverleaf with Center HOV ▪ B – Cloverleaf with Center HOV ▪ C – Cloverleaf with Reversible HOV ▪ D – Cloverleaf with Directional HOV ▪ E – Partial Cloverleaf with Center HOV	▪ E – Partial Cloverleaf with Center HOV ▪ Revised E – Partial Cloverleaf with Center HOV	*Revised E – Partial Cloverleaf with Center HOV*
Little River Turnpike	▪ A – Partial Cloverleaf with Directional Ramps ▪ B – Partial Cloverleaf ▪ C – Single Point Diamond ▪ D – Cloverleaf with Directional Ramps ▪ E – Improved Cloverleaf ▪ F – Partial Cloverleaf with Directional Ramps ▪ G – Three-Level Urban Diamond	▪ B – Partial Cloverleaf (“Option 2”) ▪ Revised D – Cloverleaf with Directional Ramps (“Option 1”) ▪ E – Improved Cloverleaf	*E – Improved Cloverleaf*
Gallows Road	▪ A – Improved Partial Diamond ▪ B – Partial Clover/Partial Diamond ▪ C – Full Diamond	▪ Revised A – Improved Partial Diamond with No Improvements to west bound Gallows Road Auxiliary Lane ▪ Revised A, Option 1 – Improved Partial Diamond with Improvements at Woodburn Road (“Option 1”) ▪ C – Full Diamond	*Revised A – Improved Partial Diamond with No Improvements to west bound Gallows Road Auxiliary Lane*
Arlington Boulevard	▪ A – Improved Full Cloverleaf	▪ A – Improved Full Cloverleaf	*A – Improved Full Cloverleaf*
Interstate 66	▪ A – Directional with Full Movements** ▪ B – Directional with Full Movements** ▪ C – Directional with Partial SOV Movements ▪ D – Directional with Partial SOV Movements ▪ E – Directional with Full Movements ▪ F – Directional with Full Movements ▪ G – Directional with Full Movements	▪ A – Directional with Full Movements** ▪ B – Directional with Full Movements** ▪ C – Directional with Partial SOV Movements ▪ E – Directional with Full Movements ▪ Modifications to Existing Interchange	*Modifications to Existing Interchange*

Table S-4
INTERCHANGE IMPROVEMENT CONCEPTS

Interchange	Interchange Concepts Considered in the Draft EIS	Interchange Concepts Considered for Inclusion in Preferred Alternative*	Preferred Concept
Leesburg Pike	▪ A – Directional ▪ B – Directional ▪ C – Directional ▪ D – Directional ▪ E – Partial Cloverleaf	▪ B – Directional ▪ Modifications to Existing Full Cloverleaf Interchange	*Modifications to Existing Full Cloverleaf Interchange*
Chain Bridge Road	▪ A – Partial Cloverleaf ▪ B – Partial Cloverleaf ▪ C – Partial Cloverleaf ▪ D – Partial Cloverleaf ▪ E – Partial Cloverleaf ▪ F – Partial Cloverleaf ▪ G – Partial Cloverleaf ▪ H – Mainline Shift	▪ C – Partial Cloverleaf ▪ Revised C – Partial Cloverleaf with Modified Loop Ramp in Southwest Quadrant ▪ Option 1 – Partial Cloverleaf with Flyover Ramp and Modified Loop Ramp in Southwest Quadrant ▪ Option 2 – Partial Cloverleaf with Flyover Ramp	*Revised C – Partial Cloverleaf with Modified Loop Ramp in Southwest Quadrant*
Dulles Access/Toll Road	▪ A – Directional ▪ B – Directional ▪ C – Directional ▪ D – Directional ▪ E – Directional	▪ B – Directional ▪ E – Directional ▪ Modifications to Existing Interchange	*Modifications to Existing Interchange*
Georgetown Pike	▪ A – Diamond ▪ B – Partial Cloverleaf	▪ A – Diamond ▪ Revised A – Diamond	*Revised A – Diamond*
GW Parkway	▪ A – Trumpet	▪ None	*None*

*Note: Includes all interchange options carried forward for detailed evaluation in the Draft EIS, as well as those developed after publication of the Draft EIS in an effort to minimize the impacts of the proposed improvements. Interchange options that are the same as those developed during initial screening are called by same name as in Table 2-3. If an alternative was referred to by a different name during preferred concept selection, that name is given in parentheses.

**Concept A applies only to the Concurrent HOV [5-5] mainline; Concept B is identical in design and applies to all other mainline alternatives.

Direct HOV Access. Direct access to the proposed HOV lanes via dedicated ramps was included in the improvement concepts for all interchanges that connect to existing (or planned) HOV roadways in the project area: Braddock Road, Interstate 66 and the Dulles Access/Toll Road. HOV access also was included in each of the improvement concepts for the Chain Bridge Road interchange to improve access to the Tysons Corner area. In addition, HOV access at the Lee Highway (Route 29) providing access to the Merrifield area was developed. It should be noted that Direct HOV access at locations with no facilities may also be beneficial by encouraging increased use of the HOV system and by allowing buses to access these locations more efficiently.

Following the development and refinement of various improvement concepts, a three-level screening process was used to identify the best-performing concepts, which could then be evaluated in greater detail. Concepts remaining at the end of the screening process were combined into complete "end-to-end" improvement alternatives consisting of 1) a specific lane configuration (e.g., Concurrent HOV), 2) improvements for each interchange, and 3) new direct access points for HOV traffic. The development of alternatives for the proposed Beltway improvements was coordinated with federal, state, and local agencies, citizens, interest groups, civic organizations, and businesses. VDOT encouraged agency and public participation throughout the study process.

Each level of the screening process concluded with a presentation of the preliminary concepts and/or alternatives to the Beltway Study Team. This multi-agency group provided comments and recommendations throughout the course of developing and evaluating alternatives. The results of the Study Team's efforts also were presented to the general public in the form of individual group meetings as well as two sets of public workshops.

Refinement of Alternatives Based on Comments on the Draft EIS. After the publication of the Draft EIS, three public hearings were held in May 2002 to elicit comments from citizens, local agencies, and organizations on the Candidate Build Alternatives considered and their effects. Although each of the Candidate Build Alternatives studied in the Draft EIS satisfied the purpose and need for improvements, comments from the general public and local government suggested that the cost and environmental impacts associated with these alternatives were more than they were willing to bear. In response, each of the build alternatives was scaled back significantly to lessen both costs and impacts on the surrounding community. The most significant reduction in impacts was found in residential displacements. Whereas the original Candidate Build Alternatives would potentially displace between 206 and 294 residences, the “scaled back” alternatives are estimated to only displace 3 to 10 residences.

Right-of-way requirements for each of the alternatives were reduced by minimizing shoulders and replacing physical barriers with painted strips, as well as reducing improvements to interchanges. For instance, the typical cross section for the original Barrier-Separated HOV alternative was 226 feet wide; shoulders and barrier modifications reduced the width to approximately 202 feet. However, the most notable reductions in right-of-way requirements involved minimizing improvements to interchanges. All of the interchange improvements evaluated in detail in the Draft EIS were revisited; most were revised to lessen impact on surrounding area, and a Preferred Concept for each interchange was selected. These preferred interchange concepts are detailed in Section 2.2.2.

In addition to the design modifications to the proposed mainline and interchange improvements, each of the three Candidate Build Alternatives was also evaluated for High Occupancy Toll lane operations. As a result, six modified alternatives were developed: the three original mainline concepts, with and without HOT lanes. Of the six alternatives initially considered, two were identified as the most promising and were evaluated further, including the Revised 10-Lane Concurrent HOV Alternative and the Revised 12-Lane HOT Managed Lanes Alternative. The two revised alternatives were presented at a series of public information meetings in June 2004.

S.3.2 Alternatives Considered and Eliminated

As a result of the alternatives refinement and screening, several of the improvement concepts initially considered were eliminated from further consideration:

Conversion of Existing Beltway Lanes to HOV or HOT. The possibility of converting a general-purpose lane to either an HOV or HOT lane was considered in conjunction with a number of alternatives. However, based on the current and projected travel demand in the corridor, a reduction in the number of general-purpose lanes was not recommended. Some level of peak period congestion in the general purpose lanes is desirable in order to achieve effective utilization of the HOV or HOT lanes. However, too much congestion will increase an already high level of "cut-through" traffic in neighborhoods adjacent to the Capital Beltway. It is essential that when first opened that there be both a direct benefit to the users of the HOV or HOT lane and no deterioration in the LOS for the general-purpose lanes.

When projects have opened with an increase in overall congestion, the conversion of general purpose lanes to special use lanes has not been well received in Virginia and elsewhere throughout the country (most recently in Minneapolis). A public backlash could easily undermine an otherwise successful project. With the Preferred Alternative, if the HOT lanes are well utilized and demand grows, the Beltway could be re-striped in the future to provide three general purpose lanes and three HOT lanes in each direction.

Rail Transit. The MIS analyses included a circumferential rail system running the entire length of the Beltway. It was concluded that implementation of a rail transit system serving the Beltway corridor would not preclude the need for other improvements to the Beltway. Rail transit's impact on vehicular travel demand for specific roadways within the region is small, and a large proportion of Beltway trips, which are local and intra-regional trips, are not conducive to transit use. Nevertheless, additional rail transit in the region is desirable and will be advanced independently of the Beltway improvements.

Express Bus Service. The MIS analyses also encompassed express bus services in the Beltway corridor. However, it was concluded that implementation of such services alone would not preclude the need for other improvements to the Beltway. Bus transit trips represent only about 2 percent of the total person trips in the region. Transit options were shown to have a limited effect in reducing Beltway traffic volumes. Nevertheless, the mobility improvements and HOV facilities that would be provided by the proposed project are expected to enhance opportunities for making bus transit more competitive.

Transportation System Management. A capital-intensive Transportation System Management (TSM) alternative would involve actions designed to improve traffic operations and maximize the efficiency of the existing roadway network, such as optimizing traffic signal timing. Evaluation of traffic, operational, safety, and environmental factors showed that implementing the TSM alternative alone would not meet the project's purpose and need for several reasons, including the fact that daily vehicle trips and traffic volumes on the Beltway would be reduced by less than 1 percent.

Beltway Mainline Configurations. Eleven of the original mainline alternatives shown in Table S-3 were eliminated because they would provide inferior levels of traffic service or because of other operational problems, design difficulties, cost, or environmental impacts.

Non-HOV Roadway Concepts. All concepts that did not include HOV lanes were eliminated from further consideration because they did not address the purpose and need.

Construction of Beltway improvements without HOV lanes would not be consistent with state, regional, and local land use and transportation plans and would provide 25 percent less person-capacity in this highly congested corridor.

Single-Lane Barrier-Separated Roadway Concepts. Concepts that included only a single barrier-separated HOV lane in each direction were eliminated from further consideration. They would be the least flexible for future roadway modifications (i.e., change in lane usage) and for incident or accident management and would have high costs for modest improvements in capacity and operations. Likewise, the capacity of single lane concepts would be quickly used up.

Roadway Concepts with Two Express Lanes. Concepts that included only two express lanes were eliminated from further consideration. These configurations were dropped because of operational and safety problems arising from having only one express lane in each direction for general use traffic (the other lane would be reserved for HOV traffic).

Express/Local with HOV Roadway Concepts. The 10- and 12-lane express/local configurations on the Beltway were consolidated to create an optimized Express/Local with HOV alternative. It was determined that the 12-lane option provided some additional capacity in the local lanes, but did not perform substantially better than the 10-lane Express/Local with HOV alternative.

Interchange Improvement Options. A total of 29 concepts, as shown in Table S-4, were eliminated at various stages of the alternatives development process for their traffic operations deficiencies, safety problems, and environmental impacts.

S.3.3 No-Build Alternative

The No-Build Alternative provides for no improvements to the Beltway except for periodic maintenance and minor enhancements needed to maintain operation of the roadway. However, other planned improvements to the regional roadway and transit network other than the section of Beltway under consideration here, as outlined in the 2000 update to *The Long-Range Transportation Plan for the National Capital Region*, were assumed to be in place by the design year (2020) for purposes of traffic forecasting.

S.3.4 Preferred Alternative

Based on input received at the Location Public Hearing, the Public Information Meetings held in June 2004, and additional analysis and agency input, the 12-Lane HOT Alternative was adopted by the Commonwealth Transportation Board (CTB) as the project's Preferred Alternative on January 20, 2005. This alternative would add two HOT lanes to the Capital Beltway in each direction and modify, improve and reconfigure the interchanges to increase capacity, reduce congestion, and improve safety.

The 12-Lane HOT Alternative is similar in design to the 12-Lane Barrier Separated HOV Alternative evaluated in the Draft EIS. Under this alternative, the Beltway would have a total of 12 through lanes: four general-purpose lanes and two HOT lanes in each direction, i.e., a 4-2-2-4 configuration. The two far left lanes would be designated as HOT lanes and separated from the general-purpose lanes with a 4-foot buffer strip. The HOT lanes would be used by high occupancy vehicles (HOV-3^{+}; three or more occupants), buses, and tolled low occupancy vehicles with less than three occupants.

The main advantage of this roadway type is the capacity it provides for both HOV and HOT traffic, thereby encouraging car-pooling and bus ridership by facilitating movement throughout the HOV/HOT roadway network. Accordingly, the HOT lanes would have direct access/egress to the existing and anticipated HOV facilities at four interchanges: Braddock Road, I-66, Route 123, and the Dulles Access/Toll Road, as well as direct HOT access to and from Lee Highway (Route 29).

Collector-distributor (C-D) roadways would be barrier-separated from the mainline roadways at interchanges and also between closely spaced interchanges to minimize movement conflicts and to improve safety and traffic operations. Continuous C-D roadways would be provided in both directions between Gallows Road and Route 50 (there is also an existing C-D road at Route 7 and along the northern portion of the Dulles Access/Toll Road). Generally, connection to interchanges would be made via the C-D roadways; however, direct access/egress would also be provided from the main roadways at selected interchanges. The locations where direct access/egress would occur are southbound at Gallows Road, I-66 (both directions), Route 123 (both directions), and Georgetown Pike. Northbound traffic at Gallows Road would have direct access, but egress onto a C-D road. The Dulles Access/Toll Road would have direct access northbound but egress onto a C-D road, while southbound traffic at the Dulles Access/Toll Road would have direct egress, with access via a C-D road. Left exits and entrances for non-HOV traffic, from the mainline and the C-D roadways, would be eliminated. The existing left exits and entrances would be retained to serve HOV/HOT traffic only.

At the northern end of the project segment, the 12-lane roadway configuration would transition to match the roadway cross-section prior to the George Washington Memorial Parkway interchange. The required transition in the I-495 mainline cross section would begin after the Dulles Access/Toll Road. The improvements to the southbound I-495 roadways would also begin south of the George Washington Memorial Parkway.

Similarly, at the southern end of the project segment, the I-495 mainline cross section would tie into the I-95/I-395/I-495 interchange improvements immediately north of the Beltway bridge crossing over the Norfolk Southern Railway. At this location, the Beltway cross section would consist of a 12-lane cross section.

Most of the recommended improvements would be accommodated within the existing right-of-way. Additional right-of-way would be necessary because of the widening only at a few locations, but the total right-of-way taking would be reduced from up to 294 residential properties to three residential properties. The proposed improvements that would reduce traffic congestion and enhance traffic operation and safety are:

- Additional capacity by adding four lanes to the Beltway.
- Replacement of left exit and entrance ramps for general traffic with right exit and entrance ramps; this would eliminate multilane weaving and improve traffic safety and operation.
- Existing loop ramps that have radii smaller than the minimum design standard would be improved or replaced. Some minor design exceptions for loop ramps would be sought at locations where potential impacts to parks, residences and Metro’s Orange Line could occur.

- Interchange configurations would be modified to reduce traffic congestion by eliminating the weaving movements at Braddock Road, Little River Turnpike (Alternative), and Chain Bridge Road interchanges. For instance, traffic weaving movements at the Chain Bridge Road interchange would be eliminated through the use of a flyover ramp southbound and the replacement of a loop ramp with left turn lanes for northbound traffic.

Direct HOV/HOT access would also be provided at the Lee Highway (Route 29) crossing of the Beltway. This access would involve two center access ramps for HOV/HOT traffic only: one from the northbound I-495 HOT lanes to Lee Highway in either direction, and one from Lee Highway in either direction to the southbound I-495 HOT lanes. There would be no HOV/HOT access from southbound I-495 or to northbound I-495, nor any access for non-HOV/HOT traffic. A traffic signal would be required on Lee Highway at this location.

The construction costs for the Preferred Alternative are estimated at $891 million (in Year 2002 dollars). Right-of-way costs are estimated to be $7.6 million. (Note: A supplemental estimate was prepared to forecast these same costs for the anticipated year of expenditure - 2009 - which represents the mid-point of construction. The escalated construction cost for the future year is $1.15 billion and the escalated right-of-way cost is $18.9 million.)

S.4 ENVIRONMENTAL CONSEQUENCES

The following briefly describes the principal environmental effects of the proposed project. **Table S-5** is a matrix showing the comparative effects of the alternatives studied. The total impact numbers are given as ranges because of the multiple interchange options available at Gallows Road, Interstate 66, and the Dulles Access/Toll Road.

S.4.1 Land Use

Improvements to the Beltway are included in the Comprehensive Plan and are therefore part of the planned growth of Fairfax County. The Preferred Alternative would require the acquisition of approximately 10 acres of land adjacent to the Beltway and conversion of the existing uses to highway use.

S.4.2 Socioeconomics

The Preferred Alternative would result in a dramatic reduction in the number of residential relocations compared to the Candidate Build Alternatives studied in the Draft EIS. The Preferred Alternative was developed in part to address the concerns of the general public and local governments regarding the high number of relocations. No established communities will be bisected or their community cohesion significantly disrupted. The Preferred Alternative would not displace any non-profit organizations, schools, or churches.

Impacts of the Preferred Alternative on community cohesion would include the taking of land and homes along the edges of neighborhoods. Access to or from adjacent neighborhoods would not be disrupted, except for possible temporary detours during construction. No non-motorist facilities such as pedestrian or bicycle paths will be lost. To the degree that improvements to the Capital Beltway attracts trips away from local roads, quality of life in communities will improve due to a decrease in cut-through traffic.

Several populations under the aegis of the Presidential Executive Order 12898 on environmental justice (EJ) were identified in the project area. However, there is no evidence that such populations would be subjected to disproportionately high and adverse environmental effects compared to non-EJ populations.

Table S-5
COMPARATIVE SUMMARY OF PROJECT EFFECTS BY ALTERNATIVE

	Final EIS Alternatives		Revised Alternative	Candidate Build Alternatives Draft EIS		
	No-Build	Preferred 12-Lane HOT	10-Lane HOV	Concurrent HOV (10 Lanes)	Express/ Local with HOV (10 Lanes)	Barrier-Separated HOV (12 Lanes)
Noise Impacts (dwellings)	3,054	3,233	3,069	4,238	4,076	4,031
Dwellings Protected by Noise Barriers	NA	2,943	2,902	3,900	3,616	3,875
Homes Displaced	0	3	1	217	294	258
Businesses Displaced	0	0	0	31	32	32
Community Facilities Displaced	0	0	0	0	2 tennis courts	0
Carbon Monoxide (ppm) - 1 hr	6.1-17.9	5.9-9.6	5.8-9.6	6.1-9.1	6.1-9.6	6.1-9.2
Range from 10 sites - 8 hr	3.1-11.5	2.9-6.2	3.0-6.2	3.1-5.7	3.1-6.2	3.1-5.8
Public Parks Impacted	0	5	5	7	7	7
Parkland Required (acres)	0	2.50	1.14	15.05	18.13	19.36
Adverse Effects to Historic Resources	0	0	0	1	1	1
Wetlands Displaced (acres)	0	3.03	3.86	4.62	4.74	5.06
Impacted Length of Streams (feet)	0	4,452	4,235	8,262	8,031	8,053
Floodplain Encroachments (acres)	0	10.42	8.79	14.99	15.15	15.49
Potential Hazardous Material Sites	0	0	0	7-8	8-9	8
Threatened and Endangered Species	0	0	0	0	0	0
Length of Alternative (miles)	14	14	14	14	14	14
Right-of-Way Required (acres)	0	10	5	118	168	153
Right-of-Way, Utilities, and Relocation Costs (millions)	$0	$7.6	$2.9	$345	$423	$402
Construction Costs (millions)	$0	$891	$783	$2,340	$2,830	$2,480

The Preferred Alternative will have positive impacts on highway and traffic safety. Although the project would generate tax losses to Fairfax County from the conversion of right-of-way, these losses would be offset to some degree by tax gains from added employment and materials sales during construction, and by time and shipment cost savings associated with improved mobility.

S.4.3 Air Quality

On a local, macro-level the estimated carbon monoxide concentrations following construction of the Preferred Alternative would be well below the National Ambient Air Quality Standards (NAAQS) for one-hour and eight-hour average concentrations. The Preferred Alternative has also been included in the region's current CLRP (FY 2005) and TIP (FY 2006 -2011) and found to conform by the Capital Region's Transportation Planning Board (TPB is the MPO for the Washington, D.C. Metropolitan Area). TPB's conformity determination was reviewed by the EPA in accordance with the procedures and criteria of the Transportation Conformity Rule. Based on their review, EPA determined that TPB's conformity determination meets the requirements of the Clean Air Act and the applicable regulations promulgated under 40 CFR Part 93. On February 21, 2006, FHWA and FTA jointly found the 2005 CLRP and FY 2006 -2011 TIP for the Washington, D.C. Metropolitan Area to be in Conformance with the Transportation Conformity Rule.

S.4.4 Noise

The number of residences exposed to noise impacts would be greater with the Preferred Alternative than with the No-Build Alternative. The majority of impacted residences would be exposed to design-year (2020) traffic noise levels that approach or exceed 67 dBA L_{eq} (equal or exceed 66 dBA L_{eq}) during the loudest hour of the day. In some cases, impacted residences would experience noise levels substantially greater (10 dBA or more) than existing levels.

A total of 3,054 dwelling units would be impacted with the future No-Build Alternative. A total of 3,233 dwelling units would be impacted with the Preferred Alternative. Most of the impacts, however, can be abated. Where feasible and reasonable, noise barriers will be constructed to mitigate noise impacts of the project. Based on preliminary analyses, it appears that barriers could reasonably be provided that would protect and benefit more than 4,000 residences (i.e., receive at least 5 decibels of noise reduction). This additional benefit would not occur under the No-Build Alternative.

S.4.5 Visual Quality And Aesthetics

The primary visual effect of the proposed improvements will result from clearing of existing vegetation buffers between the Beltway and neighborhoods along the roadway edge and the changes in size and elevation of interchange ramps and overpasses. Where sufficient right-of-way remains after construction, vegetation buffers would be reestablished by landscaping or by allowing indigenous species to regenerate naturally. Where noise barriers would be provided, adjacent neighborhoods will be afforded opportunities to provide input on the design and appearance of the barriers. The increased visibility of the interchanges would not be incompatible with the urbanized surroundings of the project.

S.4.6 Parks and Recreation Areas

The Preferred Alternative would require the use of small amounts of land from five parks and recreation areas. The Preferred Alternative also would have other incremental effects on Section 4(f) properties, such as changes in noise levels, and visual quality. These effects would not substantially impair the use of the affected resources.

S.4.7 Cultural Resources

A comprehensive historic property identification survey found two historic districts in the project's Area of Potential Effect: Holmes Run Acres and the W&OD Railroad. No major archaeological sites were identified. With the Preferred Alternative, the effects to Holmes Run Acres were eliminated.

The W&OD Railroad Historic District is a 45-mile linear district that spans the Beltway on modern bridges. These bridges would be replaced as part of the Preferred Alternative. However, because the project would not alter the characteristics that qualify the district for inclusion on the National Register of Historic Places, there would be no effect on the district.

S.4.8 Natural Resources

Some natural resources adjacent to the Beltway would be displaced by implementation of the Preferred Alternative. The Preferred Alternative would result in approximately 4,452 feet of direct stream impacts from pipe and culvert installation. No substantial effects on water quality are expected. Although the increase in impervious surface, combined with increases in traffic volumes, would result in elevated stormwater runoff volumes and pollutant outputs, stormwater management measures should offset any deleterious effects. In addition, compensatory mitigation for unavoidable stream impacts will be provided as determined appropriate in consultation with the permitting agencies, the U.S. Army Corps of Engineers and the Virginia Department of Environmental Quality.

Wetlands displacements would be 3.03 acres or about 14 percent of the total wetland area within the existing Beltway right-of-way. Compensatory mitigation for unavoidable wetland displacements will be provided as determined appropriate in consultation with the permitting agencies.

There are four 100-year floodplains within the 14-mile project area that are spanned or abutted by the existing Capital Beltway. The Scotts Run floodplain would be further encroached upon with the Preferred Alternative.

There are no federal or state listed threatened or endangered species in the project area.

S.4.9 Hazardous Materials

The locations of potential hazardous materials sites throughout the study area were identified early in the project process in an effort to avoid impacts. No hazardous materials sites would be affected by the Preferred Alternative.

S.4.10 Indirect and Cumulative Effects

There will be no induced, or secondary, effects caused by the project as a result of any access changes, because there is no direct access to adjacent properties from the Beltway.

The mobility enhancements that the project would provide are expected to be only a marginal factor in future development decisions, because it is believed that development in the region will continue due to other factors, regardless of the Beltway improvements. It is unlikely that any resulting marginal increase in development will have any negative effect on communities, which are generally fully built out already. Therefore, secondary effects from the project are anticipated to be minimal.

Quantifying cumulative impacts depends on the availability of data for each of the projects and resources that have occurred or are likely to occur within the cumulative effects study boundaries. In some cases this data is not available due to the timing of this and other studies, as is the case with the Capital Beltway Rail study. In other cases, impacts are evaluated only qualitatively, making only qualitative assessments of cumulative impacts possible. The proposed improvements to the Capital Beltway will affect resources, particularly water resources, that have been impacted by prior public and private projects and will likely be impacted in the future. On the other hand, this project and others in the region will have a net benefit on regional air quality due to reductions in congestion.

S.5 OTHER REGIONAL TRANSPORTATION IMPROVEMENTS

A number of other transportation improvements throughout the region are currently in the planning stages, in final design, or under construction. These projects, described below, provide compatible improvements or deal with deficiencies and capacity issues in other critical regional transportation corridors that connect with the Beltway.

S.5.1 I-95/I-395/I-495 Interchange Improvements

Construction of improvements to the I-95/I-395/I-495 interchange began in early 1999. The planned improvements will provide partial separation of traffic with different destinations (i.e., local and through traffic) and full HOV connections (including provisions for connections to future HOV lanes on the Beltway). This project also includes improvements to the Beltway from Backlick Road on the west to Van Dorn Street (Route 644) on the east. Except for the HOV connections, construction is expected to be completed by 2007.

S.5.2 Dulles Corridor Transit Improvements

The Virginia Department of Rail and Public Transportation (DRPT), in cooperation with the Washington Metropolitan Area Transit Authority (WMATA), Fairfax and Loudoun counties, and the Metropolitan Washington Airports Authority (MWAA), is planning to construct a 23.1-mile transit system in Fairfax and Loudoun counties, Virginia. A Final Environmental Impact Statement (Final EIS) for the project was completed in December 2004. A record of decision was signed by the Federal Transit Administration in March 2005.

The Project will extend the existing Metrorail system from the Orange Line (between the East and West Falls Church stations) in Fairfax County through Tysons Corner to Washington Dulles International Airport and beyond the airport to Route 772 in Loudoun County. Most of the extension will be constructed in the median of the Dulles International Airport Access Highway and Dulles Connector Road, but the alignment would also directly serve Tysons Corner and Dulles Airport. The extension will include 11 new Metrorail stations, a new rail yard on Dulles Airport property, and improvements to an existing rail yard at West Falls

Church. This alignment was selected because it offers the highest ridership potential with the fewest impacts on residential areas and the natural environment.

Because of federal funding limitations and the timing of local funding availability, DRPT intends to construct the LPA in two major phases. Phase 1 of the Project will complete the first 11.6 miles of the planned extension and include five new stations (Tysons East, Tysons Central 123, Tysons Central 7, Tysons West, and Wiehle Avenue). Metrorail service to Wiehle Avenue is scheduled to begin in 2011. DRPT began Preliminary Engineering on Phase 1 of the Project in October 2004. Phase 2 of the Project will complete the remainder of the LPA from Wiehle Avenue to Route 772 in Loudoun County.

S.5.3 Beltway Improvements in Maryland

The Maryland State Highway Administration also is studying ways to enhance mobility in the Maryland portion of Beltway corridor. The Capital Beltway Transportation Corridor Study (a combined MIS and EIS) is being conducted to determine the most appropriate transportation improvements for the Maryland portion of the Beltway. Potential improvement options include the addition of HOV or express toll lanes to the Beltway, new transit alignments, and transportation system management/transportation demand management (TSM/TDM) strategies. Representatives from VDOT and MSHA continue to maintain close coordination to ensure compatible studies and designs. MSHA is currently in the alternatives analysis phase and a Draft EIS is being prepared.

S.6 AREAS OF CONTROVERSY AND SIGNIFICANT UNRESOLVED ISSUES

No known areas of controversy regarding the level of investigations or the methods of analysis employed in this Final EIS have been raised by any agency with which this work has been coordinated.

S.7 ONLY PRACTICABLE ALTERNATIVE FINDING

In accordance with Executive Orders 11988 and 11990, this portion of the Final EIS documents the basis for the finding that the Preferred Alternative as described herein is the only practicable alternative.

S.7.1 Wetland Finding

Each of the Candidate Build Alternatives contained in the Draft EIS as well as the Revised Candidate Build Alternatives presented in the Final EIS encroach upon wetlands within the corridor. Initial improvements involved up to 27 acres of wetland encroachments. Significant reductions were made through design modifications to reduce these potential impacts 4.6 to 5.1 acres for the Draft EIS Candidate Build Alternatives. Further reductions in the mainline and interchange areas for the two revised alternatives resulted in yet further reduction of impacts to these protected resources. The Preferred Alternative results in the least impact of all alternatives considered (3.03 acres). Additional avoidance and minimization efforts will be considered in the final design phase and coordinated with the US Army Corps of Engineers.

Based on the above considerations, it is determined that there are no practicable alternative to the proposed construction in wetlands and that the proposed action includes all practicable measures to minimize harm to wetlands which may result from such use.

S.7.2 Floodplain Finding

There are four 100-year floodplains located within the 14-mile project corridor that are spanned or abutted by the existing Capital Beltway. Each of the Candidate Build Alternatives would impact one or more of these floodplains.

Preliminary project designs sought to minimize and avoid impacts to floodplains by including floodplains as evaluation criteria in early alternatives development process. The Candidate Build Alternatives contained in the Draft EIS were estimated to impact 15 to 15.5 acres of wetlands -- primarily due to longitudinal encroachments. Reductions in the mainline and interchange areas for the Revised Candidate Build Alternatives resulted in associated reductions in floodplain encroachments for the Revised Alternatives -- 10.4 acres for the Preferred Alternative and 8.8 acres for the Revised 10-Lane HOV Alternative. These impacts are limited to the Scotts Run floodplain which runs adjacent to the eastern edge of the Beltway for over a mile. Most of the longitudinal encroachments are attributed to fill outside the actual pavement area and cannot be avoided by bridging. Although the Revised 10-Lane HOV Alternative encroaches upon 1.6 fewer acres of floodplain, it does not meet the purpose and need of the project comparable to the Preferred Alternative.

During the final design phase of the Preferred Alternative, a detailed Location Hydraulic Study will be performed in accordance with 23 CFR 650. The study will determine if the 100-year base flood elevations will increase due to the construction of the new facility within the impacted floodplain. The detailed hydraulic analysis will demonstrate that adequate measures will have been taken to ensure that any floodplain encroachment will not increase the risk of flooding to adjacent properties and comply with all federal, state, and local floodplain regulations (44 CFR 60.3 - Floodplain Management Criteria for Flood Prone Areas, and Part 65.12 - Revision of Flood Insurance Rate Maps to Reflect Base Flood Elevations Caused by Proposed Encroachments).

In accordance with Executive Order 11988 and 23 CRF 650 Subpart A, it has been determined that based on the above considerations, there is no practicable alternative to the proposed construction in the floodplain, and the proposed action will include all practicable measures to minimize harm to the floodplain which may result from such use.

S.8 OTHER FEDERAL ACTIONS AND PERMITS REQUIRED

Federal and state laws require various environmental permits before construction can proceed. They include:

- Authorizations from the U.S. Army Corps of Engineers pursuant to Section 404 of the Clean Water Act for discharges of fill material into waters of the United States, including wetlands.

- Authorizations from the Virginia Department of Environmental Quality pursuant to Sections 401 (Virginia Water Protection Permit) and 402 of the Clean Water Act for discharges into waters of the United States.
- Authorizations from the Virginia Marine Resources Commission pursuant to Virginia Water Law for encroachments on subaqueous state-owned stream bottoms.
- Coordination with the National Park Service will be necessary to identify and acquire suitable replacement lands for the use of any lands in the W&OD Regional Park that were acquired with Land and Water Conservation Funds.

S.9 REEVALUATION

Due to the extensive amount of coordination conducted with local government and the general public and the consideration of the High Occupancy Toll (HOT) lane concept, the Final EIS was not completed within three years of the Draft EIS approval date (March 15, 2002). Therefore in accordance with 23 CFR 771.129, a reevaluation was conducted to determine whether there had been changes in the project or its surroundings or new information which would require a supplement to the Draft EIS or a new Draft EIS. The reevaluation reviewed the scaled-back versions of the Candidate Build Alternatives; evaluated the operational issues of HOT lanes; identified one newly acquired park parcel; and determined that no major regulatory changes had occurred since the publication of the Draft EIS. Based on the findings of the reevaluation, VDOT concluded and FHWA concurred that the findings of the Draft EIS were valid and that a Supplemental Draft EIS was not required. A copy of the Reevaluation Report is included as Appendix C of this Final EIS.

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LIST OF ACRONYMS

AASHTO	American Association of State Highway Transportation Officials
APE	Area of Potential Effect
BMP	Best Management Practice
dBA	Decibels on the A-weighted scale
CBPA	Chesapeake Bay Protection Act
CEQ	President's Council on Environmental Quality
CFR	Code of Federal Regulations
COE	U.S. Army Corps of Engineers
CO	carbon monoxide
CLRP	Constrained Long Range Transportation Plan
CRMP	Virginia Coastal Resources Management Program
CTB	Commonwealth Transportation Board
DCR	Virginia Department of Conservation and Recreation
DEIS	Draft Environmental Impact Statement
DEQ	Virginia Department of Environmental Quality
DRPT	Virginia Department of Rail and Public Transportation
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
EJ	Environmental Justice
FCHD	Fairfax County Health Department
FCWA	Fairfax County Water Authority
FEIS	Final Environmental Impact Statement
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FIRM	Flood Insurance Rate Maps
FORVA	Friends of Rivers of Virginia
FWS	U.S. Fish and Wildlife Service
HCM	Highway Capacity Manual
HOT	High Occupancy Toll
HOV	High Occupancy Vehicle
IACM	Interagency Coordination Meeting
LOS	Level of Service
LOV	Low Occupancy Vehicle
MIS	Major Investment Study
MPH	miles per hour
MPO	Metropolitan Planning Organization
MSL	mean sea level

MWCOG	Metropolitan Washington Council of Governments
MSAT	Mobile Source Air Toxics
NAAQS	National Ambient Air Quality Standards
NAC	Noise Abatement Criteria
NCPC	National Capital Planning Commission
NCRTPB	National Capital Region Transportation Planning Board
NEPA	National Environmental Policy Act
NHR	Natural heritage resources
NPDES	National Pollution Discharge Elimination System
NRCS	National Resource Conservation Service
NRHP	National Register of Historic Places
O_3	ozone
PEM	Palustrine, Emergent (wetlands)
PFO	Palustrine, Forested (wetlands)
$PM_{2.5}$	Particulate Matter less than 2.5 microns in size
ppm	parts per million
PSS	Palustrine, Scrub-Shrub (wetlands)
RPAs	Resource Protection Areas
RMAs	Resource Management Areas
SIP	State Implementation Plan
SHPO	State Historic Preservation Officer
TIP	Transportation Improvement Program
TNM	FHWA Traffic Noise Model
TNMLOOK	FHWA-TNM lookup program
TPB	Transportation Planning Board
TSM	Transportation System Management
USDOT	U.S. Department of Transportation
USDA	U. S. Department of Agriculture
USGS	United States Geological Survey
VDACS	Virginia Department of Agriculture and Consumer Services
VDEQ	Virginia Department of Environmental Quality
VDGIF	Virginia Department of Game and Inland Fisheries
VDHR	Virginia Department of Historic Resources
VDNH	Virginia Department of Conservation and Recreation, Division of Natural Heritage
VDOT	Virginia Department of Transportation
VDRPT	Virginia Department of Rail and Public Transportation
VMT	Vehicle Miles Traveled
WMATA	Washington Metropolitan Area Transit Authority
W&OD	Washington & Old Dominion

GLOSSARY OF COMMONLY USED TERMS

Alluvial Communities: Habitat of variable vegetation type that has developed in an area with a stream and a well-developed floodplain. The terms "alluvial" and "riparian" are synonymous, and imply overbank flooding events.

Alternative: General term that refers to possible approaches to meeting the transportation deficiencies identified in the purpose and need statement.

Attainment: A condition where a pollutant conforms to or shows levels at or below one or more of the National Ambient Air Quality Standards.

Benthic: Located on the bottom of a body of water or in the bottom sediments, or pertaining to bottom-dwelling organisms.

Best Management Practices (BMPs): Various methods of minimizing the impacts of change in land use on surface and groundwater systems.

Biochemical Oxygen Demand (BOD): The quantity of oxygen used by a mixed population of microorganisms in the oxidation of organic matter.

Biotic Integrity: Condition of the living things in the natural community.

Bottleneck: A section of roadway where traffic flow is constricted, for example, at ramp merges/diverges, weaving areas, lane drops, and incidents.

Capacity: The maximum rate of flow at which persons or vehicles can be reasonably expected to traverse a point or uniform segment of a lane or roadway during a specified time period under prevailing roadway, traffic, and control conditions. Expressed as vehicles per hour or persons per hour. The theoretical capacity of a single freeway lane is 2,200 vehicles per hour.

Carbon Monoxide (CO): A colorless, odorless, poisonous gas that is formed as a product of the incomplete combustion of carbon and is emitted directly by automobiles and trucks.

Community Cohesion: The connections between and within communities that are essential for serving the needs of the residents.

Congestion: Traffic flow, which is influenced by the affects of a bottleneck. In this type of flow, speeds may range from 10 to 45 mph on the freeway, with periods of stop-and-go traffic and queuing.

Congestion (Moderate): Average speeds between 20 and 45 mph.

Congestion (Severe): Average speeds below 20 mph.

Criteria Pollutants: Pollutants for which National Ambient Air Quality Standards (NAAQS) have been adopted. All other air pollutants are considered non-criteria pollutants.

Cumulative Effects: The incremental consequences of a proposed action in addition to other past and reasonably foreseeable future actions that affect the same resources. Other actions in the project area include other highway projects and residential, commercial, and institutional development.

Delay: Additional travel time experienced by a person or vehicle beyond what would be reasonable for a given trip.

Demand: The traffic volume expected to desire service past a point or segment of the highway system, or the traffic currently arriving or desiring service past such a point, usually expressed as vehicles per hour.

Diurnal: The typical 24-hour travel pattern on a particular roadway, usually expressed ion vehicles per hour.

Environmental Justice: Presidential Executive Order 12898 requires federal agencies to ensure that their actions (or actions they oversee) do not disproportionately discriminate against (impact) minority populations and low-income populations

Eutrophication: The process by which lakes gradually age and become more productive. It normally takes thousands of years to progress. However, humans, through their various cultural activities, have greatly accelerated this process in many lakes. Cultural or anthropogenic "eutrophication" is water pollution caused by excessive plant nutrients.

Fauna: Animals characteristic of a region, period, or special environment.

Fish Taxa Richness: Total number of unique fish species.

Floodplain: The portion of a river or stream valley, adjacent to the channel, that is covered with water when the river or stream overflows its banks at flood stage.

Floodway: A large-capacity channel constructed to divert floodwaters safely through or around population areas.

Free-flow: Traffic flow which is unaffected by upstream or downstream conditions. This flow is generally defined within a speed range of 45 to 65 mph at high flow rates.

High Occupancy Vehicle Lanes (HOV): Designated travel lanes which require two or more occupants per vehicle. Future regional plans anticipate occupancy requirement to be three (HOV-3^{+}).

High Occupancy Toll Lanes (HOT): Designated travel lanes which are utilized by high occupancy vehicles, buses, and tolled vehicles carrying less than noted high occupancy levels.

Independent Utility: A project is said to have independent utility if it will provide functional improvements that can stand alone and serve a major purpose, even if no other improvements are made in the region.

Indirect Effects: Impacts on the environment resulting from the primary impact of the proposed action but occurring later in time or farther removed in distance, although still reasonably foreseeable.

Intermodal Relationships: Relationships between transportation modes. An example of a mode is bus mass transit.

Invasive Species: A plant, animal, or other organism (1) that is non-native (or alien) to the ecosystem under consideration and (2) whose introduction causes or is likely to cause economic or environmental harm or harm to human health.

Isolated Wetlands: Non-jurisdictional wetlands. Wetlands that are not subject to Clean Water Act regulation.

Jurisdictional Determination: A written statement issued by the COE that identifies areas within a discrete project area that are subject to Clean Water Act regulation.

Jurisdictional Wetlands: Wetlands that are subject to Clean Water Act regulation.

L_{eq}: The equivalent sound level, containing the same amount of sound energy as the varying sound level measured over a specified time period.

Lane Balance: For smooth and efficient operation through an interchange, there should be a balance between the number of lanes on the highway and the ramps.

Lane Configuration: Layout of lanes, including the number of lanes and type of traffic allowed to use each lane.

Lane Continuity: Maintenance of a basic number of lanes on a roadway, which is essential for uniformity in service.

Level of Service (LOS): Operating conditions within a stream of traffic describing safety, traffic interruptions, speed, freedom to maneuver, comfort and convenience. Six levels of service are defined, designated A through F, with A representing the best conditions and F the worst.

Link: Traffic term referring to one portion of a longer trip in the transportation system.

Logical Termini: Rational endpoints for consideration of transportation improvements and for review of environmental impacts.

Low-Income Population: A low-income-household is one where the median household income is below the Department of Health and Human Services poverty guidelines.

Major Investment Study (MIS): 23 CFR 450 required these studies for large-scale transportation improvements in urban areas. The studies were used to identify the most promising transportation improvements. The MIS concluded that highway improvements would be the most effective transportation investment in the Beltway corridor. Appendix A contains the Executive Summary of the MIS report.

Measure of Effectiveness (MOE): Parameters describing the quality of service provided by a traffic facility, for example speed and delay.

Minority Individuals: Members of the following population groups: American Indian or Alaskan Native, Asian or Pacific Islander, Black (not of Hispanic origin), and Hispanic.

National Priority List (NPL): Also known as the United States Environmental Protection Agency's (EPA's) Superfund program. The National Priorities List is a comprehensive list of the sites/facilities that have been evaluated using the Hazard Ranking System and have been found to pose a sufficient threat to human health and/or the environment to warrant cleanup under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). EPA is responsible for updating and maintaining the NPL.

Noise Abatement Criteria: In accordance with Section 772 of the Federal Aid Policy Guide, the Federal Highway Administration has established noise standards. These standards include Noise Abatement Criteria, which are noise levels that represent a balancing of desired levels of noise with achievable levels.

Non-attainment: A condition where one or more of the National Ambient Air Quality Standards for a pollutant have been violated.

Notice of Intent (NOI): The CEQ regulations and Title 23, Code of Federal Regulations, Part 771, Environmental Impact and Related Procedures, require the sponsoring agency to publish a notice of intent in the Federal Register as soon as practicable after the decision is made to prepare an environmental impact statement and before the scoping process for a proposed action.

Ozone: Unstable blue gas with a pungent odor, formed principally in secondary reactions involving volatile organic compounds, nitrogen oxides, and sunlight.

Paleozoic: An era of geologic history that extends from approximately 230 million years ago to 620 million years ago.

Palustrine, Emergent Wetlands (PEM): Wetlands characterized by erect, herbaceous vegetation present for most of the growing season (e.g., marshes, wet meadows, fens, sloughs, or potholes).

Palustrine, Forested Wetlands (PFO): Wetlands characterized by woody vegetation over 6 meters (20 feet) in height (e.g., swamps or bottomlands).

Palustrine, Scrub-Shrub Wetlands (PSS): Wetlands characterized by the dominance of small trees, saplings and shrubs. These wetlands generally have higher value than emergent systems, but not as much as forested systems.

Physiographic Province: A region that is generally consistent in geologic structure and climate and which has had a unified geomorphic history.

Precambrian: The earliest era of geological history, extending from approximately 620 million years ago to 3,800 million years ago.

Resource Management Areas: As designated by Fairfax County, these areas include floodplains, highly erodible soils, steep slopes, highly permeable soils, and non-tidal wetlands not designated in RPA zones.

Resource Protection Areas (RPAs): Lands at or near the shoreline that have intrinsic water quality value for ecological and biological processes, or are sensitive to significant water quality degradation impacts. The RPA designation includes tidal wetlands, tidal shores, non-tidal wetlands connected by surface flow and contiguous to tidal wetlands or tributary streams, and a minimum 100-foot (30.5-meter) buffer landward along both sides of any tributary stream and all other components of RPAs.

Riparian: Pertaining to anything connected with or immediately adjacent to the banks of a stream.

Screenline: A line drawn to cross two or more parallel roadways to determine the total traffic that is traveling in a specific direction. For example, a horizontal line may be drawn to cross two or more north-south roadways to determine the volume of traffic traveling northbound or southbound in that corridor.

Slip ramp: A ramp between two parallel roadways traveling in the same direction (as in an express/local roadway system) which allow vehicles to move between the two facilities.

Throughput: The number of vehicles or persons that traverse past a point or uniform segment of a lane or roadway during a specified time period, usually expressed as vehicles or persons per hour.

Through trip: A trip which has an origin and destination outside of a specified area.

Travel demand forecast: A forecast for travel demand on future or modified transportation system alternatives using existing or projected land use, socioeconomic, and transportation services data.

Upstream: Direction from which traffic is arriving at a location. When a vehicle is upstream of a bottleneck, it means that the vehicle is traveling toward the bottleneck and has yet to reach it.

Volume to capacity ratio (v/c): The ratio of demand flow rate to capacity for a freeway facility.

Watershed: A specific geographic area drained by a major stream or river.

Wetlands: Areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and under normal conditions do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

1

PURPOSE AND NEED

1.1 PROJECT DESCRIPTION AND LOCATION

The Federal Highway Administration (FHWA), in conjunction with the Virginia Department of Transportation (VDOT), proposes to improve the Capital Beltway (I-495) in Fairfax County, Virginia, between the I-95/I-395/I-495 interchange and the American Legion Bridge over the Potomac River. Improvements are needed to alleviate safety and operational concerns, provide road design features consistent with current standards, add capacity for congestion relief, enhance transportation system linkage, and fulfill the goals of local and regional plans.

Constructed as part of the interstate highway system, the Beltway was originally designed to serve through traffic bypassing Washington, D.C. However, since its completion in 1964, growth in the Washington metropolitan area and changes in land use and travel patterns have made the Beltway an integral part of the regional and local transportation systems. Although still functioning as a bypass, the Beltway is now used primarily for travel to and from destinations within the region. Each day, hundreds of thousands of local residents use the Beltway to travel to work, shopping centers, and other destinations throughout the metropolitan area.

1.1.1 Project Setting

The Capital Beltway is a 64-mile (103-kilometer) multi-lane circumferential freeway serving the Washington, D.C. metropolitan area (see **Figure 1-1**). The Beltway is located approximately 10 miles from Washington, D.C. in both Virginia and Maryland. The Virginia portion of the Beltway is approximately 22 miles (35 kilometers) long and forms a crescent through northeastern Fairfax County, from the Woodrow Wilson Memorial Bridge in Alexandria to the American Legion Bridge near Great Falls. This portion of the Beltway connects to major interstate highways (I-95, I-395, and I-66), limited access roadways (Dulles Access/Toll Road and the George Washington Memorial Parkway), and local roadways, including higher-capacity secondary roadways via 15 interchanges. Because of its circumferential nature, the separate directional roadways on the Beltway are referred to as the Inner and Outer Loops. Traffic runs clockwise on the Inner Loop and counter-clockwise on the Outer Loop.

PROJECT SETTING Figure 1-1

CAPITAL BELTWAY STUDY

The Virginia portion of the Beltway has four through lanes in each direction, with auxiliary lanes or collector-distributor roadways provided at several interchanges. Adjacent land uses include numerous residential subdivisions, dense commercial development, high-rise office buildings, and parks and recreational areas.

1.1.2 Project Limits

The proposed improvements to the Beltway and its interchanges would extend for about 14 miles (23 kilometers), from Backlick Road to the American Legion Bridge over the Potomac River, as shown on **Figure 1-2**. Backlick Road is the limit of major improvements to the I-95/I-395/I-495 interchange. The American Legion Bridge is the limit of Beltway improvements to be constructed by the Maryland State Highway Administration.

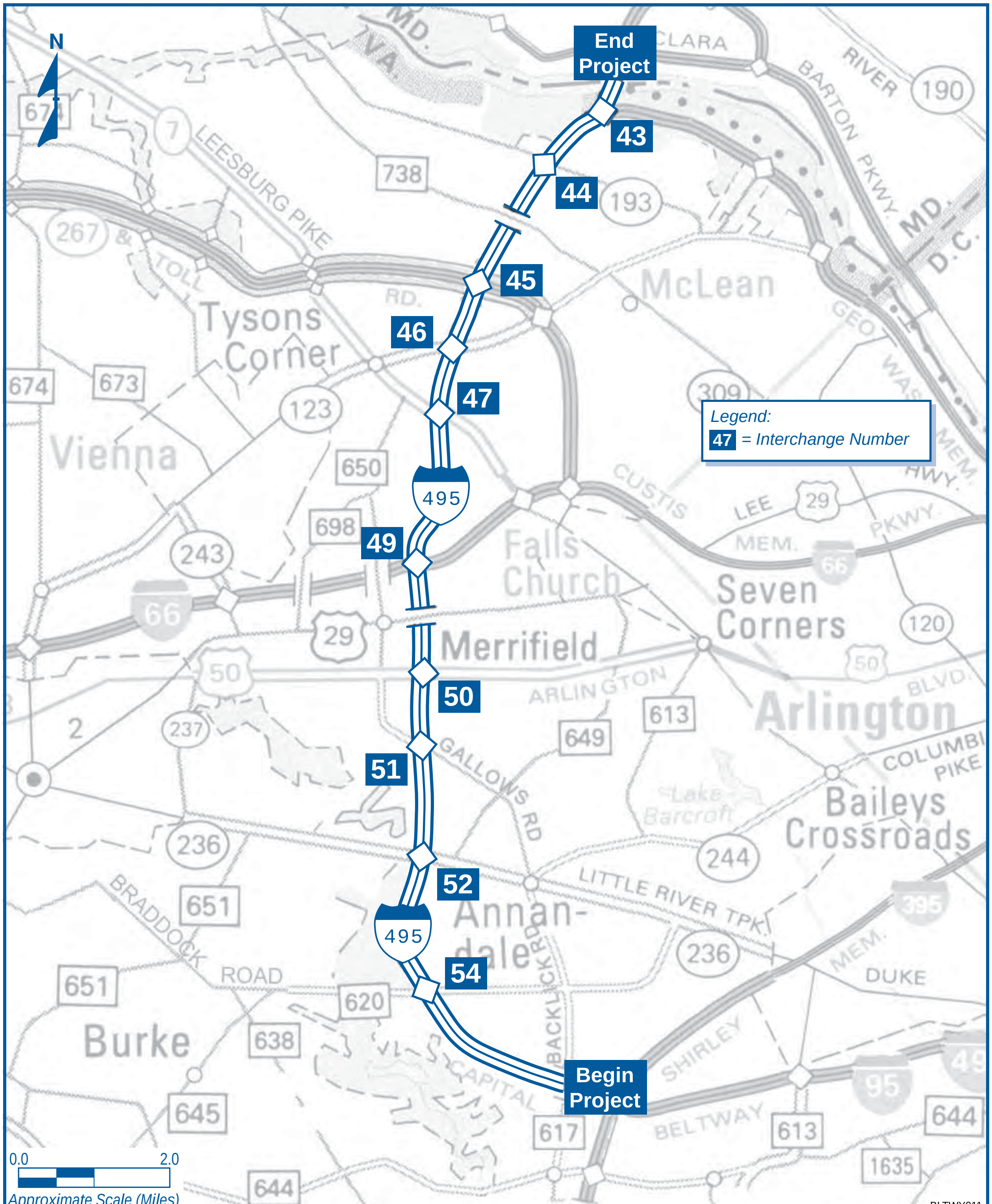
The project would also include improving portions of 10 roadways that connect to the Beltway via existing interchanges, listed in **Table 1-1**. Modifications to these roadways would properly integrate the proposed Beltway and interchange improvements with existing or planned designs and traffic patterns on these other roadways. Termini for each of these connecting roadways are also presented in Table 1-1.

Table 1-1
IMPROVEMENT LIMITS OF ROADWAYS CONNECTING WITH THE BELTWAY

Roadway	Western Limit	Eastern Limit
Braddock Road (Route 620)	Inverchapel Road	Ravensworth Road
Little River Turnpike (Route 236)	Woodlark Drive	Woodland Road
Gallows Road (Route 650)	Decourcey Court	Hemlock Drive
Arlington Boulevard (U.S. Route 50)	Gallows Road	Fairview Park Drive
Interstate 66 (I-66)	Cedar Lane	Barbour Road
Leesburg Pike (Route 7)	Chain Bridge Road	George C. Marshall Drive
Chain Bridge Road (Route 123)	Leesburg Pike	Dulles Access/Toll Road
Dulles Access/Toll Road (Route 267)	Spring Hill Road	Chain Bridge Road
Georgetown Pike (Route 193)	Saigon Road	Dead Run Drive
George Washington Memorial Parkway	Live Oak Drive	Dead Run

The FHWA has determined that this project has the following characteristics:

- Has logical termini; that is, it has rational endpoints for consideration of transportation improvements and for review of environmental impacts. The interchange linking I-95, I-395, and I-495 represents a major distribution point to other major travel arteries in the regional and national highway network. This interchange is currently undergoing a major upgrade of its own. The Potomac River at the American Legion Bridge divides the regional transportation system of Fairfax County, Virginia from the regional transportation system of Montgomery County, Maryland. Virginia and Maryland transportation officials have differing concepts of how best to



PROJECT TERMINI Figure 1-2

CAPITAL BELTWAY STUDY

adapt Beltway improvements to their own regional needs. The American Legion Bridge represents a logical transition point between these concepts.

- Has independent utility; that is, it will provide functional improvements to the Beltway that can stand alone and serve a major purpose, even if no other roadway improvements are made in the region.
- Is of sufficient length to fully assess potential environmental impacts associated with the proposed improvements.
- Does not restrict consideration of alternatives for other reasonably foreseeable transportation improvements in the region.

1.1.3 Project Status

The Beltway has evolved over time. Development of a "beltway" for the Washington, D.C. area dates back to the late 1920s, when the National Capital Planning Commission (NCPC) first recommended a series of ring roads for the metropolitan area. This concept was reinforced during World War II, when military planners advocated construction of a highway network through and around major metropolitan areas throughout the United States. By 1950, a circumferential roadway for the Washington area was included on the NCPC's regional planning map as the "Cross County Loop." Construction of a 64-mile (103-kilometer) circumferential highway, with two lanes in each direction, was formally approved in 1956 as part of the original interstate highway system. Construction in Virginia began in 1958, and in 1960 the entire roadway was officially named the "Capital Beltway." The Beltway was completed and opened to traffic in 1964. Since then, incremental improvements have been made, including the addition of lanes, construction of noise barriers, construction or modification of interchanges, and minor improvements to improve safety. In Virginia, the last major expansion of the roadway occurred between 1974 and 1977, when the Beltway was widened from four to eight lanes.

Planning for Beltway improvements has been ongoing for several years. A Major Investment Study (MIS) was initiated in November 1994 and completed in early 1997. The MIS was conducted in accordance with 23 CFR 450, which, at that time required such studies for large-scale transportation improvements in urban areas. Elements of the study included comprehensive analyses of highway and transit travel in the Capital Beltway corridor, consultations with citizens in a series of public information meetings, coordination with local and regional planning agencies, and development and testing of a range of strategies for dealing with transportation deficiencies in the corridor. The conclusion of the MIS was that highway improvements promoting high occupancy vehicle (HOV) and bus transit use would be the most effective transportation investment to serve current and future travel demand on the Capital Beltway. The MIS recommendation was that potential rail transit improvements serving the Capital Beltway corridor be studied separately on a regional basis by an appropriate transit agency or multi-jurisdictional team.

In 1998, FHWA and VDOT launched location and environmental studies for the Beltway improvements covered in this document. Initially, an Environmental Assessment (EA) was undertaken to determine if the proposed improvements would result in significant environmental impacts, warranting preparation of a full Environmental Impact Statement (EIS).

As preliminary engineering and environmental studies progressed, and as input from citizens and environmental agencies was collected, it became apparent that the footprint of the proposed improvements would likely be larger than originally envisioned and that the resulting environmental consequences would also be greater than originally anticipated. Therefore, a decision was made to prepare a full Environmental Impact Statement, and a Notice of Intent to do so was published in the *Federal Register* on July 11, 2000. The environmental data collection and analysis efforts involved in preparing the Draft EIS are described in Chapters 3 and 4. The public involvement and agency coordination activities are described in Chapter 7.

The Draft EIS was published in March 2002 and made available for public review and comment. It was distributed to the agencies listed in Chapter 6, and a notice of availability was published in the Federal Register. This document, along with other data and informational displays was presented at Location Public Hearings held in May 2002.

Following the hearings and an analysis of the comments received, the proposed designs were scaled back to reduce the physical impacts and costs. In addition, another major revision was made in response to a public-private venture proposal introducing High Occupancy Toll (or HOT) lanes on the Beltway. Additional public information meetings were held in June 2004 to report findings regarding the potential impacts and costs of the revised alternatives in comparison to the Candidate Build Alternatives presented in the Draft EIS. Based on the input received at the meetings and on the detailed engineering, traffic, and environmental analyses for the revised alternatives, the 12-Lane HOT Alternative, was selected for implementation by the Commonwealth Transportation Board on January 20, 2005.

Next steps. This Final EIS is being made available for public review. Like the Draft EIS, it was distributed to the agencies listed in Chapter 6 and notice of its availability was published in the Federal Register. After a review period, FHWA will issue a Record of Decision. If a build alternative is selected, design and construction of the proposed improvements may then advance as funding permits.

1.2 PURPOSE AND NEED FOR ACTION

The Capital Beltway is one of the most important highways in the Washington region. It links other major roadways in the region and carries more traffic than any other road in Virginia. Because of the Beltway's role as a key link in the region's transportation system, major Beltway improvements have been recommended in local, regional, and state transportation plans for almost a decade. These improvements are needed to accomplish the following:

- Provide safer travel on the Beltway.
- Correct problems with current roadway design and interchange configurations.
- Accommodate growing travel demand and changes in regional trip characteristics.
- Ease congestion on the Beltway and reduce "cut-through" traffic on local roadways and neighborhood streets.

- Complete the region's HOV network and enhance connections with other regional roadways.
- Accommodate expanded availability of mass transit in Northern Virginia and improve access to other transportation modes.
- Serve the diverse mix of land uses in Northern Virginia more effectively and improve mobility between regional activity centers.
- Help sustain the local and regional economy.
- Upgrade the region's transportation infrastructure in accordance with local and regional plans.

Factors contributing to the need for Beltway improvements are discussed in the following sections.

1.2.1 Operational Characteristics

Travel demand on the Beltway routinely exceeds capacity[1] during peak periods (6:00 to 9:00 a.m. and 3:00 to 7:00 p.m.), and commonly results in extended periods of congestion. Future growth of traffic volumes and off-peak trips will lengthen the periods of congestion. Current and projected traffic volumes on the Beltway within the project limits are shown in **Table 1-2**. Further detailed analysis of the existing conditions, including Levels of Service, may be found in Chapter 3 of the *Transportation Technical Report.*

Table 1-2
1998 AND 2020 DAILY TRAFFIC VOLUMES BY BELTWAY SEGMENT

From	To	1998 Traffic Volumes	2020 Traffic Volumes*
I-95/I-395/I-495 Interchange	Braddock Road	198,000	287,000
Braddock Road	Little River Turnpike	205,000	290,000
Little River Turnpike	Gallows Road	220,000	315,000
Gallows Road	Arlington Boulevard	225,000	310,000
Arlington Boulevard	Interstate 66	240,000	317,000
Interstate 66	Leesburg Pike	215,000	307,000
Leesburg Pike	Chain Bridge Road	188,000	263,000
Chain Bridge Road	Dulles Access/Toll Road	178,000	219,000
Dulles Access/Toll Road	Georgetown Pike	211,000	240,000
Georgetown Pike	George Washington Parkway	212,000	256,000

* Without improvements to the Beltway.
Source: Capital Beltway Study Travel Demand Forecasts (1999)

Although it comprises only 3 percent of the total highway lane-miles in Northern Virginia,[2] the Beltway carries almost 11 percent of all trips made in the region each day. For many travelers,

[1] The generally accepted capacity of a single freeway lane is 2,200 vehicles per hour. Therefore, the capacity of the existing four-lane Capital Beltway is 8,800 vehicles per hour. Existing demand volumes on the Beltway often exceed 9,000 vehicles in one hour, resulting in congestion and the backup of vehicles over time.
[2] Arlington County, City of Alexandria, City of Fairfax, Fairfax County, City of Falls Church, Town of Leesburg, Loudoun County, Cities of Manassas and Manassas Park, and Prince William County.

the Beltway is the preferred (and sometimes only) route for trips to and between residential communities, activity centers, and major employment locations in Fairfax County and elsewhere in the Washington metropolitan area. Key characteristics of Beltway trips include the following:

- Travel on the Beltway is usually only a "link" or portion of a longer trip. Most trips begin or end on other major roadways in the region.
- Most trips on the Beltway are short (not long-distance or "through") trips. Most drivers who use the Beltway get on and off within three to five interchanges.
- More than 75 percent of the motorists who travel on the Beltway begin or end their trip within Fairfax County. Between the I-95/I-395/I-495 interchange and the Dulles Access/Toll Road, 30 to 40 percent of these trips are to or from locations within 2 miles of the Beltway.

Figure 1-3 shows the origins of daily vehicle trips on sections of the Beltway.

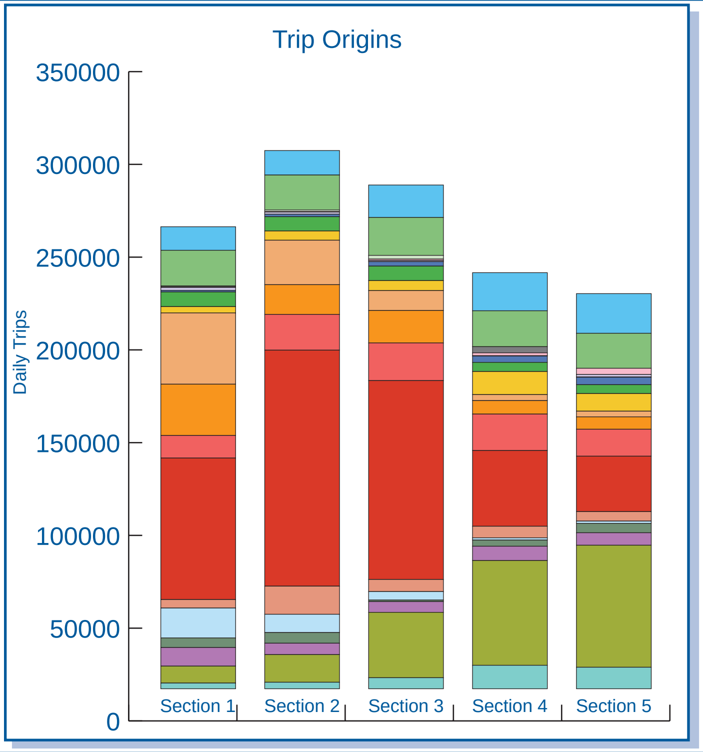
1.2.2 Safety and Operational Concerns

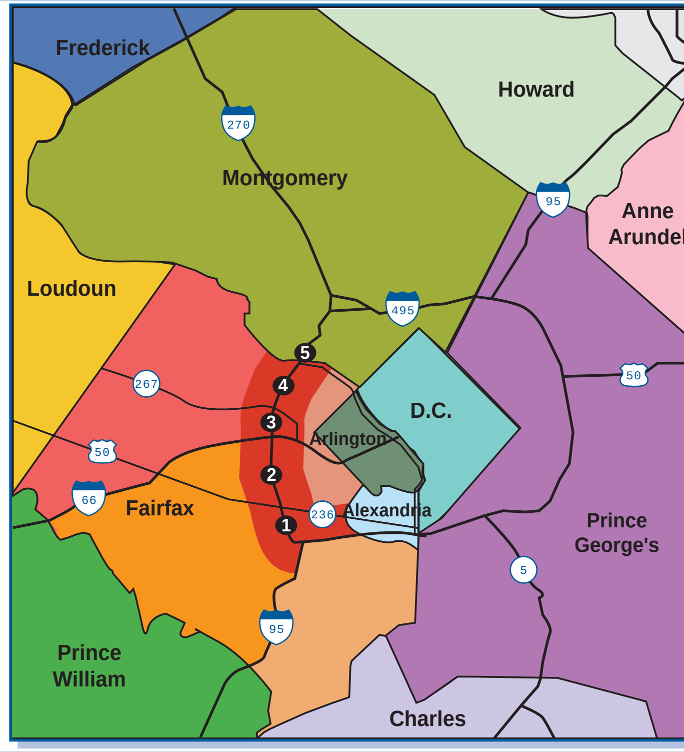
Even minor traffic incidents on the Beltway can cause delays, and major accidents can cause delays lasting several hours, both on the Beltway and the secondary roads that travelers use as alternate routes. The high traffic volumes and insufficient capacity lead to operational problems such as reduced travel speeds, longer back-ups, and extended periods of congestion.

Congestion causes accidents on the Beltway. A number of recent safety studies found that congestion is a major cause of Beltway accidents. Crashes on the Beltway happen most often during peak periods, and rear-end collisions account for 44 percent of all crashes (almost double the rate of such accidents on urban interstates nationally). Accidents on the Beltway also tend to cause "follow-on" crashes due to increased congestion, abrupt driving maneuvers, and increased hazards.

The current design of the Beltway and its interchanges may also be a factor in some accidents. Entrance and exit ramps to the left, substandard acceleration/deceleration lanes, and tight loop ramps create challenging driving conditions. Interchange spacing is inconsistent, and, with some interchanges located less than a mile apart, entry and exit to the Beltway requires accelerating and decelerating traffic to merge within a relatively short distance. Most of the interchanges do not meet current design standards, and connections with intersecting roadways are insufficient for current traffic volumes. Beltway crashes often occur in known "high-accident" locations, generally at or near an interchange. Between 1990 and 1994, more than 75 percent of all Beltway crashes occurred within ½ mile of an interchange. The interchanges with the highest number of accidents during this time period were I-66, Arlington Boulevard, Braddock Road, and Leesburg Pike.

Beltway travel speeds are decreasing. Increasing congestion on the Beltway has already reduced travel speeds to well below the posted limit of 55 miles per hour (mph) during peak travel times. Travel speeds on the Inner Loop during the morning peak period now average less than 20 mph between Braddock Road and Leesburg Pike. During the evening peak period, the average travel speed on the Outer Loop between the Dulles Access/Toll





Legend:

MD Externals	Charles	Fairfax East of I-95	Fairfax 2+ miles Inside Beltway	Montgomery
VA Externals	Frederick	Fairfax 2+ miles Outside Beltway Between I-95 & I-66	Alexandria	D.C.
Howard	Prince William	Fairfax 2+ miles Outside Beltway North of I-66	Arlington	
Anne Arundel	Loudoun	Fairfax Within 2 miles of Beltway	Prince George's	

The bar chart shows the existing origins and estimated number of daily vehicle trips using sections of the Capital Beltway within the study area. A trip is considered to use a given Beltway section if it travels on the Beltway within that section. Thus the number of trips using a Beltway section will be higher than the average daily traffic. If a trip uses more than one Beltway section, it will appear on the chart on each section that it uses.

Source: Metropolitan Washington Council of Governments Regional Model-Round 6A, 1999

BLTWY072

USERS OF THE CAPITAL BELTWAY

Figure 1-3

CAPITAL BELTWAY STUDY

Road and Braddock Road is less than 20 mph. Overall travel speeds will continue to decline as traffic volumes increase on the Beltway. **Figure 1-4** shows peak hour travel speeds on sections of the Beltway within the project limits.

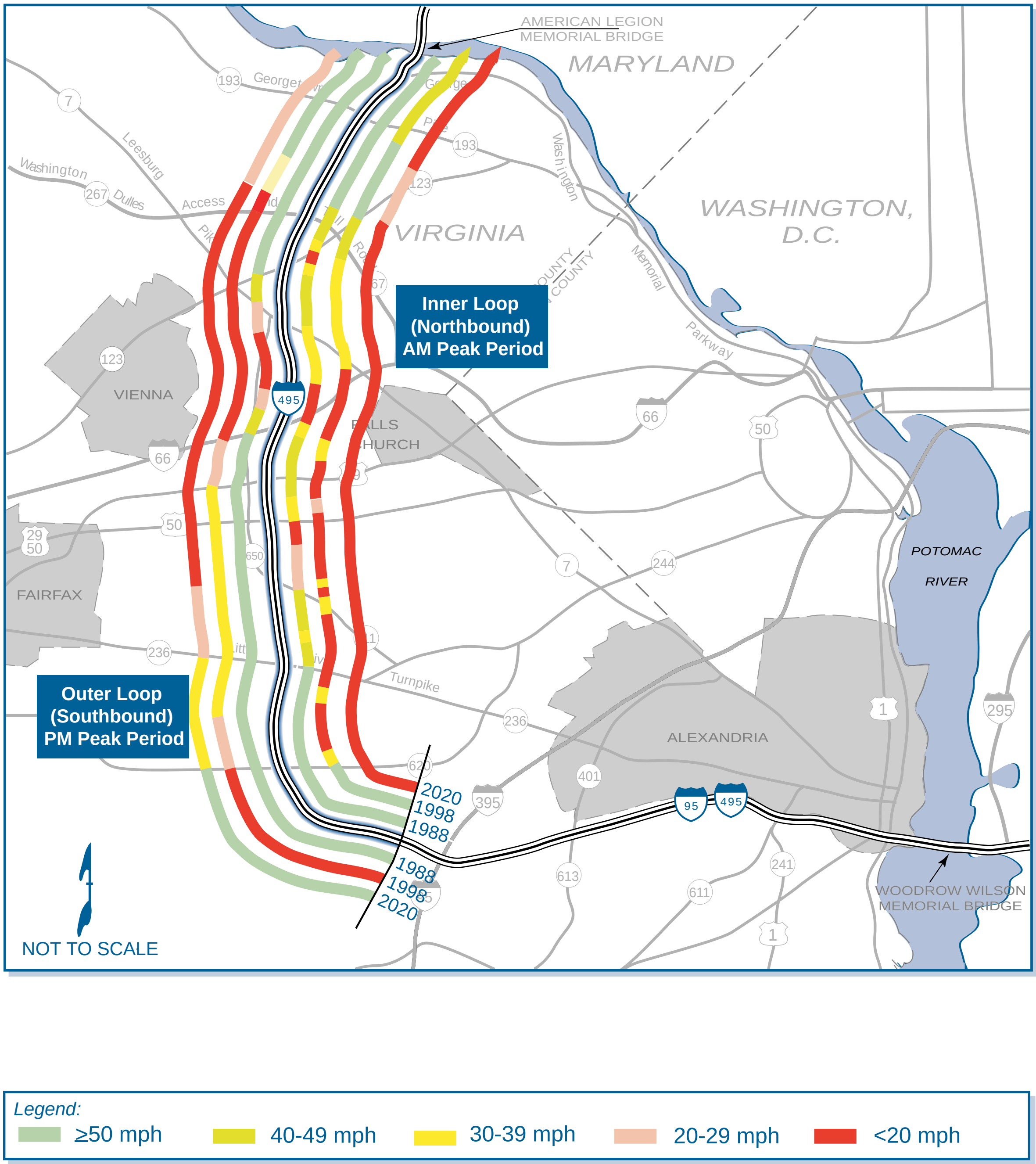
***Beltway back-ups are getting longer*.** Traffic volumes on the Beltway, and at many of its interchanges, already exceed design capacity. Because the roadway and these interchanges cannot accommodate all of the vehicles now using them, traffic on the Beltway becomes congested. During the morning peak period, it is not uncommon for traffic approaching Tysons Corner from the south to be backed up as far as Braddock Road (a distance of approximately 6 miles) and for spillover to occur, causing significant back-ups on eastbound I-66 outside the Beltway. From the north, congested traffic extends from the Tysons Corner area to the American Legion Bridge (about 4 miles), and often to the junction with I-270 in Maryland (about 9 miles).

Beltway travel times are increasing. As travel speeds decline and back-up lengths increase, average travel times for trips on the Beltway will increase. Today, about 30 percent of drivers using the Beltway experience delays during their trips. By 2020, 90 percent of drivers will experience delays. Delay is defined as an increase in the length of time in which a specific trip can be made due to congestion over the time it would take at free-flow speeds. The time it takes to complete a trip between Springfield and Tysons Corner is expected to almost double by 2020; the time required for a trip from Fairfax to Bethesda will increase by more than 110 percent.

1.2.3 Roadway Design

Although incremental improvements have been made to the Beltway, the roadway and its interchanges are largely unchanged from plans developed in the late 1950s. Since that time, experience in operating heavily traveled urban freeways has led transportation planners to make changes in the way these types of roads and interchanges are designed. The Beltway was not designed to accommodate today's traffic volumes and it does not meet current engineering requirements for high-volume, high-speed urban interstate freeways. The design issues that need to be considered include the following:

- Interchange ramps with sharp curves, tight loops, and low speeds (Braddock Road, Little River Turnpike, Leesburg Pike, and Chain Bridge Road).
- Short merging and exiting lanes, and excessive weaving (all interchanges).
- Entrance and exit ramps on the left, instead of the customary right, for general-purpose traffic (I-66 and Dulles Access/Toll Road).
- HOV traffic merging onto non-HOV roadways (I-66 and Dulles Access/Toll Road).
- Lack of full traffic movements at key interchanges (I-66 and Dulles Access/Toll Road).
- Dual exits (left- and right-handed) at the same interchange (I-66).



TRAVEL SPEEDS

Figure 1-4

CAPITAL BELTWAY STUDY

1.2.4 Capacity Constraints

Because the Beltway serves as both a regional circumferential highway and a principal local highway, it is often the only route available to serve an increasing number of trips being made throughout the day. Congestion, already a daily problem during peak periods, is becoming more frequent at other times of the day, as well as on weekends and holidays. Without additional roadway capacity, the level and duration of congestion will get worse on the Beltway and on other parts of the regional transportation network.

Expansion of the regional roadway network has not kept pace with growth. Among major metropolitan areas in the nation, the Washington, D.C. area has the fifth smallest roadway network (i.e., the number of lane miles per 1,000 persons). According to one annual survey, the Washington, D.C. area now ranks fourth among areas with the most congested roadways in the nation. Average commuting times for area residents (30 minutes each way) are the second longest in the nation (behind New York City), and 30 percent longer than the national average. Even though the region's population has almost tripled over the last 40 years, more than 200 miles of planned regional roadways throughout the metropolitan area have not been constructed.

The Beltway has not been improved in 30 years. Although the amount of daily traffic on the Beltway has tripled since the mid-1970s, there have been no major improvements to the Beltway or expansion of its capacity since 1974. This increase in overall traffic volumes, combined with interchanges that cannot adequately handle those volumes, has led to recurring and extended periods of congestion.

During peak travel times, Beltway congestion generally lasts for at least three hours. Inclement weather or accidents (in either direction) can cause even longer periods of congestion.

Beltway congestion spills over to adjacent roadways. Congestion on the Beltway encourages drivers to seek shortcuts on local and neighborhood streets. This "cut-through" traffic problem is most acute on those roads or streets that parallel the Beltway and provide connections between major radial roadways. As congestion on the Beltway increases, more drivers will use alternative routes that have limited capacity and are not intended to accommodate high traffic volumes. For example, daily traffic volumes on Gallows Road between the Beltway and Tysons Corner are projected to increase by as much as 30 percent by 2020. Similar increases are expected on other local roads that provide alternatives to using the Beltway.

Congestion will get worse. Without improvements, Beltway traffic is projected to increase by as much as 45 percent by 2020. More than 300,000 vehicles are expected to use the Beltway each day on its most heavily traveled segment: between Little River Turnpike and I-66. Congested conditions, which lead to longer travel times and delays, are expected to last for more than 18 hours each day.

1.2.5 System Linkage

A key objective of any transportation improvement is to strengthen the linkage among elements of the region's transportation system. The Beltway is a critical element in the transportation network because of its unique dual role as a regional circumferential bypass and a major local road. Improvements are needed to ensure that the roadway is capable of meeting future demand for traveling through and within the region. In addition, without HOV lanes on the Beltway, the regional HOV system is incomplete.

The Beltway has dual transportation functions. As development in Northern Virginia has grown, the Beltway has evolved into a dual-purpose roadway that provides mobility between major activity centers and connects radial roadways within the region. For local traffic, it serves as the "Main Street" of Fairfax County and provides a continuous north-south route between residential areas, employment centers, and other destinations. The Beltway is the preferred route for many trips within the county. As shown in Figure 1-1, the Beltway also connects to each major radial roadway in the region, providing access to Washington, D.C. and other destinations throughout the region. For longer-distance trips, the Beltway serves as the principal connection between I-95, I-66, and I-270.

The regional HOV system is incomplete. The Washington, D.C. region has one of the nation's most extensive HOV roadway networks, and HOV facilities have been in operation in Northern Virginia since the 1960s. All of the radial freeways in Northern Virginia now have lanes dedicated for HOV use during peak periods. As a result, the region has the highest percentage of workers who carpool (16 percent) of any metropolitan area in the United States, and the second lowest percentage of residents who travel to work by single-occupancy vehicle. The Beltway is the one critical link that is currently missing from the regional HOV system. Completion of HOV lanes on the Beltway would connect the HOV elements already in place (I-95/I-395, I-66, and the Dulles Access/Toll Road), improve HOV access to major regional activity centers, and allow high-occupancy vehicles (carpools, vanpools, buses) to operate throughout the region without mixing with general-purpose traffic.

The Beltway is important to regional freight movement. The Beltway serves as the primary route for the transfer and delivery of local goods and services. Approximately 70 percent of freight movements within the region are made by truck, and truck movements between warehouses and businesses in Virginia and Maryland occur almost exclusively via the Beltway. In addition, the Beltway is a key link in transporting freight to and from the region's airports, and congestion on the regional highway system is one of the major impediments to movements of air cargo within the region. The Beltway is also part of the national highway system, and provides an important link between major interstate highways in the region for long-distance freight shipments.

The Beltway's role in evacuation. In addition to the roles described above, the Beltway also plays a significant role in aiding evacuation of the Washington, D.C. metropolitan area in the event of an emergency. The Beltway connects to every major highway within the region and must be traversed at some point in order to access the major exit routes from the District of Columbia and the surrounding inner suburbs.

1.2.6 Intermodal Relationships

Although the Washington, D.C. region has one of the nation's most successful mass transit (bus and rail) systems, few suburb-to-suburb trips are made via transit. For example, in Fairfax County, only 3 percent of work trips are made using transit. Factors contributing to this are a lack of dedicated lanes on major roadways in the region and limited scheduled service between residential areas and key suburban destinations, such as Tysons Corner. The Beltway serves as an important intermodal link for movements among other transportation facilities, such as airports, rail terminals, transit stations, and ports, and it complements other transportation modes in or near the corridor. **Figure 1-5** shows the principal transit routes and facilities in the study area.

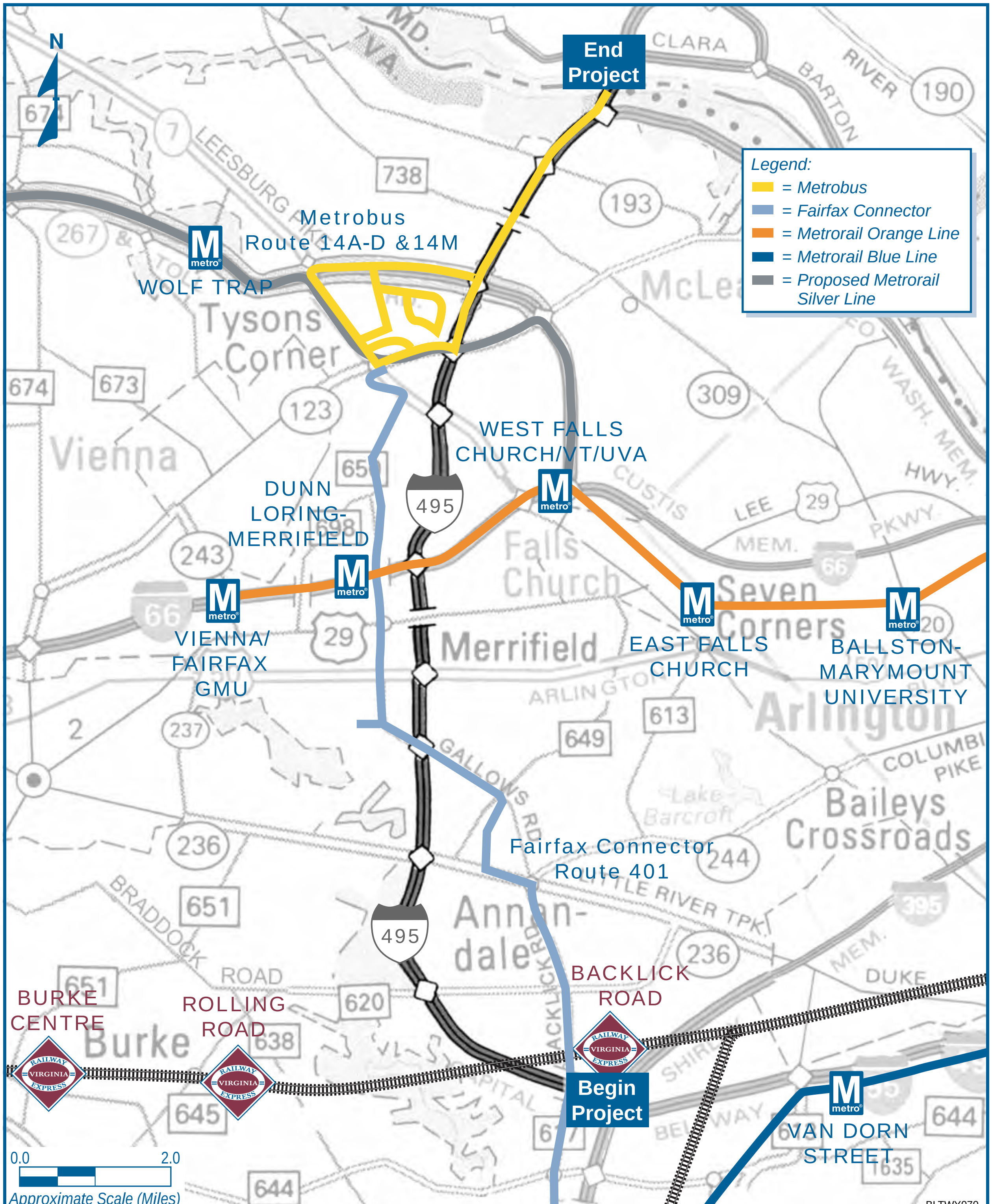
The Beltway does not currently support effective use of bus transit. The Washington Metropolitan Area Transit Authority (WMATA) recently began operating suburb-to-suburb express bus routes on the Beltway between activity centers in Maryland and Virginia. The success of these routes has been constrained by the lack of separate lanes and access points at interchanges. Without such lanes, the "express" buses must travel in the congested general-purpose lanes, which do not provide the travel time savings that are critical to attracting and retaining riders. Adding lanes dedicated to HOV and transit travel would make the express bus service currently provided on the Beltway more attractive, encourage the initiation of new service on other suburb-to-suburb links, and promote transit connections among the I-95, I-66, and Dulles corridors.

Congestion on the Beltway impedes access to other transportation modes. The Beltway is an important highway link for vehicular movements among facilities for other transportation modes in the metropolitan area, including three major airports (Reagan National, Dulles International, and Baltimore-Washington International) and two rail systems (Metrorail and Virginia Railway Express). Congestion on the Beltway increases travel times to these other facilities, which in turn decreases traveler confidence in being able to travel to and use these facilities in a timely manner. Furthermore, Beltway congestion causes traffic diversions to other local roads, further compounding the overall reduction in regional mobility.

1.2.7 Increased Travel Demand and Changing Trip Patterns

Growth in the Washington area and geographic shifts in the regional economy have increased travel demand and changed the way that many trips are made within the region. Population and employment growth, particularly in Fairfax County, has fueled increases in travel demand for the Beltway and other roadways. Trip patterns also have changed markedly; today, suburb-to-suburb travel is as common as trips to or from the Washington, D.C. urban core. Trips now are dispersed throughout the region, and roadways originally intended for local or through travel must now serve commuters as well. As shown in **Figure 1-6**, the daily volumes on the Beltway have increased steadily over the 20-year period. Up until the early 1980s, traffic growth was relatively constant at approximately 5 percent per year. In the 1980s, traffic growth on I-495 almost doubled, increasing at an average of approximately 10 percent per year. In the 1990s, traffic growth has remained steady, increasing at approximately 5 percent per year. Detailed traffic data are presented in the *Transportation Technical Report*.

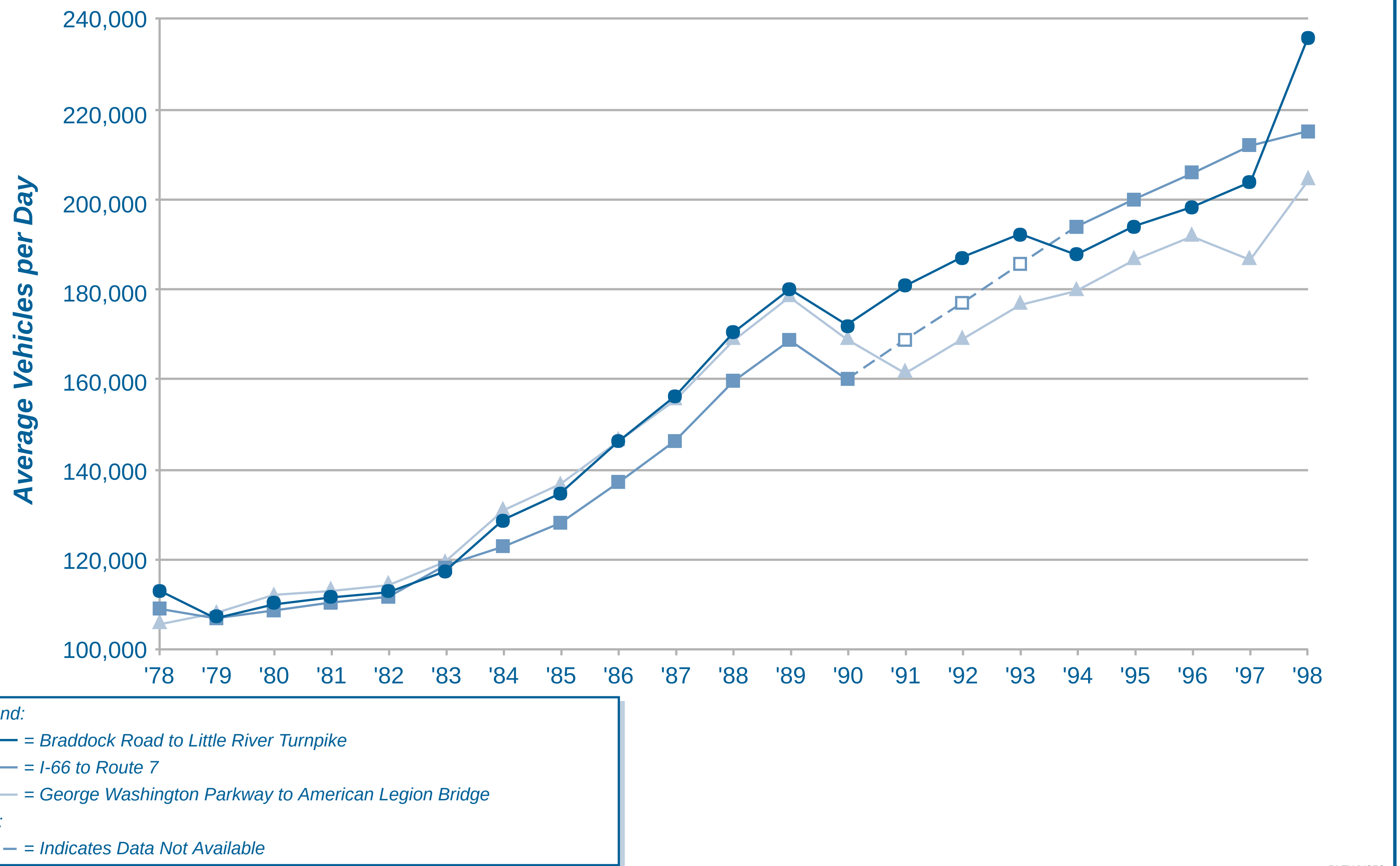
Changing demographics and employment patterns are increasing the number of trips made in the region. The combination of increasing population, a growing economy, the large proportion of two-worker households, high labor force participation, growth in temporary and part-time employment, and smaller household sizes is causing an increasing number of trips to be made within the region each day.



BUS AND RAIL TRANSIT

Figure 1-5

CAPITAL BELTWAY STUDY



AVERAGE DAILY TRAFFIC ON BELTWAY

Figure 1-6

CAPITAL BELTWAY STUDY

Most trips in the region are no longer focused on a central destination. In 1998, 10 percent of all regional trips were made between Washington, D.C. and outlying areas, while 73 percent of regional trips were from suburb to suburb. In Fairfax County, more than half of the residents now work within the county, and less than 20 percent work in Washington. The number of suburb-to-suburb trips within the region is expected to increase by 85 percent between 1990 and 2020.

Combined trips, with intermediate stops, are increasing. It is now common for workers to combine shopping and entertainment trips with their commute, either to avoid another trip after getting home or to delay their trip home until congestion levels have waned. According to a study by the Metropolitan Washington Council of Governments (MWCOG), 15 percent of all workers made at least one stop (for example, for child care, shopping, personal or family business) on their way to work in 1998, a 50 percent increase from 1988. On the work-to-home trip in the evening, more than 30 percent of all workers made intermediate stops.

Most trips in the region are made by automobile. According to MWCOG, 81 percent of all trips in the Washington, D.C. region each day are made by auto; only 6 percent are made using transit (bus, Metrorail, commuter rail). The remaining daily trips are made via walking (8 percent), school bus (4 percent), or other means (1 percent). Even with planned improvements to the region's transit system, transit's share of total regional trips is not expected to increase significantly by 2020.

1.2.8 Land Use Changes

Continued population growth and a restructuring of the regional economy have transformed Fairfax County from a bedroom community to a multi-faceted suburban area and major employment center. However, most of its roadways (including the Beltway) were planned or constructed when the county was predominantly a residential suburb, and consequently were not designed to handle today's traffic volumes or trip patterns. The proposed improvements would upgrade the Beltway to accommodate these changes in area land uses and metropolitan development patterns.

Rapid urbanization. After the influx of new residents in the 1950s and 1960s, Fairfax County quickly changed from a predominantly residential community to an urbanized suburb. The expanding population base created demand for commercial services and retail shopping, and encouraged businesses to relocate closer to their customers and employees. Large areas of the county (often along major roadways) were rezoned to allow commercial, retail, and industrial development. Since 1975, 84 percent of the commercial development in the county has occurred, as has 57 percent of retail development and 65 percent of industrial development.

Regional growth is occurring in the suburbs. Suburbs outside the traditional core of the metropolitan area, such as Fairfax County, are now the preferred location for new residents and businesses, in part because these areas have vacant land available that can accommodate the demand for new residential and commercial development. Almost all regional population and employment growth over the last 20 years has been in suburban areas. These trends accelerated during the 1990s and are expected to continue.

Non-residential land uses are increasing. The total floor area of non-residential land uses in Fairfax County grew by 235 percent between 1980 and 1996. During the same time period, the number of residential housing units grew by only 57 percent. Today, only 14 percent of the land planned for residential uses remains vacant, compared to 32 percent of the land designated for commercial and industrial uses.

Suburban activity centers have emerged. Recent commercial and retail development has become concentrated in selected suburban locations, primarily in locations with convenient access to major transportation facilities. Two of these activity centers, or “edge cities”—Tysons Corner and Merrifield—are served directly by the Beltway. The Beltway is also used for a portion of many trips to other suburban activity centers, such as Reston/Herndon, Springfield, Fairfax/Fair Oaks, and Montgomery County, Maryland.

Additional development is already approved. Fairfax County is not yet completely developed, and continued development of now-vacant land is included in the county’s comprehensive plan. When the county is completely built out, there will be an additional 56,000 housing units and another 4,300 acres of commercial and industrial development. At the two activity centers along the Beltway alone (Tysons Corner and Merrifield), an additional 25 to 30 million square feet of commercial office and retail space is anticipated. The continued development of Fairfax County and the subsequent employment growth will increase Beltway travel demand.

1.2.9 Regional Population Growth

The Washington, D.C. metropolitan area has experienced substantial population growth and suburban expansion over the last four decades. Almost all of this growth occurred in suburbs that are served by the Beltway, including Fairfax County. A review of statistics from the U.S. Census Bureau and MWCOG identified several trends that are contributing to increased use of the Beltway, including the trends described below.

Sizeable and sustained population growth. According to MWCOG, between 1960 and 1998, the population of Northern Virginia grew at an annual rate of almost 5 percent, from 614,000 to more than 1.7 million. The area’s population has increased by nearly 50 percent in the last 20 years alone.

Shift of the region’s population to the suburbs. In 1960, Fairfax County was the region’s fourth largest jurisdiction, with 275,000 residents (the District of Columbia was the largest). By 1990, Fairfax County was the largest jurisdiction in the region, with almost 820,000 residents. Today Fairfax County’s population has exceeded the one million mark.

Increasing number of households. Due to changing demographics and societal trends, the number of households in Northern Virginia has been growing at an even faster rate than the population (more than 7 percent per year). Between 1960 and 1995, the total number of households grew by more than 250 percent, from 171,000 to 603,000.

The region’s population will continue to grow. Although projections indicate that the rate of regional growth will abate, the area will continue to attract new residents over the next 20 years. MWCOG estimates that by 2020, the population of Northern Virginia will increase another 39 percent, to 2.5 million people. Almost half of these residents will live in Fairfax County. By 2020, there will be 250,000 more households in Northern Virginia; 100,000 of these will be in Fairfax County.

1.2.10 Economy and Employment

Changes in the composition of the regional economy and shifts in employment patterns over the past 30 years have increased demand for all transportation facilities outside the District of Columbia, particularly for roadways such as the Beltway that provide mobility among major suburban business and employment centers. Improving the Beltway is important to the continuing economic vitality of Northern Virginia for the reasons described below.

Northern Virginia is a major employment center and key element of the regional economy. In 1995, total employment in Northern Virginia was 34 percent higher than employment in the District of Columbia and 14 percent higher than the combined employment in Montgomery and Prince George's counties in Maryland. About half of all jobs in Northern Virginia are located in Fairfax County, where a diversified economic base includes high-technology companies, corporate and regional headquarters, trade associations, business and financial services, and wholesale and retail trade outlets.

Most new jobs and businesses are in suburban areas. New businesses are locating primarily in suburban areas such as Fairfax County, especially on sites with convenient access to major transportation facilities such as the Beltway. Over the last three decades, suburban employment grew at a faster rate than the population, and since the early 1980s, approximately 84 percent of the new jobs created in the Washington metropolitan area were located in the suburbs. The District of Columbia, the traditional core of the metropolitan area, now accounts for less than 30 percent of all jobs in the region.

Regional employment will increase substantially over the next two decades. By 2020, employment levels in Northern Virginia are expected to increase by 50 percent, amounting to 1.5 million people in the work force. Much of this job growth will occur at established suburban activity centers along the Beltway, including Tysons Corner and Merrifield, and at other nearby activity centers that rely on the Beltway for regional mobility (Reston/Herndon, Dulles Airport, Fairfax/Fair Oaks, and Springfield).

Changes in the composition of the work force are increasing travel demand. The Washington, D.C. area has the highest number of commuters per household (1.52) of any region in the country, in large part because nearly 80 percent of all eligible workers are employed and 75 percent of households include two workers. These same-household workers often commute to different parts of the metropolitan area.

Congestion has economic costs. The Beltway's increasing congestion could undermine efforts to attract new business and retain businesses already in place. Traffic congestion is already the top concern of current workers and prospective businesses seeking to relocate to the area. According to a recent study by the Texas Transportation Institute, on a per capita basis, Washington-area residents currently spend about 46 hours per year sitting in traffic, at a cost of $780 per person. Freight movements are also affected by congestion, which slows deliveries and increases shipping costs. Many businesses now plan their activities and deliveries to avoid travel during the Beltway's most-congested periods. By

2020, the Greater Washington Board of Trade estimates that increased congestion will raise local shipping costs by $345 million a year. These costs, ranging from $750 to $1,300 per household, are likely to be passed on to consumers in the form of higher prices for goods and services.

1.2.11 Local Plans and Policies

Improving the Beltway would upgrade the region's transportation infrastructure in accordance with local and regional plans. Enhancing mobility in the Beltway corridor and adding capacity to the roadway has long been recommended in a number of long-range transportation and land use plans prepared by various local, regional, state, and federal agencies. Current plans that generally endorse or recommend continuing improvements to the Beltway include the following:

- Fairfax County's *Policy Plan*
- Fairfax County's *Comprehensive Plan*
- National Capital Region Transportation Planning Board's *Transportation Vision Plan*
- National Capital Planning Commission's *Comprehensive Plan for the National Capital*

Long-range transportation and land use plans that specifically recommend implementing the Beltway improvements include the following:

- Fairfax County's *Comprehensive Plan*
- Fairfax County's *Transportation Plan*
- National Capital Region Transportation Planning Board's *Update to the Financially Constrained Long-Range Transportation Plan for the National Capital Region*. The Board is the designated Metropolitan Planning Organization responsible for coordinating planning and prioritizing transportation improvements in the metropolitan Washington region.
- Northern Virginia Transportation Coordinating Council's *Northern Virginia 2020 Transportation Plan*. The Council is an advisory group of locally elected officials from 13 northern Virginia jurisdictions and the Virginia General Assembly that serves as a caucus on recommending regional transportation priorities and funding allocations.

2

ALTERNATIVES

A wide range of improvement alternatives was considered throughout the course of this project. The alternatives were identified and evaluated through an iterative screening process in cooperation with citizens, local and regional planning agencies, and a technical study team. Except for the No-Build Alternative, alternatives deemed not reasonably capable of meeting the identified needs or deemed too disruptive in comparison to the transportation benefit achieved were eliminated from further consideration. While required to be considered by National Environmental Policy Act regulations, the No-Build Alternative was also studied in detail because it illuminates the need for improvements and serves as a baseline for comparing the other alternatives.

The range of alternatives considered in detail and carried forward to the Draft EIS included the No-Build (or no-action) Alternative and three Candidate Build Alternatives for expanding and reconfiguring the total number of lanes on the Beltway: the Concurrent HOV Alternative (10 through lanes), the Express/Local with HOV Alternative (10 through lanes), and the Barrier-Separated HOV Alternative (12 through lanes). Options for interchange configurations along the length of the mainline alternatives were also examined.

Based on the comments received on the Draft EIS from the general public and local government, the three Candidate Build Alternatives, as well as the various interchange options, were reevaluated to identify possible cost savings and opportunities to reduce their environmental impacts. The goal of this review and refinement process was to develop alternatives that further minimized the footprint of the proposed Beltway but were still operationally balanced with the existing and planned transportation network that delivers traffic to and from the Beltway.

As the majority of the impacts and right-of-way requirements were driven by interchange improvements, each interchange was reviewed to determine if the number and size of ramps and bridges could be reduced. The capacity of each of the intersecting roadways was reviewed and the ability to deliver or receive traffic identified. The size of the proposed interchange improvements was reduced as much as possible without undermining the effectiveness of the process, which resulted in a dramatic reduction in the size of the interchanges and right-of-way requirements. In addition, the required right-of-way for mainline improvements was reduced by minimizing shoulders and utilizing painted buffer strips where barrier medians had been proposed before. Finally, each of the three revised Candidate Build Alternatives was re-evaluated for two different operational scenarios within the managed lanes: HOV (as originally proposed) and High Occupancy Toll (HOT) lane operations, resulting in six "refined" alternatives to be evaluated.

Based on a multiple step review process that examined both the mainline and the interchange areas, two of the refined alternatives proved to be the most prudent and feasible and were chosen for further development and study. One alternative was developed from the Barrier-Separated (12 through lanes) Alternative presented in the Draft EIS. The Revised 12-Lane HOT / Managed Lanes Alternative – achieves a significant reduction in total lane miles (and associated right-of-way requirements) along the entire corridor and reduces the size of the interchanges. Similarly, a Revised 10-Lane Concurrent HOV Alternative was also developed.

These two Candidate Build Alternatives, along with the No-Build Alternative, were then assessed in more detail against a refined set of guidelines that better reflect the performance and impact criteria identified in the Purpose and Need as well as the public comments. Based on this assessment, the 12-Lane HOT / Managed Lanes Alternative was adopted by the Commonwealth Transportation Board (CTB) as the project's Preferred Alternative on January 20, 2005.

The following chapter explains the alternatives development process; illustrates the Preferred Alternative; describes the conditions assumed with the No-Build Alternative; provides the results of the operational analysis of the alternatives; summarizes the costs and impacts associated with the Preferred Alternative and the other Candidate Build Alternatives considered throughout the EIS process; and identifies the alternatives eliminated from further consideration. Additional details on alternatives development are provided in the Draft EIS *Alternatives Development Technical Report*.

2.1 ALTERNATIVES DEVELOPMENT PROCESS

2.1.1 Refinement of Strategies from Major Investment Study

In January 1997, the findings of the Major Investment Study (MIS) for the Beltway project were summarized in the *MIS Results Report: The Framework for Beltway Improvements*. The MIS Results Report described the identification and evaluation of a number of approaches, or strategies, for achieving the following four primary goals with respect to the Beltway:

- Support regional mobility and address current and future congestion.
- Provide for increased safety and maximum operational efficiencies.
- Make best use of resources.
- Preserve capital investment.

The report also identified the types of roadway improvements recommended for developing into specific alternatives for preliminary engineering and detailed environmental review. Five of the twenty improvement strategies considered in the MIS were included in the recommended strategy package as follows:

- Add HOV lane(s) with direct access to HOV lanes on connecting roads.
- Add separated express lanes for long-distance trips.
- Renovate interchanges.
- Implement enhancements to facilitate traffic law enforcement, promote ridesharing, and provide better traveler information (e.g., ITS technologies).
- Plan for express bus transit service on the Beltway.

An iterative process of translating these strategies into physical improvements involved detailed mapping of existing conditions, detailed definition and analysis of the needs for Beltway improvements that underlie the goals noted above, conceptual drawings, increasingly detailed preliminary design drawings of road and interchange configurations, and further consultations with the public and local and regional agencies.

2.1.2 Identification of Reasonable Alternatives for Further Study in the Draft EIS

Translating the general MIS strategies into specific physical improvements involved a complex interplay between the identified transportation needs in the Beltway Corridor and engineering, traffic, and environmental considerations. Engineering considerations included geometric design standards for horizontal and vertical alignments, weave and merge distances for interchange ramps, vertical clearances for overpasses, widths of travel lanes and shoulders, barrier wall configurations, cut and fill slopes, stormwater and drainage elements, and cost. Traffic considerations included volumes, classifications (e.g., trucks and autos), speeds, entering and exiting movements, lane capacities, and maintenance of traffic during construction. Environmental considerations included potential effects on parks, schools, homes, businesses, air quality, noise levels, water quality, wetlands, visual quality, and vegetation.

2.1.2.1 Development and Definition of a Range of Possible Solutions

Based on an understanding of the Beltway Corridor and the findings of the MIS, several general principles guided the definition of potential improvements. First, better management of the overall Beltway would be explored, which would entail organizing lanes by travel patterns or character (e.g., physically separating express/through traffic from local/short-trip traffic and distinguishing HOV lanes from general-purpose lanes). In addition, it would include eliminating bottlenecks that create congestion and reduce traffic throughput rates, and it would include informational (e.g., signing), enforcement, and accident response systems. Second, it would be necessary to establish the maximum amount of additional capacity needed to fully accommodate projected traffic volumes, as well as the amount that could reasonably be added before the level of community disruption would become unacceptable. Third, existing design features would need to be updated in accordance with current design standards. Fourth, direct access to the Beltway would have to be provided for HOV traffic. Future HOV occupancy requirements were assumed to be three (HOV-3^+) to be consistent with regional transportation plans.

Improvements defined under these principles would provide the desired mobility and safety enhancements. These enhancements in turn would help to fulfill the Beltway's roles in the regional and local transportation systems, help reduce cut-through traffic on local and neighborhood streets, improve connectivity between major activity centers, support expanded availability of mass transit, and help maintain the transportation support necessary to the regional economy.

2.1.2.2 Maximum of 12 Lanes

During the MIS Phase, it was determined that in order to provide sufficient capacity for the future travel demand, 14 or more lanes would be required for the mainline of the Beltway. However, to build 14 lanes or more, it would be necessary to acquire a significant amount of additional right-of-way to accommodate the lanes, drastically changing the existing character of the corridor, which would be unacceptable. Thus, the maximum number of lanes was set at 12 in order to minimize the environmental impacts of the Beltway widening.

There are several different ways to add lanes and reconfigure the existing Beltway, improve the design and traffic operations of interchanges, and provide direct access for HOV traffic and express buses. Various conceptual designs were developed for each of these three major elements for public review and technical evaluation (screening). **Table 2-1** summarizes the factors considered in developing the three-part improvement concepts.

Table 2-1
FACTORS CONSIDERED IN THE DEVELOPMENT OF ALTERNATIVES

Roadway Configurations	Interchange Improvements	Direct HOV Access
Type of Lanes and Lane Configuration (Layout)	Travel Patterns and Interchange Capacity	Interchange Locations for Direct HOV Ramps
Total Number of Lanes	Connections with Intersecting Roadways	HOV/Express Bus to General-Purpose Lane Connections
Traffic Operations and Safety	Compatibility with Roadway Modifications	Express to Local Lane Connections
Environmental and Community Concerns	Safety Enhancements	Environmental and Community Concerns
	Environmental and Community Concerns	

***Roadway Configurations**.* There are numerous options to reconfigure (or organize) the number and type of lanes making up the Beltway mainline. VDOT, in conjunction with the Beltway Study Team, developed the following assumptions to guide the development of possible configurations so as to meet the operational and safety needs identified, as well as minimize disruption to neighboring communities:

- Alternatives considered will not reduce the number of existing general-purpose lanes on the Beltway.
- Alternatives considered will not have more than six mainline lanes in any direction.

- Alternatives considered will not have more than five undivided mainline lanes in direction.
- HOV and/or express lanes will be located in the interior of the roadway.
- Alternatives considered will not include more than one concurrent HOV lane due to concerns about excess weaving/merging and the safety of traffic operations.
- Ten-lane HOV alternatives will have a maximum of one HOV lane in each direction; similarly, 12-lane HOV alternatives will have a maximum of two HOV lanes in each direction.
- Direct HOV access will be provided at each crossing roadway with existing or planned HOV facilities.
- Express/local roadway alternatives considered will have at least two express lanes in each direction.
- Express/local roadway alternatives will use one or two of the HOV lanes as a concurrent HOV lane during peak periods.
- Alternatives in Virginia will be designed to ensure total connectivity with the proposed Beltway improvements in Maryland.

Four different roadway configurations were found to meet these criteria and are described below.

- Concurrent HOV - One concurrent HOV lane would be added to the Beltway in each direction. No additional general-purpose lanes would be constructed. The Beltway would have a total of 10 lanes under this option.
- Barrier-Separated - The Beltway would be reconfigured to separate general-purpose and HOV traffic. One or two HOV lanes, separated from the other lanes by a concrete barrier and shoulders, would be built in each direction. Access to these HOV lanes would be provided at selected interchanges and at various points along the Beltway. No additional general-purpose lanes would be constructed. Under this scenario, the Beltway would have 10 or 12 lanes.
- Express/Local - This roadway configuration would separate the Beltway's short- and long-distance trips. One additional general-purpose lane would be constructed in each direction. The "express" lanes (for longer trips) would be separated from the other lanes by a concrete barrier and shoulders. Access to these lanes would be provided at select interchanges and at various points along the Beltway. With this improvement, the Beltway would have 10 lanes.
- Express/Local with HOV - This mainline configuration would also separate short- and long-distance trips. One or two HOV lanes, concurrent with the express lanes, would be constructed in each direction. As with the other Express/Local option, the "express" lanes would be separated from the local lanes by a concrete barrier and shoulders. Access would be provided at select interchanges and at various points along the Beltway. The HOV lanes

could be used as express bus lanes during non-peak hours. Under this option, the Beltway would have 10 or 12 lanes.

Based on these four configuration options, 14 mainline alternatives were initially developed. **Table 2-2** summarizes these alternatives and shows which were carried forward for detailed evaluation in the Draft EIS.

Table 2-2
MAINLINE IMPROVEMENT CONCEPTS IN THE DRAFT EIS

Mainline Concepts Considered	Number of Through Lanes	Lane Configuration
Concurrent HOV	10	5-5
Barrier-Separated HOV	10	4-1-1-4
	12	4-2-2-4
	12	5-1-1-5
Express/Local	10	2-3-3-2
	10	3-2-2-3
	12	2-4-4-2
	12	3-3-3-3
	12	4-2-2-4
Express/Local with HOV	10	3-2-2-3
	10	2-3-3-2
	12	2-4-4-2
	12	3-3-3-3
	12	4-2-2-4

Interchange Options. The 14-mile segment of the Beltway between the Springfield Interchange and the American Legion Bridge provides connections to a major interstate highway (I-66), limited access highways (Dulles Access/Toll Road and George Washington Memorial Parkway), and local primary roads via 10 interchanges. Modifications to these interchanges and intersecting roadways would be needed to accommodate and enhance the proposed Beltway improvements. For each interchange, existing conditions were analyzed and various ways to improve traffic operations and safety were developed. In most cases, the proposed interchange types are similar to the existing types and all movements are retained. In some locations, however, such as the Little River Turnpike, two very different interchange types were developed (i.e., cloverleaf vs. diamond design). **Table 2-3** shows the 44 interchange options initially identified in the Draft EIS. Details of each interchange are presented in the Draft EIS *Alternatives Development Technical Report*.

Direct HOV Access. Direct access to the proposed HOV lanes via dedicated ramps was included in the improvement concepts for all interchanges that connect to existing (or planned) HOV roadways in the project area: Braddock Road, Interstate 66, and the Dulles Access/Toll Road. HOV access was also included in each of the improvement concepts for the Chain Bridge Road interchange to improve access to the Tysons Corner area. In addition, improvement concepts for HOV access at Lee Highway (Route 29) to serve the Merrifield area were developed.

Table 2-3
INTERCHANGE IMPROVEMENT CONCEPTS IN THE DRAFT EIS

	Interchange Concepts Considered
Braddock Road (Route 620)	A – Cloverleaf with Center HOV B – Cloverleaf with Center HOV C – Cloverleaf with Reversible HOV D – Cloverleaf with Directional HOV E – Partial Cloverleaf with Center HOV
Little River Turnpike (Route 236)	A – Partial Cloverleaf with Directional Ramps B – Partial Cloverleaf C – Single Point Diamond D – Cloverleaf with Directional Ramps E – Improved Cloverleaf F – Partial Cloverleaf with Directional Ramps G – Three-Level Urban Diamond
Gallows Road (Route 650)	A – Improved Partial Diamond B – Partial Clover/Partial Diamond C – Full Diamond
Arlington Boulevard (Route 50)	A – Improved Full Cloverleaf
Interstate 66	A – Directional with Full Movements* B – Directional with Full Movements* C – Directional with Partial SOV Movements D – Directional with Partial SOV Movements E – Directional with Full Movements F – Directional with Full Movements G – Directional with Full Movements
Leesburg Pike (Route 7)	A – Directional B – Directional C – Directional D – Directional E – Partial Cloverleaf
Chain Bridge Road (Route 123)	A – Partial Cloverleaf B – Partial Cloverleaf C – Partial Cloverleaf D – Partial Cloverleaf E – Partial Cloverleaf F – Partial Cloverleaf G – Partial Cloverleaf H – Mainline Shift
Dulles Access/Toll Road (Route267)	A – Directional B – Directional C – Directional D – Directional E – Directional
Georgetown Pike (Route 193)	A – Diamond B – Partial Cloverleaf
George Washington Memorial Parkway	A – Trumpet

*Concept A applies only to the Concurrent HOV [5-5] mainline; Concept B is identical in design and applies to all other mainline alternatives.

2.1.2.3 Screening of Improvement Concepts

Following the development and refinement of various improvement concepts, a three-level screening process was used to identify the best-performing concepts, which could then be evaluated in greater detail. Preliminary screening determined whether the concepts would meet the project's purpose and need and fulfill basic safety and operational requirements. Concepts that could not be modified to meet these objectives were eliminated from further consideration. Next, the remaining concepts were refined and evaluated for engineering feasibility and general environmental impacts. Concepts that would be difficult to construct while maintaining traffic operations on the Beltway, as well as concepts with environmental consequences disproportionate to the benefits provided, were dropped. In some cases, similar improvement concepts were consolidated and carried forward. Finally, each remaining concept was tested to ensure that the proposed designs could safely accommodate projected traffic volumes. Poorly performing or operationally deficient concepts were dropped from further consideration. The criteria considered at each level of the screening process are summarized in **Table 2-4**.

Table 2-4
CRITERIA USED IN SCREENING ALTERNATIVES IN THE DRAFT EIS

Level 1 **Preliminary Criteria**	**Level 2** **Environmental & Engineering Criteria**	**Level 3** **Traffic & Operations Criteria**
Consistent with Planning Assumptions?	Feasible to Construct?	Improves Mobility and Reduces Congestion?
Meets Purpose and Need?	Able to Maintain Traffic Operations During Construction?	Compatible with Other Planned Improvements?
Improves General Performance, Operations, and Safety?	Disproportionate Environmental Impacts?	Enhances Interchange Operation and Safety?
Complies with Design and Safety Standards?	Similar to Other Improvement Concepts?	Improves Mainline Operation and Safety?

2.1.2.4 Preliminary Engineering of Candidate Build Alternatives

Concepts remaining at the end of the screening process were combined into complete "end-to-end" improvement alternatives consisting of (1) a specific lane configuration (e.g., concurrent HOV), (2) improvements for each interchange, and (3) new direct access points for HOV traffic. The "end-to-end" alternatives were evaluated to ensure that each could be constructed and operated safely for the entire 14-mile segment between the I-95/I-395/I-495 interchange and the American Legion Bridge. For some interchanges, multiple concepts were viable; so more than one improvement option was retained for detailed evaluation in the Draft EIS.

As a result of this process, three mainline Candidate Build Alternatives were considered in the Draft EIS: Concurrent HOV (10 through lanes), Express/Local with HOV (10 through lanes), and Barrier-Separated HOV (12 through lanes). For some of the interchanges, more than one interchange option was carried forward for further study. In addition, direct access points for HOV traffic to the HOV lanes were identified. Over the course of the next two years, these Candidate Build Alternatives were further developed and evaluated. Detailed environmental assessments were conducted for each and the results were documented in the Draft EIS issued in March 2002.

Coordination with Agencies, Local Officials, and the General Public. The development of the Candidate Build Alternatives evaluated in the Draft EIS was coordinated with federal, state, and local agencies, citizens, interest groups, civic organizations, and businesses. VDOT encouraged agency and public participation in the study process.

Each level of the screening process concluded with a presentation of the preliminary concepts and/or alternatives to the Beltway Study Team. The Beltway Study Team consisted of representatives from the area's transportation agencies, including VDOT, FHWA, Virginia Department of Rail and Public Transportation (DRPT), Fairfax County Department of Transportation, Metropolitan Washington Council of Governments, Northern Virginia Transportation Commission, and the Washington Metropolitan Area Transit Authority (WMATA). The Maryland State Highway Administration also participated in Study Team meetings. This multi-agency group provided comments and recommendations throughout the course of developing and evaluating alternatives. All decisions made by the Study Team were documented in formal Decision Chronicles. These decision documents are included in the Draft EIS *Alternatives Development Technical Report.* The results of the alternatives development process were also presented to the general public in the form of individual group meetings, as well as two public workshops. Details of these meetings are presented in Chapter 7.

2.1.3 Refinement of Alternatives Based on Comments on the Draft EIS

After the publication of the Draft EIS, three public hearings were held in May 2002 to elicit comments from citizens, local agencies, and organizations on the document and the Candidate Build Alternatives considered and their environmental effects. Although each of the Candidate Build Alternatives studied in the Draft EIS satisfied the purpose and need for improvements, comments from the general public and local government suggested that the cost and environmental impacts associated with these alternatives were too high and that a better balance of operational benefits versus negative environmental consequences be achieved. In response, the guidelines for developing alternatives were revised to better reflect operational performance and impacts.

- Minimize to the extent possible the total footprint while providing sufficient capacity to achieve LOS D during non-peak periods.
- Provide additional capacity using managed lanes.
- Avoid to the extent possible queuing that extends upstream (back onto) the arterial street system, as it has the potential to increase cut-through traffic in residential neighborhoods.
- Provide to the extent possible direct or preferential access to managed lanes for transit, HOV, and tolled vehicles within the right-of-way, particularly when connecting to other facilities with existing or planned HOV or managed lanes.
- Provide predictable and reliable travel times for transit, HOV, and tolled vehicles.

- Provide maximum flexibility in terms of operating or pricing strategies that could be implemented.
- Allow for the enforcement of the adopted operating strategies and policies.
- Provide adequate transition distance to meet the Maryland portion of the Capital Beltway safely.

Each of the build alternatives was scaled back significantly to lessen both costs and impacts on the surrounding community. The most significant reduction in impacts was found in residential displacements. Whereas the original Candidate Build Alternatives could potentially displace between 206 and 294 residences, the “scaled back” alternatives are estimated to only displace 3 or less residences.

Right-of-way requirements for each of the alternatives were reduced by minimizing shoulders and replacing physical barriers with painted strips, as well as by reducing improvements to interchanges. For instance, the typical cross-section for the original 12-Lane Barrier-Separated HOV Alternative was 226 feet wide; however, with the revised shoulders and barrier modifications the width was reduced to approximately 202 feet. The most notable reductions in right-of-way requirements, however, involved minimizing improvements to interchanges. All of the interchange improvements evaluated in detail in the Draft EIS were revisited and sized to balance with the intersecting roadways and access to the managed lanes was limited to locations where the additional ramps could be incorporated with minimal right-of-way requirements. In addition, potential design exceptions were considered at each of the interchanges to further reduce impacts. Examples included slight reductions in the radius and design speeds for loop ramps and shortening of auxiliary lanes. In every case, however, the proposed designs still represented an improvement over existing conditions. Following these refinements, a Preferred Concept for each interchange was selected. These preferred interchange concepts are detailed in Section 2.2.2 below.

In addition to the design modifications to the proposed mainline and interchange improvements, each of the three Candidate Build Alternatives was also evaluated to assess the potential for the implementation of High Occupancy Toll (HOT) lane operations. This new operational scenario was the result of an unsolicited Public Private Transportation Act (PPTA) proposal that was submitted after the publication of the Draft EIS. The proposal recommended the use of HOT lanes on the Beltway.

As a result of these design revisions and operational modifications, six revised alternatives were developed: the three original mainline concepts, both with and without HOT lanes (see **Table 2-5**). Revenue studies and pricing were not evaluated as part of this assessment -- such studies will be conducted by the PPTA proponent. Instead, the potential market and available capacity were assessed based on origin-destination patterns and the ability to provide access to and from the managed HOT lanes. The six revised alternatives were subjected to the same level of screening that was used in the evaluation of previous alternatives (see Table 2-4) plus the operational aspects of managed HOT lanes. After a series of lane-balancing evaluations, it was determined that there would not be enough high occupancy vehicles to require two HOV lanes in each direction. Conversely, the same evaluations revealed that two HOT lanes in each direction would be necessary to accommodate the projected combined use of high occupancy and tolled vehicles. Based on these screening evaluations, two alternatives were identified as the most promising and were further evaluated: the Revised 10-Lane Concurrent HOV Alternative and the Revised 12-Lane HOT / Managed Lanes Alternative.

Table 2-5
REVISED MAINLINE IMPROVEMENT CONCEPTS

Concept	Number of Through Lanes	Lane Configuration	Detailed Evaluation	Preferred Alternative
	10	4-1-1-4	4-1-1-4	
HOV Managed Lanes	10	3-2-2-3		
	12	4-2-2-4		
	10	4-1-1-4		
HOT Managed Lanes	10	3-2-2-3		
	12	4-2-2-4	4-2-2-4	4-2-2-4

The two revised alternatives were presented at two public information meetings in June 2004. More than 360 citizens attended the meetings. Attendees were able to review the engineering plans of the revised alternatives, as well as information regarding traffic operations, tolls, environmental impacts, and project costs. The revised alternatives reflected many of the comments issued by the general public in previous meetings and overall were received in a positive manner. Based on the written comments received, approximately 59 percent of commentors preferred the 12-Lane HOT / Managed Lanes Alternative.

2.2 PREFERRED ALTERNATIVE

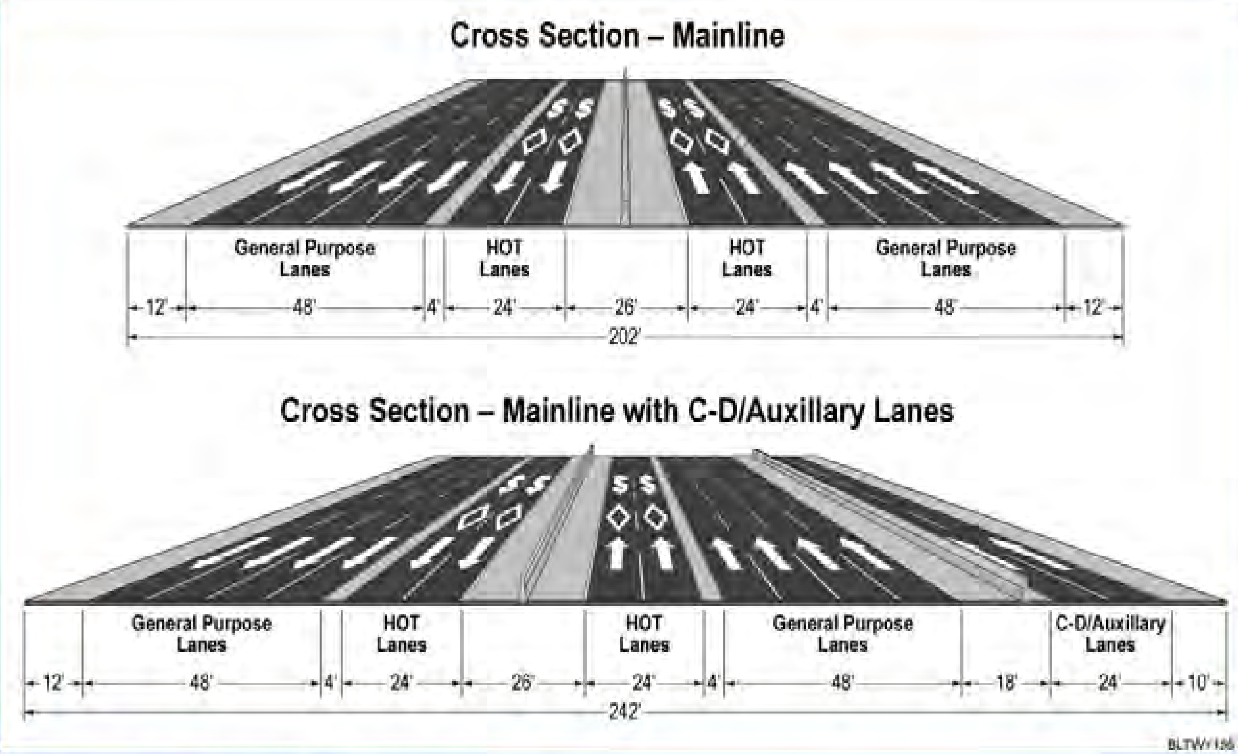
Based on input received at the June 2004 public information meetings, as well as additional analysis and agency input, the 12-Lane HOT / Managed Lanes Alternative was adopted by the Commonwealth Transportation Board (CTB) as the project's Preferred Alternative on January 20, 2005. This alternative would add two managed HOT lanes to the Capital Beltway in each direction and modify, improve, and reconfigure the interchanges to increase capacity, reduce congestion, and improve safety. The details of the proposed mainline configuration and interchange improvements included in this alternative are described in the following sections.

Figure 2-1 illustrates two typical sections of the Preferred Alternative. The top drawing shows what a typical mainline section will look like in segments where there are no ramps or auxiliary roadways. This typical section will be approximately 202 feet wide. The lower drawing depicts a typical section for those segments which include adjoining Collector-distributor (C-D) roadways -- similar to those that exist today between Gallows Road and Route 50. These segments could be as much as 40 feet wider depending on the number of CD or auxiliary lanes. **Figure 2-2** provides plan drawings for the entire fourteen miles of the Preferred Alternative. These plans, shown on aerial photography, illustrate the various improvements in relation to the existing Beltway and its surroundings, and they also indicate the existing and proposed right-of-way lines. The reviewer is encouraged to reference these plans while reading the following text description.

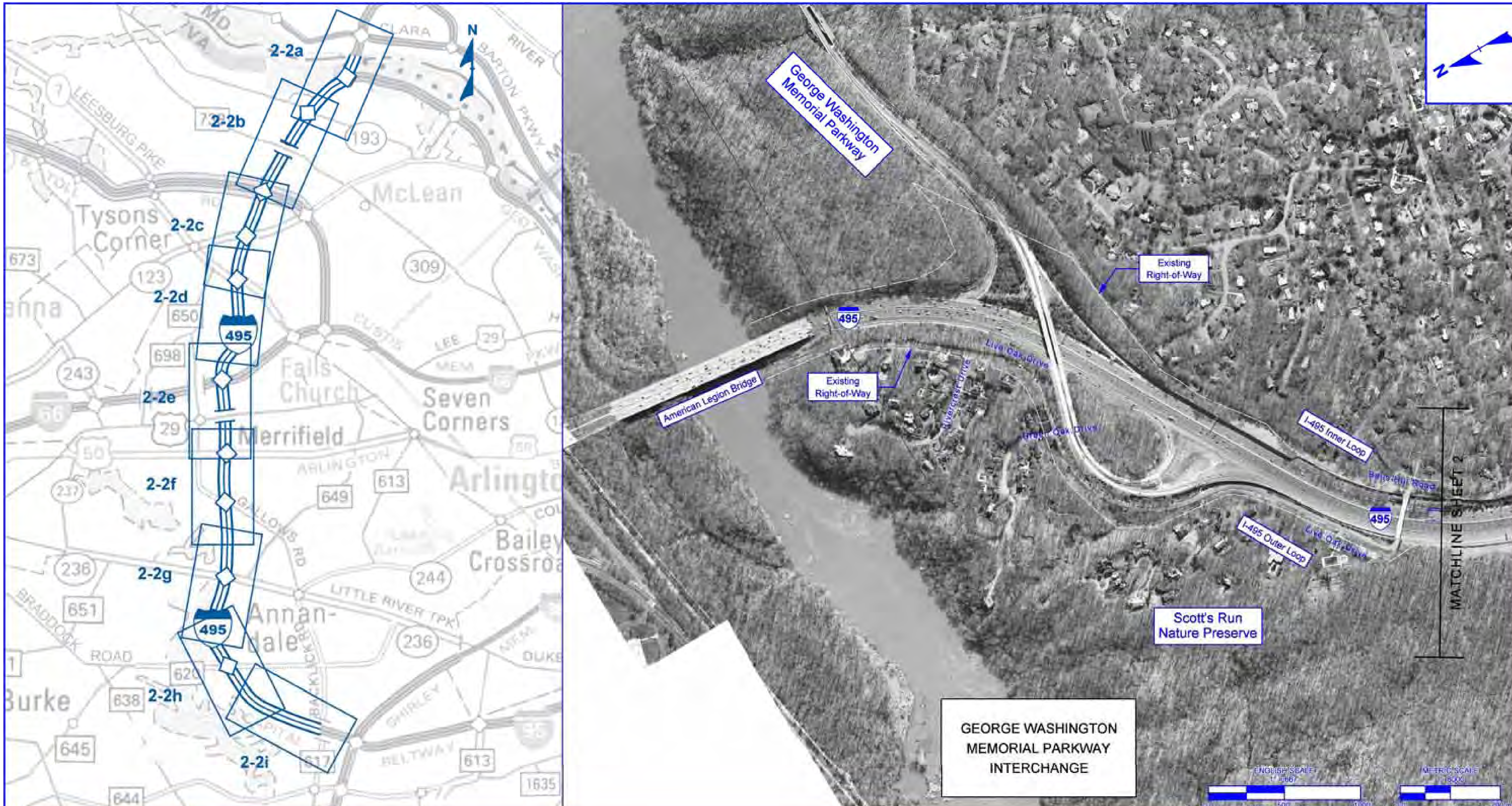
2.2.1 12-Lane HOT / Managed Lanes Alternative

The 12-Lane HOT / Managed Lanes Alternative is similar in design to the 12-Lane Barrier Separated HOV Alternative evaluated in the Draft EIS. Under this alternative, the Beltway would have a total of 12 through lanes: four general-purpose lanes and two HOT lanes in each direction, i.e., a 4-2-2-4 configuration. The two far left lanes (in each direction) would be designated as HOT lanes and separated from the general-purpose lanes with a 4-foot buffer strip. The HOT lanes would be used by high occupancy vehicles (HOV-3^{+}), buses, and tolled low occupancy vehicles carrying less than three occupants.

The main advantage of this roadway type is the capacity it provides for both HOV and HOT traffic, thereby encouraging car-pooling and bus ridership by facilitating movement throughout the HOV/HOT roadway network. Accordingly, the HOT lanes would have direct access/egress to the existing and anticipated HOV facilities at three interchanges: Braddock Road, I-66, and the Dulles Access/Toll Road, as well as at the Route 123 interchange to improve access to Tysons Corner and partial HOT access to and from the south at Lee Highway (Route 29) to improve access to Merrifield. Based on the projected number of lane changes and the speed differential between the managed HOT lanes and the general-purpose lanes, it was determined that access and egress to the HOT lanes by simply changing lanes could not be provided safely and without undermining the reliability of the HOT lanes.



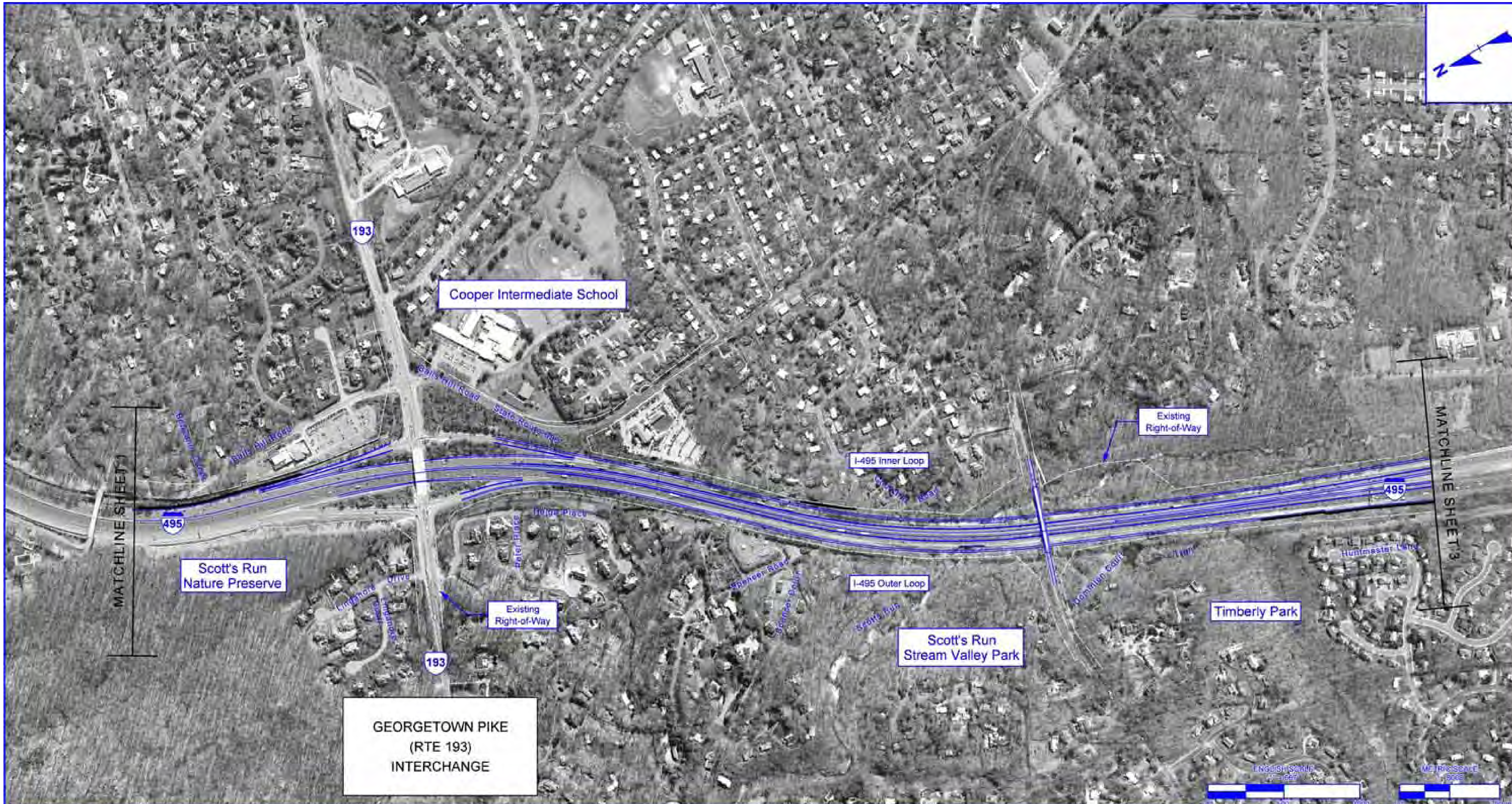
TYPICAL SECTIONS
Preferred Alternative
Figure 2-1
CAPITAL BELTWAY STUDY



PREFERRED ALTERNATIVE
12-Lane HOT / Managed Lanes

CAPITAL BELTWAY STUDY

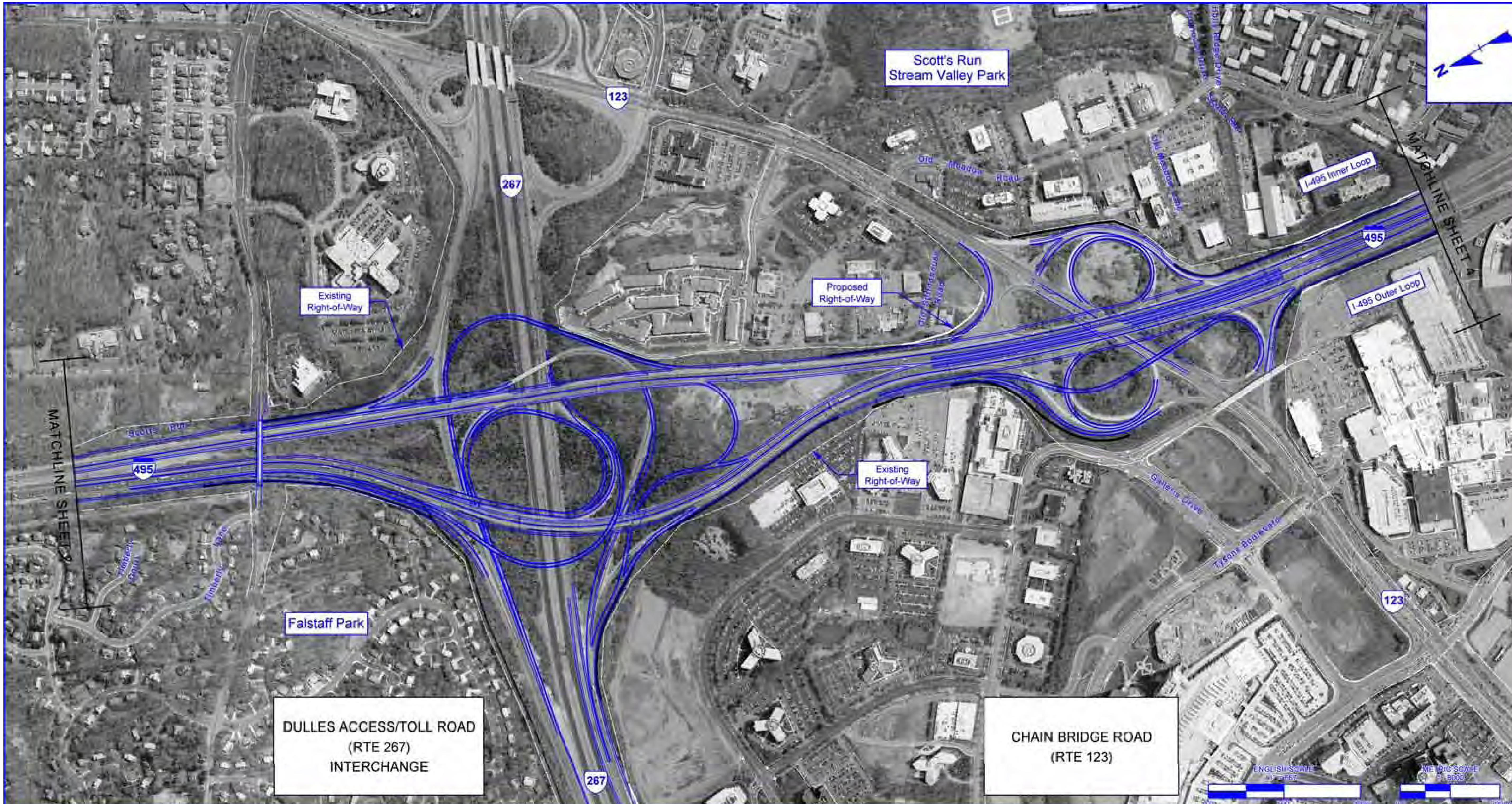
Figure 2-2a
(1 of 9)



PREFERRED ALTERNATIVE
12-Lane HOT / Managed Lanes

CAPITAL BELTWAY STUDY

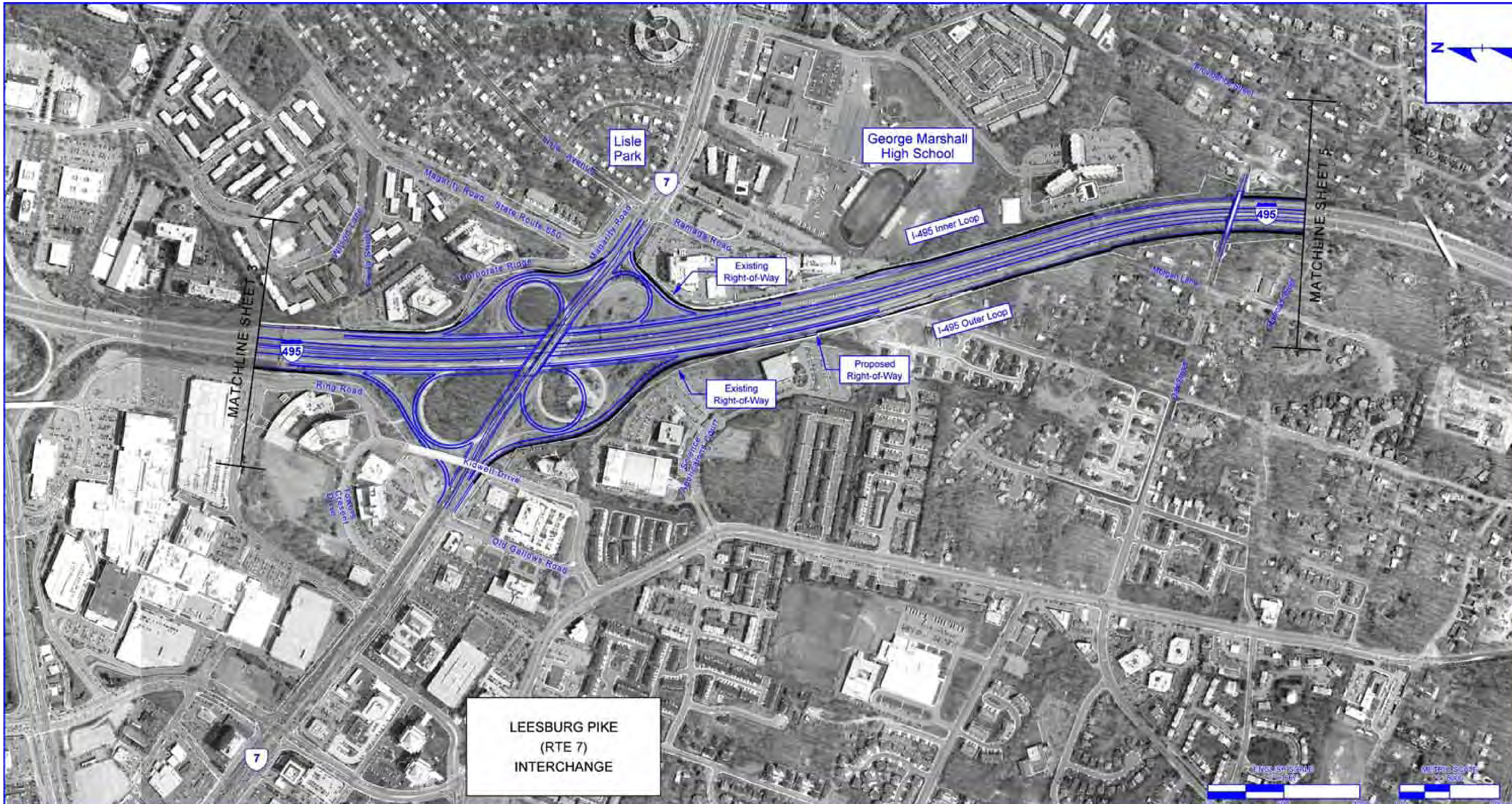
Figure 2-2b
(2 of 9)



PREFERRED ALTERNATIVE
12-Lane HOT / Managed Lanes

CAPITAL BELTWAY STUDY

Figure 2-2c
(3 of 9)



PREFERRED ALTERNATIVE
12-Lane HOT / Managed Lanes

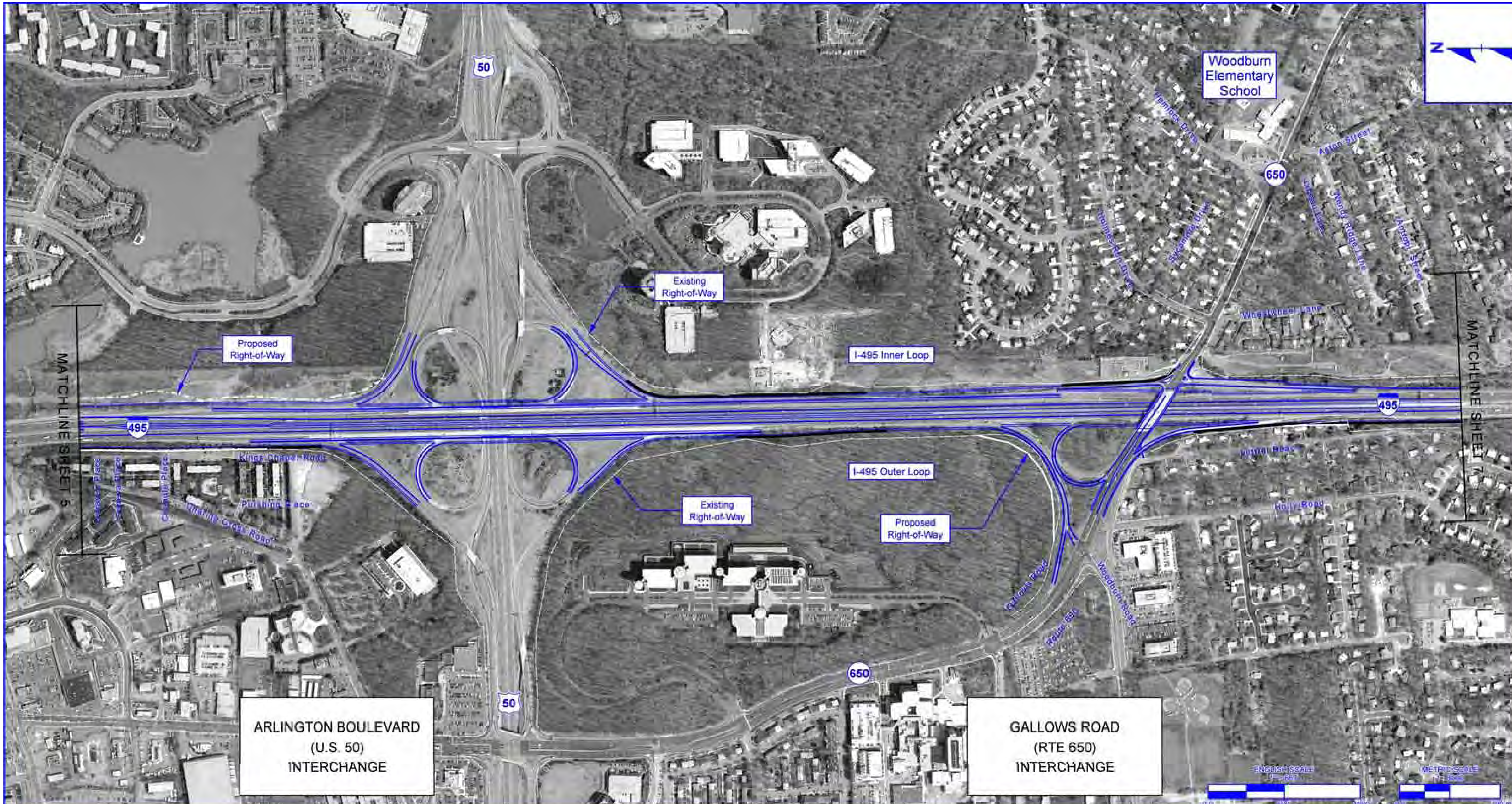
CAPITAL BELTWAY STUDY

Figure 2-2d
(4 of 9)

PREFERRED ALTERNATIVE
12-Lane HOT / Managed Lanes

CAPITAL BELTWAY STUDY

Figure 2-2e
(5 of 9)



PREFERRED ALTERNATIVE
12-Lane HOT / Managed Lanes

CAPITAL BELTWAY STUDY

Figure 2-2f
(6 of 9)

PREFERRED ALTERNATIVE
12-Lane HOT / Managed Lanes

CAPITAL BELTWAY STUDY

Figure 2-2g
(7 of 9)

Figure 2-2h (8 of 9)

PREFERRED ALTERNATIVE
12-Lane HOT / Managed Lanes

CAPITAL BELTWAY STUDY

Figure 2-2i
(9 of 9)

Collector-distributor (C-D) roadways would be barrier-separated from the mainline roadways at interchanges and also between closely-spaced interchanges to minimize movement conflicts and to improve safety and traffic operations. Continuous C-D roadways would be provided in both directions between Gallows Road and Route 50. There is also an existing C-D road at Route 7 and along the northern portion of the Dulles Access/Toll Road. Generally, connection to interchanges would be made via the C-D roadways; however, direct access/egress would also be provided from the main roadways at selected interchanges. The locations where direct access/egress would occur are southbound at Gallows Road, I-66 (both directions), Route 123 (both directions), and Georgetown Pike. Northbound traffic at Gallows Road would have direct access, but egress onto a C-D road. The Dulles Access/Toll Road would have direct access northbound but egress onto a C-D road, while southbound traffic at the Dulles Access/Toll Road would have direct egress, with access via a C-D road. Left exits and entrances for non-HOV/ HOT traffic, from the mainline and the C-D roadways, would be eliminated. The existing left exits and entrances would be retained to serve HOV/HOT traffic only.

At the northern end of the project segment, the 12-lane roadway configuration would transition to match the roadway cross-section prior to the George Washington Memorial Parkway interchange. The required transition in the I-495 mainline cross-section would begin after the Dulles Access/Toll Road. The improvements to the southbound I-495 roadways would also begin south of the George Washington Memorial Parkway.

Similarly, at the southern end of the project segment, the I-495 mainline cross-section would tie into the I-95/I-395/I-495 interchange improvements immediately north of the Beltway bridge crossing over the Norfolk Southern Railway. At this location, the Beltway would have a 12-lane cross-section.

Most of the recommended improvements would be accommodated within the existing right-of-way. Additional right-of-way would be necessary at only at a few locations and the total number of residential displacements would be reduced from as many as 294 down to three.

Under the Preferred Alternative the following improvements would serve to reduce traffic congestion and enhance traffic operation and safety:

- Addition of capacity by adding four lanes to the Beltway.
- Replacement of left exit and entrance ramps for general traffic with right exit and entrance ramps; this improvement would eliminate multi-lane weaving and improve traffic safety and operation.
- Replacement or improvements of existing loop ramps that have radii smaller than the minimum.
- Modification to interchange configurations to reduce traffic congestion by eliminating the weaving movements at the Braddock Road, Little River Turnpike, and Chain Bridge Road interchanges. For instance, traffic weaving movements at the Chain Bridge Road interchange would be eliminated through the use of a flyover ramp southbound and the replacement of a loop ramp with left turn lanes for northbound traffic.

2.2.2 Interchange Improvements

As discussed above, the interchange improvements that were evaluated in the Draft EIS were revised in an effort to minimize the impact of the project on the surrounding environment. A Preferred Concept was selected for each interchange as part of the complete 14-mile Preferred Alternative. The Preferred Concepts for each interchange are listed in **Table 2-6** and described below. The details for each interchange are shown on the project plans in Figure 2-2.

Table 2-6
INTERCHANGE CONCEPTS – PREFERRED ALTERNATIVE

Interchange	Interchange Concepts Considered for Inclusion in Preferred Alternative*	Preferred Concept
Braddock Road	E – Partial Cloverleaf with Center HOV Revised E – Partial Cloverleaf with Center HOV	Revised E – Partial Cloverleaf with Center HOV
Little River Turnpike	B – Partial Cloverleaf (“Option 2”) Revised D – Cloverleaf with Directional Ramps (“Option 1”) E – Improved Cloverleaf	E – Improved Cloverleaf
Gallows Road	Revised A – Improved Partial Diamond with No Improvements to westbound Gallows Road Auxiliary Lane Revised A, Option 1 – Improved Partial Diamond with Improvements at Woodburn Road (“Option 1”) C – Full Diamond	Revised A – Improved Partial Diamond with No Improvements to westbound Gallows Road Auxiliary Lane
Arlington Boulevard	A – Improved Full Cloverleaf	A – Improved Full Cloverleaf
Interstate 66	A – Directional with Full Movements B – Directional with Full Movements C – Directional with Partial SOV Movements E – Directional with Full Movements Modifications to Existing Interchange	Modifications to Existing Interchange
Leesburg Pike	B – Directional Modifications to Existing Full Cloverleaf Interchange	Modifications to Existing Full Cloverleaf Interchange
Chain Bridge Road	C – Partial Cloverleaf Revised C – Partial Cloverleaf with Modified Loop Ramp in Southwest Quadrant Option 1 – Partial Cloverleaf with Flyover Ramp and Modified Loop Ramp in Southwest Quadrant Option 2 – Partial Cloverleaf with Flyover Ramp	Revised C – Partial Cloverleaf with Modified Loop Ramp in Southwest Quadrant
Dulles Access/Toll Road	B – Directional E – Directional Modifications to Existing Interchange	Modifications to Existing Interchange
Georgetown Pike	A – Diamond Revised A – Diamond	Revised A – Diamond
GW Parkway	None	None

*Note: Includes all interchange options carried forward for detailed evaluation in the Draft EIS, as well as those developed after publication of the Draft EIS in an effort to minimize the impacts of the proposed improvements. Interchange options that are the same as those developed during initial screening are called by same name as in Table 2-3. If an alternative was referred to by a different name during preferred concept selection, that name is given in parentheses.

2.2.2.1 Braddock Road

Braddock Road (Route 620) has eight lanes immediately west of the Beltway and four lanes on the east. Because HOV lanes are planned for Braddock Road between the Beltway and Burke Lake Road in the *Fairfax County Comprehensive Plan*, any improvements to the interchange would need to incorporate additional ramps to provide direct Beltway access for HOV/HOT traffic.

Although Interchange Concept E, a partial cloverleaf, was carried forward for detailed evaluation in the Draft EIS, the Preferred Concept selected for inclusion in the Preferred Alternative was revised somewhat to lessen the impact of the proposed interchange improvements on the surrounding community. The Preferred Concept would involve a partial cloverleaf with center access for HOT/HOV traffic. To eliminate the troublesome weave on the collector-distributor roadway along northbound I-495, the existing loop ramp connecting westbound Braddock Road to northbound I-495 would be removed. This movement would be replaced with a left turn lane that connects to the proposed eastbound Braddock Road to northbound I-495 ramp. A traffic signal would be required at this location. The other loop ramps at this interchange would be aligned to meet the widened I-495 and improve the overall configuration where possible.

To provide direct access to and from the HOT/HOV lanes on the Beltway at Braddock Road, access ramps would be provided. Center-access lanes were selected because they could work with HOV lanes on either the inside or outside shoulder of Braddock Road, and to ensure that HOV/HOT traffic has access to and from the Ravensworth Industrial Park. Traffic signalization would be required for these movements.

2.2.2.2 Little River Turnpike

Little River Turnpike (Route 236) has four lanes west of the Beltway and six lanes to the east. Although Interchange Concept B was carried forward for detailed evaluation in the Draft EIS, the Preferred Concept selected for inclusion in the Preferred Alternative is Concept E, which had been considered and dropped prior to publication of the Draft EIS. This interchange concept was revisited in an effort to minimize the impacts of interchange improvements at Little River Turnpike on the surrounding community.

The Preferred Concept would retain the existing full cloverleaf configuration. The ramps for this interchange would require some realignment to tie into the new Beltway configuration and to meet minimum design standards; otherwise, the interchange would be similar to the existing Little River Turnpike interchange.

2.2.2.3 Gallows Road

Gallows Road (Route 650) is a four- to six-lane secondary road that connects Annandale and Tysons Corner. This road also serves as a parallel alternate route for north-south Beltway traffic between the Gallows Road/I-495 interchange and Leesburg Pike.

Two interchange options were carried forward for detailed evaluation in the Draft EIS: Concept A, an improved partial diamond interchange involving minor modifications to the existing configuration, and Concept C, a full diamond interchange. A revised version of Concept A was selected as the Preferred Concept for inclusion in the Preferred Alternative.

Revised Concept A would contain a half diamond interchange with a single cloverleaf quadrant. This design is similar to the existing interchange configuration; however, the alignment of the ramps is modified to improve the geometric features and the connections to I-495. This concept would also require realignment of portions of Luttrell Road, and the horizontal alignment of Gallows Road would be modified to match the existing alignment. Three residences along Luttrell Road would be potentially displaced under this preferred concept.

Unlike the original Concept A design evaluated in the Draft EIS, Revised Concept A would not involve any improvements to the short auxiliary lane that currently provides right turn access for westbound Gallows Road to northbound I-495. The original Concept A extended this auxiliary lane to improve traffic flow and allow for profile improvements along Gallows Road, which resulted in impacts to the Holmes Run Acres neighborhood, a historic district. Under the Preferred Concept, the extension of the auxiliary lane and Gallows Road profile improvements are removed in order to eliminate these impacts.

2.2.2.4 Arlington Boulevard

Arlington Boulevard (U.S. 50) is a four-lane divided roadway. Interchange Concept A, which was carried forward for detailed evaluation in the Draft EIS, was selected as the Preferred Concept for inclusion in the Preferred Alternative.

Concept A would consist of minor modifications to the existing interchange layout, with the realignment of the ramps at the Beltway. However, the profile of the Beltway would have to be raised, with its bridges over Route 50 rebuilt, to provide for the necessary vertical clearance. In addition, portions of the existing ramps at the Beltway would have to be realigned.

2.2.2.5 Interstate 66

Interstate 66 (I-66) runs east-west between Washington, D.C. and the Shenandoah Valley, where it connects with I-81. To the west, between the Beltway and U.S. 50, I-66 is six lanes and expands to eight lanes between U.S. 50 and Business Route 234. East of the Beltway, I-66 transitions to a four lane roadway through Arlington County to the Roosevelt Bridge and the District of Columbia with several extended acceleration/deceleration lanes. At this time, I-66 includes concurrent HOV lanes during the peak periods and this study assumes I-66 will be designed with reversible HOV lanes west of the Beltway in the future. However, this assumption is not currently a part of the Constrained Long-Range Plan.

Four interchange concepts (A, B, C and E) were carried forward for detailed evaluation in the Draft EIS. However, in an effort to reduce the impacts of the proposed interchange improvements on the surrounding community, these concepts were eliminated, and a Preferred Concept similar to the existing interchange was selected.

The Preferred Concept would provide all of the existing movements of traffic between the two interstate highways, but would not add the two movements that are not currently allowed: southbound I-495 to eastbound I-66 and westbound I-66 to northbound I-495. The design would also provide access to and from the HOV/HOT lanes, except for westbound I-66 traffic to northbound I-495 HOV/HOT lanes and southbound I-495 HOV/HOT traffic to eastbound I-66. The configuration is similar to the existing interchange with a few revisions to improve connections to the HOV/HOT lanes and improve the alignments of ramps where possible. The existing loop ramp in the northeast quadrant from northbound I-495 to westbound I-66 would be replaced with a flyover ramp. Other ramps would be shifted and in some cases split to provide access to both general-purpose and HOV/HOT lanes; otherwise, the proposed concept is similar to existing conditions. The existing Metrorail bridge for the Orange Line would not be affected by these improvements.

2.2.2.6 Leesburg Pike

Leesburg Pike (Route 7) is the main route between Tysons Corner and Falls Church. Inside the Beltway, it is primarily four lanes wide, and outside the Beltway, it ranges from four to eight lanes. Concept B, a directional interchange, was carried forward for detailed evaluation in the Draft EIS. However, based on public and agency comments on the Draft EIS, the proposed improvements to the Leesburg Pike interchange were scaled back, resulting in a Preferred Concept very similar to the existing interchange.

The Preferred Concept selected for inclusion in the Preferred Alternative would be a full cloverleaf matching the configuration of the existing interchange, with minor modifications. Loops and ramps would be modified to tie-in to the widened I-495, and Leesburg Pike would be shifted slightly to the north to allow for maintenance of traffic during construction of the new bridge over I-495.

2.2.2.7 Chain Bridge Road

Chain Bridge Road (Route 123), known as Dolley Madison Boulevard east of the Beltway, is a primary arterial running from Washington, D.C. (via the Chain Bridge crossing) through McLean, Tysons Corner, Vienna, and south into Fairfax County and Prince William County. Route 123 is primarily a four-lane roadway that runs north-south and parallel to the Beltway in the middle of Fairfax County. It has several names depending on its location, including Chain Bridge Road, Dolley Madison Boulevard, Maple Avenue, and Ox Road. Proposed modifications to this interchange were coordinated closely with DRPT and WMATA to ensure that the changes would not preclude construction of the proposed extension of Metrorail service to Tysons Corner and Dulles Airport.

Although Concept C was carried forward for detailed evaluation in the Draft EIS, a new Preferred Concept was developed to reduce the impact of improvements to the Chain Bridge Road interchange on the surrounding community. The Preferred Concept is a partial cloverleaf interchange that would be compatible with the proposed Metrorail extension through the interchange. To help alleviate weave traffic along northbound I-495, the existing loop ramp in the northeast quadrant would be replaced with left turn lanes coming off the ramp from northbound I-495 to eastbound Route 123. To alleviate the weave traffic along southbound I-495, access to the loop ramp from southbound I-495 to eastbound Route 123 would be moved back to the same location as the southbound I-495 to westbound Route 123 ramp. The ramp from southbound I-495 to eastbound Route 123 would pass over the loop ramp in the northwest quadrant, as well as passing over Route 123 before tying into the existing loop.

Direct access to and from HOT lanes on I-495 at Route 123 would be provided by center access depressed ramps. These ramps would provide for the movement of HOV/HOT traffic in all directions to and from Route 123. They would connect to Route 123 in the middle of the interchange where I-495 crosses over Route 123. A traffic signal would be required at this location to allow for orderly turning movements to and from the Beltway.

2.2.2.8 Dulles Access/Toll Road

The Dulles Access/Toll Road (Route 267) is comprised of two separate roadways within a shared right-of-way. The Dulles Airport Access Road consists of four lanes (two lanes in each direction) and provides uninterrupted access to Washington Dulles International Airport from the Beltway. The Dulles Toll Road is an eight-lane toll facility that serves northwestern Fairfax County. Slip ramps between the Toll Road and the Access Road are located along the facility (three eastbound, four westbound) to provide non-toll access for airport users. The Dulles Toll Road has a peak period, peak direction (eastbound in the morning, westbound in the evening) concurrent HOV lane. Beyond the Capital Beltway interchange, the Dulles Toll Road extends east to connect directly to I-66. On the western end, it connects to the Dulles Greenway, a private toll road extension that extends into Loudoun County.

Two concepts were carried forward for detailed evaluation in the Draft EIS. However, both concepts were later eliminated in favor of a Preferred Concept that would lessen the impact of improvements to the interchange on the surrounding community. Under the Preferred Concept, the general configuration of the interchange in terms of traffic movements would remain essentially unchanged. The two movements currently missing—northbound I-495 to eastbound Route 267 and westbound Route 267 to southbound I-495—would still be omitted for both HOV/HOT and general-purpose traffic. In the direction of northbound I-495, HOV/HOT traffic would utilize a left exit to westbound Route 267, while general-purpose traffic would utilize a right exit to westbound Route 267. In the southbound direction of I-495, HOV/HOT traffic would utilize a left exit to access both eastbound and westbound Route 267, and general-purpose traffic would utilize a right exit to access both eastbound and westbound Route 267.

Access for eastbound Route 267 traffic would be provided for both northbound and southbound I-495 HOV/HOT and general-purpose lanes via a right exit off of Route 267. Eastbound Route 267 would access northbound I-495 general-purpose lanes only via the existing ramp in the northeast quadrant.

2.2.2.9 Georgetown Pike

Georgetown Pike (Route 193) is a primary arterial that largely serves single-family residential areas and provides access to the Central Intelligence Agency/Federal Highway Administration Complex in Langley. Designated a Virginia Scenic Byway, Georgetown Pike begins at Route 123 in McLean inside the Beltway and extends west toward Great Falls in Fairfax County.

The Preferred Concept is an improved diamond interchange that would involve minor improvements to the existing Georgetown Pike interchange. Unlike Concept A, which was carried forward for detailed evaluation in the Draft EIS, the Preferred Concept would tie directly into the existing ramps without modifications to the existing overpass bridge or widening of the existing ramps.

2.2.2.10 George Washington Memorial Parkway

The George Washington Memorial Parkway begins at the Beltway near Great Falls and travels southeast along the Potomac River through McLean, Arlington and Alexandria to Mount Vernon into southeast Fairfax County. It serves as a commuter route during the peak periods for traffic from both Virginia and Maryland to the District of Columbia. Throughout the day is serves as a convenient route connecting Arlington and Alexandria to Maryland.

Concept A, an improved trumpet configuration, was evaluated in the Draft EIS. However, under the revised designs for the Preferred Alternative, no changes or improvements are proposed for the Parkway interchange.

2.2.3 HOV/HOT Direct Access Points

As described in the above discussion of interchange improvements included in the Preferred Alternative, new direct access points for HOV/HOT traffic are incorporated into the interchange designs at Braddock Road, I-66, Chain Bridge Road, and the Dulles Access/Toll Road.

In addition to these interchanges, partial HOV/HOT access would also be provided at the Lee Highway (Route 29) crossing of the Beltway. This access would involve two center access ramps for HOV/HOT traffic only: one from the northbound I-495 HOT lanes to Lee Highway in either direction, and one from Lee Highway in either direction to the southbound I-495 HOT lanes. There would be no HOV/HOT access from southbound I-495 or to northbound I-495, nor any access for non-HOV/HOT traffic. A traffic signal would be required on Lee Highway at this location.

2.2.4 Design Exceptions

Preliminary designs for the mainline segments and each of the ten interchanges were developed in accordance with the criteria set forth in AASHTO's *A Policy on Geometric Design of Highway and Street (2001)* and VDOT's *Road Design Manual (Revised July 2005).* As noted previously in Section 2.1.3, some potential design exceptions were incorporated to further reduce right-of-way requirements and thereby further reduce impacts to parks, residential areas and Metro's Orange Line. The majority of the proposed design exceptions involved reducing the radius of interchange loop ramps and resulted in reductions in design speeds. In no instance was the design speed reduced more than 5 mph. And in every instance the proposed design showed improvement over existing conditions. Details of each of the potential design exceptions are presented in Appendix D. Design exceptions used in the conceptual design have not been approved by FHWA. Consequently, VDOT will need to submit a formal design exception request to FHWA before any design exceptions can be incorporated into the final design plans.

2.2.5 Construction Costs

Cost estimates for each of the Candidate Build Alternatives, including the Preferred Alternative, were based on quantity estimates developed from the conceptual designs for each alternative and utilized current unit costs from bid estimates from VDOT's Springfield Interchange project (which was under construction at the time the estimates were prepared). Quantities and costs were separated into four categories: Pavement, Bridge, Retaining Walls and Earthwork.

The cost estimate for each alternative was computed by multiplying the appropriate quantities by the unit costs developed from the bid estimates. A total cost for each concept was calculated by first adding the cost of each of the four items and then to apply appropriate contingencies. The costs and contingencies were verified based on the costs being experienced at the Springfield Interchange project. Cost developed for each of the build alternatives in the Draft EIS were based on Year 2002 dollars. To ensure an equivalent comparison, the same dollar units were used for the revised alternatives developed in 2004 and contained in the Final EIS. This use of comparable cost units allowed for a fair, equitable comparison of the build alternatives. Therefore all construction costs reported in the Draft EIS and this Final EIS for comparison purposes utilized the same base year dollars (2002). The construction costs for the Preferred Alternative are estimated at $891 million. Right-of-way costs are estimated to be $7.6 million.

At the direction of the FHWA, the cost estimate for the Preferred Alternative was refined to reflect the actual year of anticipated expenditure. Current forecasts estimate construction to take place between the years 2008 and 2010. Based on this three year span, the midpoint year of 2009 was selected for the year of expenditure. In addition to the historical cost data used previously from the Springfield Interchange (Phases 2/3, 4 and 5), cost estimates were further calibrated by utilizing costs from another VDOT project currently under construction in Northern Virginia: the Route 1 Interchange (part of the Wilson Bridge Improvement project). Using these two sets of current cost data as well as VDOT's most recently approved contingencies and incidental cost items, including toll facility and construction management plans, the total design and construction cost of the Preferred Alternative is estimated to be $1.15 billion (in 2009 dollars). The right-of-way costs are estimated to be $18.9 million (in 2009 dollars). Details of the refined cost estimates including methodologies, quantities, unit costs, and final estimates, are provided in the *Cost Estimates Technical Report* (April 2006).

2.3 NO-BUILD ALTERNATIVE

The No-Build Alternative provides for no improvements to the Beltway except for periodic maintenance and minor enhancements needed to maintain operation of the roadway. However, other planned improvements to the regional roadway and transit network other than the section of Beltway under consideration here, as outlined in the 2000 update to *The Long-Range Transportation Plan for the National Capital Region*, were assumed to be in place by the design year (2020) for purposes of traffic forecasting. These planned improvements include the following:[1]

Roadway Improvements:

- Reconstruction of the I-95/I-395/I-495 interchange, with direct HOV access to the Beltway.

1 Note: These improvements were also assumed to be in place by the design year for each of the build alternatives. The environmental consequences of these improvements are discussed in the cumulative effects section of Chapter 4.

- Adding two HOV lanes on Braddock Road between Burke Lake Road and the Beltway.
- Widening of Little River Turnpike (Route 236) to six lanes from Fairfax City to Alexandria.
- Widening of Lee Highway (Route 29) to six lanes from Cedar Lane to the Beltway.
- Widening of Arlington Boulevard (Route 50) to six lanes between Route 7 and Nutley Street.
- Widening of Leesburg Pike (Route 7) to eight lanes between the Beltway and the Dulles Access/Toll Road.
- Widening of Chain Bridge Road (Route 123) to eight lanes between Route 7 and the Dulles Access/Toll Road.
- Widening of the Dulles Access/Toll Road to six lanes between Dulles Airport and the Beltway.

Transit Improvements:

- Additional express bus service in the Dulles Corridor.

2.4 OPERATIONAL ANALYSIS

Each of the revised Candidate Build Alternatives offers advantages and disadvantages relative to the operational needs identified in Chapter 1. The following sections of this chapter provide a comparative summary of the operational analyses that were conducted after the Draft EIS for the two most promising revised Candidate Build Alternatives as well as the No-Build Alternative. Where appropriate, the revised alternatives are compared to the initial set of Candidate Build Alternatives contained in the Draft EIS. There are also relative differences in the level of environmental consequences associated with each alternative. These will be discussed later in Chapter 4.

2.4.1 Travel Demand and Capacity

2.4.1.1 Forecasting and Assumptions

As with the initial set of Candidate Build Alternatives, travel demand forecasts for the Capital Beltway, surrounding roadways, and cross streets were developed for each revised alternative using the Metropolitan Washington Council of Governments' (MWCOG) regional model version 1. The latest available socioeconomic forecasts at the beginning of the study, Round 6A Cooperative Forecasts of population and employment for the year 2020, were used to forecast daily travel demand in the study area. Subsequently, a detailed sub-area model was developed to produce year 2020 hourly forecasts of mainline, ramp, cross street, and intersection turning movement volumes. The sub-area model was then used in conjunction with the CORSIM simulation model to develop typical peak period and peak hour traffic flows to assess operational performance.

The detailed sub-area model includes the Beltway mainline and the 10 study interchanges, beginning just south of Braddock Road and extending north to the American Legion Bridge.

The assumed roadway network includes all existing roads and all applicable roadway improvements contained in the Constrained Long-Range Plan (CLRP) for the year 2020, along with interchange details, including C-D roadways, where necessary. Forecasting assumptions for each alternative are described in more detail below.

2.4.1.2 No-Build Alternative (8 lanes total, no HOV)

The Beltway would remain as four through lanes in each direction, along with existing merge or auxiliary lanes, with no improvements. The forecasting model assumes that other improvements included in the CLRP for construction and approved by the Transportation Planning Board (TPB) will have been implemented by the year 2020.

2.4.1.3 10-Lane HOV Alternative

This alternative would add one HOV lane to the Beltway in each direction. With this alternative, the Beltway would have a total of 10 through lanes: four general-purpose lanes and one HOV lane in each direction, i.e., a 4-1-1-4 configuration. The far left lane (in each direction) would be designated as an HOV lane and separated from the general-purpose lanes by a 4-foot buffer strip. The HOV lane would be used by high occupancy vehicles carrying three or more occupants and buses during peak periods, with times established by the Commonwealth Transportation Board, and as general-purpose lanes during the remainder of the day. As with the No-Build Alternative, it is assumed that all CLRP improvements will have been implemented.

2.4.1.4 Preferred 12-Lane HOT/ Managed Lanes Alternative

This alternative would add two HOT lanes to the Beltway in each direction. With this alternative, the Beltway would have a total of 12 through lanes: four general-purpose lanes and two HOT lanes in each direction, i.e., a 4-2-2-4 configuration. The two far left lanes would be designated as HOT lanes and separated from the general-purpose lanes with a 4-foot buffer strip. The HOT lanes would be used by high occupancy vehicles, buses, and tolled low occupancy vehicles carrying less than three occupants, as determined by the Commonwealth Transportation Board. As with the No-Build Alternative, it is assumed that all CLRP improvements will have been implemented.

2.4.1.5 Range of Volumes

Table 2-7 shows the range of forecast daily and peak hour volumes over the length of the 14-mile project corridor for existing conditions, the No-Build Alternative, and each of the two revised Candidate Build Alternatives. Forecasted travel volumes increase by between 20 and 40 percent by the year 2020, with the bigger increase in traffic forecasts occurring as alternatives increase in capacity. The majority (over 95%) of the increase is due to shifts in traffic demand between the Beltway and the nearby road network, primarily parallel north-south roadways. As congestion has grown on the Beltway, drivers have increasingly found alternate routes for their trips using arterial or local roadways. However, as capacity is added to the Beltway, vehicles will shift back to the Beltway. This movement was studied by reviewing the vehicle miles traveled within two miles east and west of the Beltway and on the parallel roadways east and west of the Beltway. As the capacity increases on the Beltway, the volume of traffic on the side streets decreases as vehicles shift back to the major facility. **Figure 2-3** illustrates the main routes that are currently being used to avoid congestion on the Beltway.

Table 2-7
RANGE OF DAILY AND HOURLY (PEAK) DEMAND VOLUMES (VEHICLES IN ONE DIRECTION)

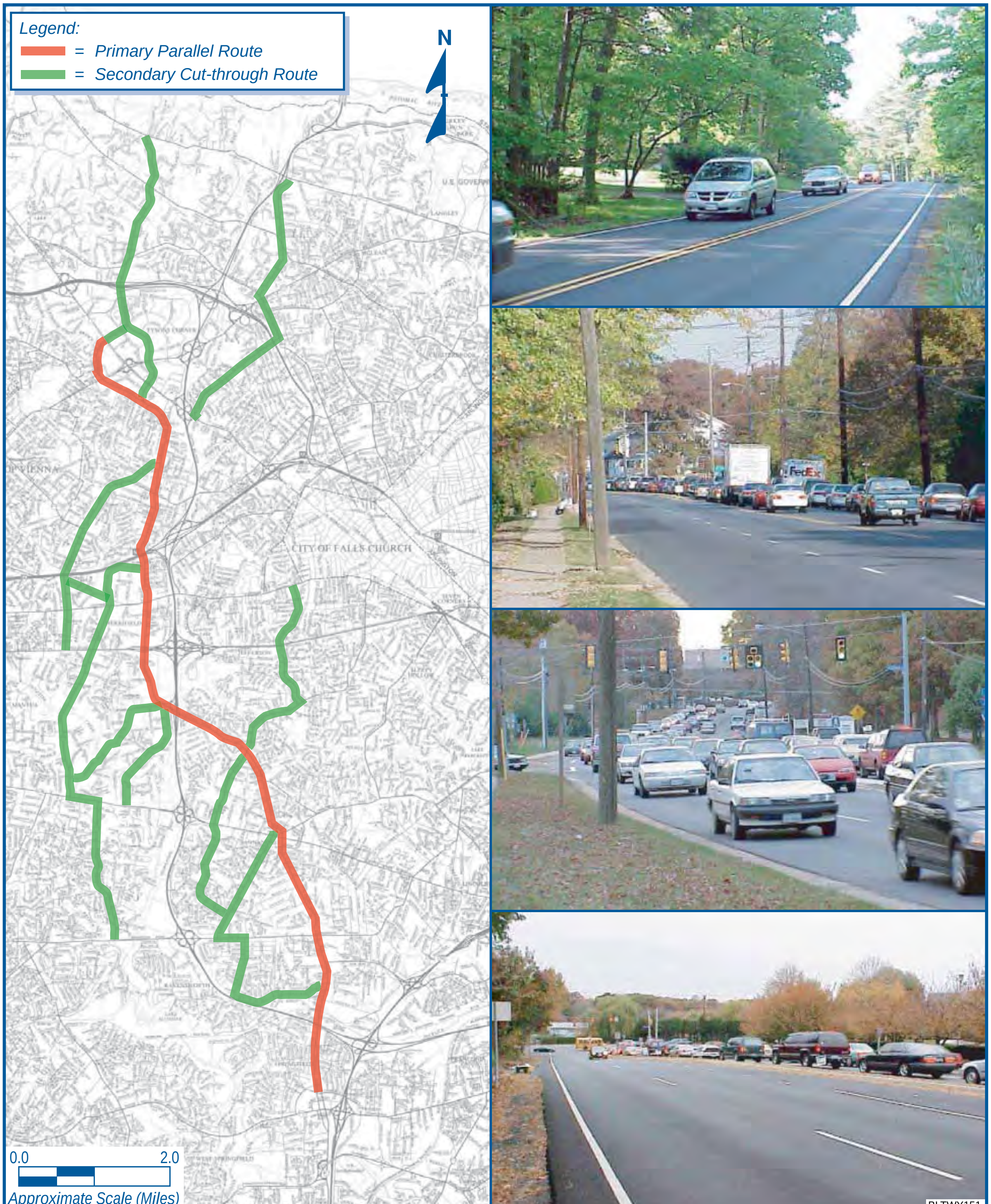
Alternative	Daily	Hourly
2020 No-Build (8 lanes with no HOV)	101,000 – 155,000	8,350 -11,800
2020 Revised 10-Lane HOV (10 lanes, 2 of which would be HOV-3$^+$)	106,000 - 165,000	8,400 - 12,600
2020 Preferred 12- Lane HOT Alternative (12 lanes, 4 of which would be HOV-3$^+$/HOT)	108,000 - 168,000	8,500 - 13,200

Typically during the course of corridor studies that span multiple years, the socioeconomic forecasts for the region have been updated several times. These forecasts are usually reviewed to ensure that modifications to the forecasts do not represent a change that would alter the comparative evaluation of the alternatives and their relative ranking in terms of operational performance.

For this study, the review of the socioeconomic forecasts concluded that the change in forecasts over the years does not change the relative relationship between alternatives. Both population and employment continue to increase in areas adjacent the Beltway and in Northern Virginia as a whole. Increasing employment in the Tysons Corner area and the extension of the forecast horizon year to 2030 would result in higher daily forecasts of travel demand. However, as areas served by the Beltway reach a mature status in terms of development, the rate of growth will be much slower than the current growth in the corridor. Without additional transportation improvements, the duration of congestion will increase on the Beltway and the road network. However, relative performance of the alternatives and the relationship to the transportation network will remain substantially unchanged. The socioeconomic forecasts for population and employment in the region are discussed in detail in Section 3.3 - Socioeconomics. When final design is conducted on the proposed improvements, the traffic forecasts will need to be updated to reflect a 20-year horizon. When this update is done, the environmental document will need to be re-evaluated to determine if the changes in the traffic forecasts will result in impacts (most notably air and noise) not already addressed in this EIS.

2.4.1.6 Origins and Destinations of Traffic

The origins and destinations of vehicles getting on and off the Beltway during the peak hours were studied using the ramp to ramp trip tables from the sub-area model that was developed to produce year 2020 hourly forecasts for the Beltway Corridor. This data was used to study the weaving patterns of vehicles in order to identify the need for auxiliary lanes, C-D roads, and other specific design features to facilitate the movement of traffic along the corridor. In addition, the information was used to assess the potential market and available capacity in the HOV or HOT lanes for the two revised Candidate Build Alternatives.



CUT-THROUGH TRAFFIC — Figure 2-3

CAPITAL BELTWAY STUDY

The travel patterns of vehicles using the Beltway for the Preferred Alternative are shown in **Figure 2-4.** The figure graphically illustrates the total number of vehicles entering the project boundary from the mainline and at each of the on ramps at the ten study interchanges. These entry volumes are color-coded so that the destination of the vehicles can be tracked along the corridor. For example, during the AM peak hour heading southbound on the Outer Loop, 11,000 vehicles (in brown) enter the project boundary from the American Legion Bridge. Of those, 1,375 travel end-to-end and exit the study area after Braddock Road. The portion of these vehicles that are HOV would most likely use the HOV lanes. In addition, a number of the 1,375 vehicles that have one or two occupants would pay for entry into the HOT lanes. The remaining users of the HOV/HOT lanes were similarly calculated given the access and egress locations that were selected along the corridor. A more detailed discussion of the assumptions and process employed to calculate the number of vehicles using the HOV/HOT lanes is provided in Section 2.4.4.

2.4.2 Operational Analysis

2.4.2.1 Developing Typical Traffic Flows

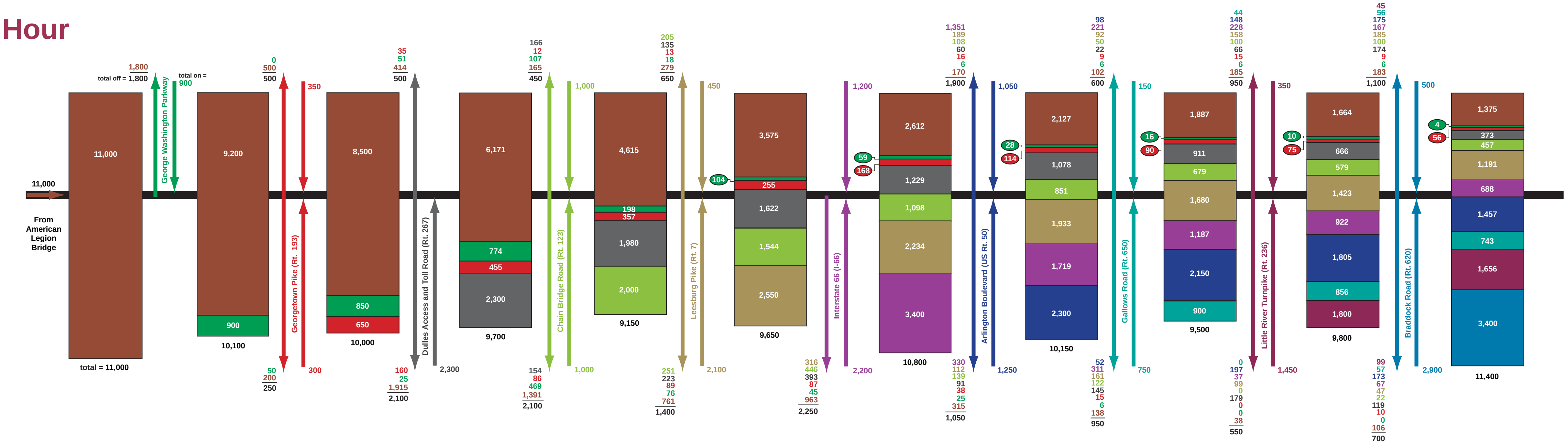
Peak hour traffic volumes have traditionally been developed after trip assignment in the travel demand modeling process by using link-based peak hour factors and directional splits adjusted by area type or facility. However, in heavily congested areas, while this approach may represent demand, it does not realistically reflect typical traffic flows as congestion in one area limits the ability of drivers to reach another area and drivers choose alternate routes to reduce their time of travel.

For the Capital Beltway, a link-based peak spreading methodology was employed utilizing the sub-area model and CORSIM in an iterative manner. The basic steps were as follows:

- Following the procedures of NCHRP 255, develop peak hour traffic volumes and use screenline analysis to assess the diversions to and from the Beltway based on the capacity available.
- Develop hourly volumes for the Beltway, interchanges, and intersecting facilities using facility-based diurnals.
- Run the CORSIM simulation model and based on the results; adjust the sub-area model before repeating the steps.

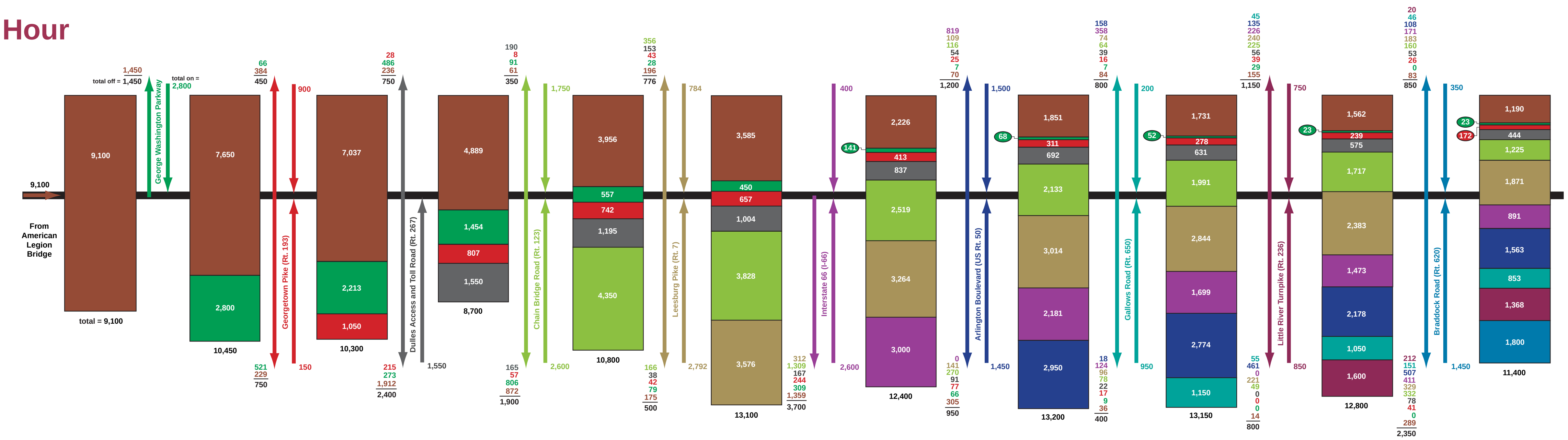
The procedure was validated by applying the approach to existing conditions and by checking against a manual approach where each alternative was segmented by operational characteristics: merge, diverge, weave, basic freeway, ramp, and intersections. Finally, the capacity of each of the facilities intersecting the Beltway was determined and the projected demand was compared to the capacity available to "feed" or accept traffic. CORSIM was then run a minimum of five times with different start times for the analysis to assess the sensitivity of the model to changes in entry volumes at individual ramps. Potential changes in design or varying operating strategies were assessed by "pivoting" the input to the CORSIM models. The process used to develop typical peak hour traffic flows is described in more detail in the *Transportation Technical Report*.

AM Peak Hour



NOTE: This figure illustrates the origin and destination of vehicles getting on and off the Beltway. For example, in brown, 11,000 vehicles enter the project boundary. 1,800 vehicles exit east at George Washington Parkway. Remaining on the Beltway are 9,200 vehicles and entering the Beltway from westbound George Washington Parkway are 900 vehicles for a total of 900 vehicles entering from George Washington Parkway.

PM Peak Hour



NOTE: This figure illustrates the origin and destination of vehicles getting on and off the Beltway. For example, in brown, 9,100 vehicles enter the project boundary. 1,450 vehicles exit east at George Washington Parkway. Remaining on the Beltway are 7,800 vehicles and entering the Beltway from westbound George Washington Parkway are 2,800 vehicles for a total of 2,800 vehicles entering from George Washington Parkway.

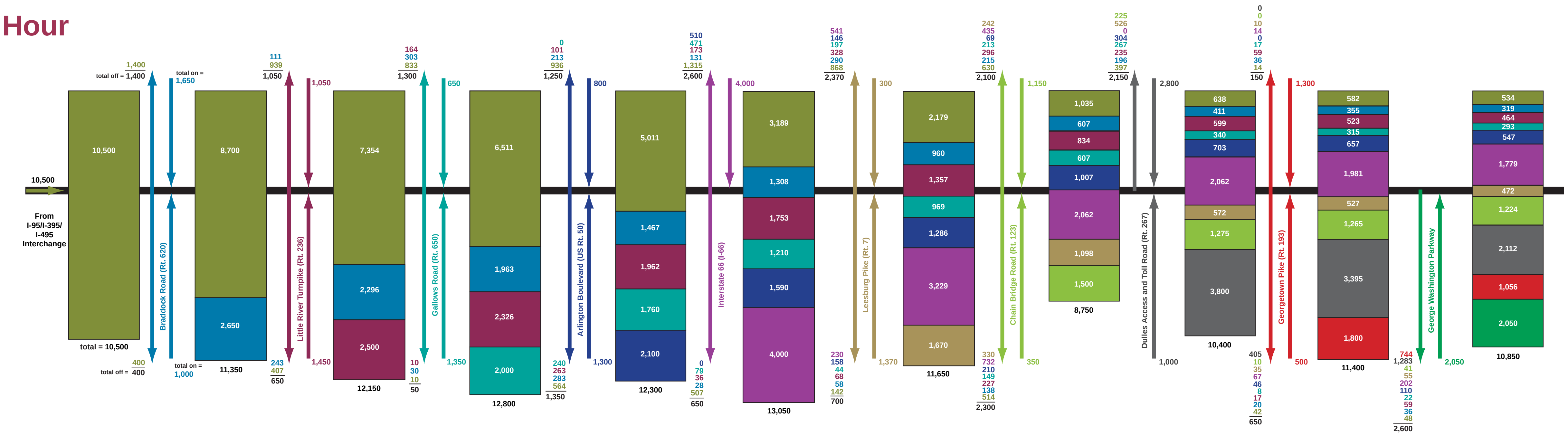
BLTWY150

RAMP-TO-RAMP TRAVEL PATTERNS
Southbound (Outer Loop)

Figure 2-4a

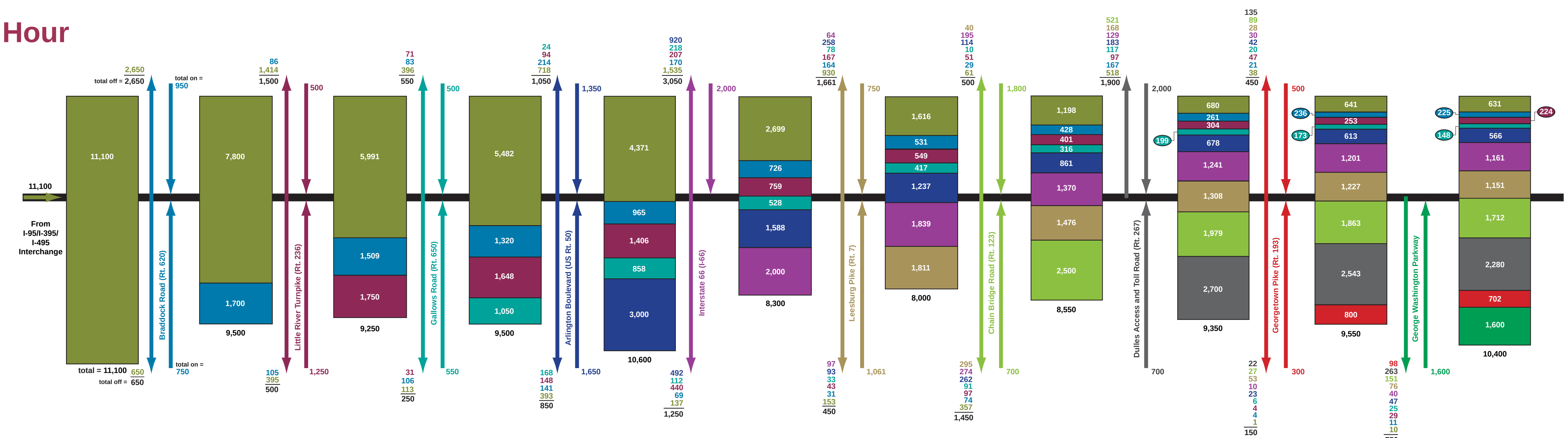
CAPITAL BELTWAY STUDY

AM Peak Hour



NOTE: This figure illustrates the origin and destination of vehicles getting on and off the Beltway. For example, in green, 10,500 vehicles enter the project boundary. 400 vehicles exit east at Braddock Road and 1,400 vehicles exit west at Braddock Road. Remaining on the Beltway are 8,700 vehicles and entering the Beltway from eastbound Braddock Road are 1,650 vehicles and from westbound Braddock Road are 1,000 vehicles for a total of 2,650 vehicles entering from Braddock Road.

PM Peak Hour



NOTE: This figure illustrates the origin and destination of vehicles getting on and off the Beltway. For example, in green, 11,100 vehicles enter the project boundary. 650 vehicles exit east at Braddock Road and 2,650 vehicles exit west at Braddock Road. Remaining on the Beltway are 7,800 vehicles and entering the Beltway from eastbound Braddock Road are 950 vehicles and from westbound Braddock Road are 750 vehicles for a total of 1,700 vehicles entering from Braddock Road.

BLTWY155

RAMP-TO-RAMP TRAVEL PATTERNS
Northbound (Inner Loop)

Figure 2-4b

CAPITAL BELTWAY STUDY

The operational comparisons described in the following sections represent average or "typical" peak hour conditions.

2.4.3 Operational Performance - Mainline of the Beltway

As stated in Section 2.1, the maximum number of lanes on the Beltway was set at 12 in order to minimize the environmental impacts of the widening. As such, all of the alternatives studied throughout the course of the EIS will experience several hours of congestion per day. Under these conditions, examining traditional measures of performance such as level of service (LOS) at individual locations is unlikely to highlight the differences between alternatives. During the peak periods, the mainline operates at LOS F throughout much of the corridor for the build alternatives. Some locations may operate at a higher LOS due to upstream bottlenecks affecting the speeds and queues downstream from the point of congestion. Therefore, it is necessary to examine several additional measures of effectiveness to better understand the conditions of the Beltway Corridor under each alternative. The measures presented include hours of congestion; peak hour queue lengths and speeds; throughput; vehicle delays and travel times during the peak hour, peak period, and off-peak; and overall performance based on CORSIM network statistics such as number of lane changes along the entire corridor, total vehicle hours of move time, and total vehicle hours of delay.

2.4.3.1 Hours of Congestion

The number of hours of congestion for each alternative varies by location. Congestion is defined as traffic flow that is influenced by the effects of a bottleneck. Moderate congestion exists when average speeds range from 20 to 45 mph, with periods of stopping/slowing and brief intermittent segments at free-flow speeds. Severe congestion consists of speeds ranging from 10 to 20 mph, with extended periods of stop and go conditions with few increases in speed.

The No-Build Alternative experiences the highest amount of congestion with up to 16 hours per day. The revised 10-Lane HOV Alternative results in up to 13 hours of congestion per day, and the Preferred 12-Lane HOT Alternative will experience up to 11 hours of congestion per day, depending on the location. Note that for the two build alternatives, the estimates of congestion apply primarily to the general purpose lanes, the HOV/HOT lanes are generally expected to operate at free flow conditions. Figure 2-4 depicts the number of hours of various congestion levels that can be expected for each alternative.

2.4.3.2 Peak Hour Queuing and Speeds

Traffic flows smoothly and maximum throughput is achieved when the volume to capacity (V/C) ratio remains generally constant. When demand exceeds capacity on a freeway facility, queues begin to form, usually at the location of merges, diverges, weaving areas, or where a lane drop causes a significant increase in the volume to capacity ratio. When developing concepts for and designing a freeway, the V/C profile is one of the most important considerations in determining the need for auxiliary lanes between interchanges to provide additional capacity. However, with the dynamic nature of demand, it is impossible to maintain a smooth V/C profile. As a result, queues form where the V/C ratio increases significantly, which in turn can change speeds and demands upstream and downstream of the location. Overall, throughput on the facility drops and additional queuing occurs along the corridor. However, at select locations, traffic will flow at relatively high speeds.

The exact location of queues and reduced speeds will vary by time of day or even by 15 minute periods. It can also vary noticeably from day to day. The general location and maximum length of queues through the project area for each of the alternatives during the AM and PM peak hours have been mapped and are shown in **Figure 2-5.** The queues vary between alternatives, but the following locations experience congestion in all alternatives:

- Northbound approaching Arlington Boulevard (U.S. 50) in the morning due to weaving at the Route 50 interchange.
- Northbound approaching Leesburg Pike in the morning due to the heavy volume of traffic approaching Tysons Corner.
- Southbound approaching the Dulles Access/Toll Road in both peaks, also due to high volumes approaching Tysons Corner.
- Southbound approaching Little River Turnpike in the evening due to a lane drop prior to the interchange area.

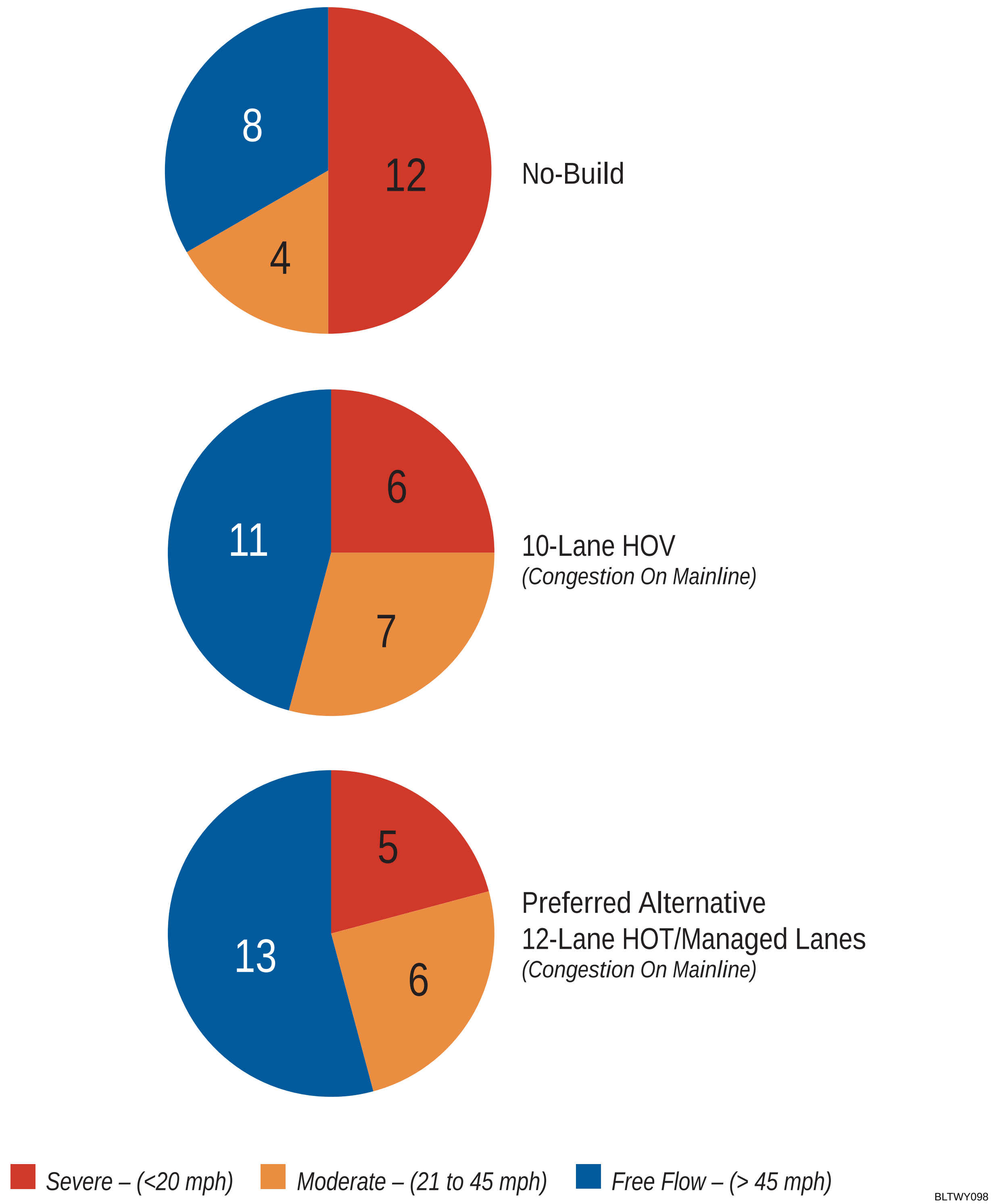
Each alternative has individual bottlenecks in addition to those listed above. These bottlenecks are often caused by design restraints unique to that alternative or by particularly high volumes. **Figure 2-7** illustrates the average speeds for each alternative during the AM and PM peaks, respectively. The speeds are affected by the location and severity of the bottlenecks within the project corridor.

2.4.3.3 Throughput

Throughput is defined as the volume of traffic that passes a given point on a facility during a particular time period. On congested facilities, this volume is usually lower than the demand, the volume of traffic that desires to travel through that point during that time period. Thus, queues develop as vehicles are not accommodated and the demand exceeds the capacity of the facility. In the case of the Beltway, daily throughput was reviewed to differentiate between the alternatives.

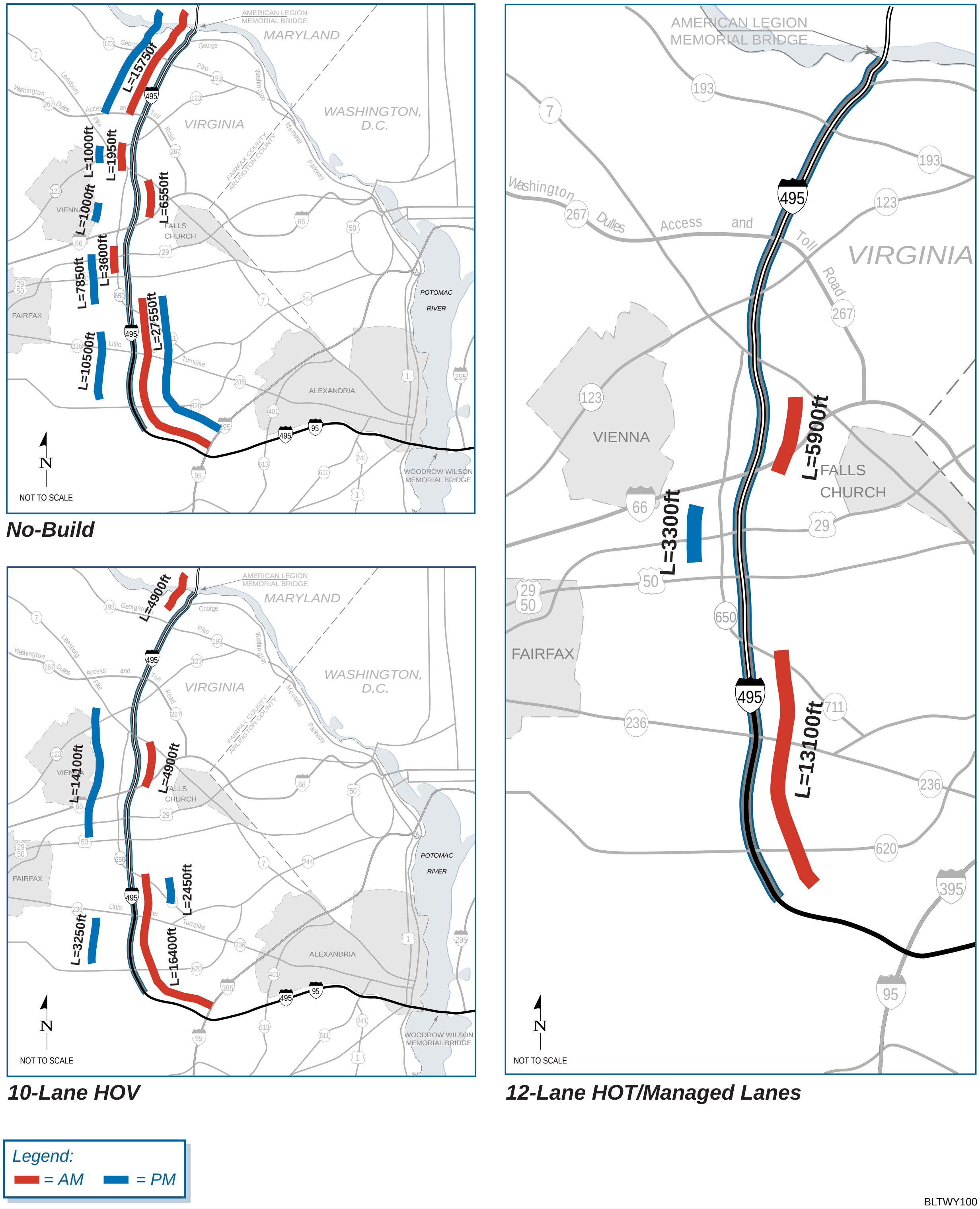
Throughput during the peak periods varies greatly from alternative to alternative. The mainline throughput for the Preferred 12-Lane HOT Alternative is the highest, accommodating over 20% more as compared to the No-Build Alternative. The 10-Lane HOV Alternative has the second highest throughput, slightly less than the Preferred Alternative, showing a 13% increase in throughput. At the on-ramps as well, the Preferred 12-Lane HOT Alternative will have higher throughput as the additional capacity on the mainline will allow vehicles to gain faster entry onto the Beltway and minimize the queues that will form on the local streets.

The capacity of both of the revised Candidate Build Alternatives can handle the forecast demand on a daily basis with congestion limited to peak periods of between two and four hours each for the AM and PM peak periods. The no-build capacity, however, cannot handle the forecast demand with congestion being experienced throughout most of the day. Approximately 10,000 vehicles that desire to use the Beltway under no-build



2020 HOURS OF CONGESTION Figure 2-5

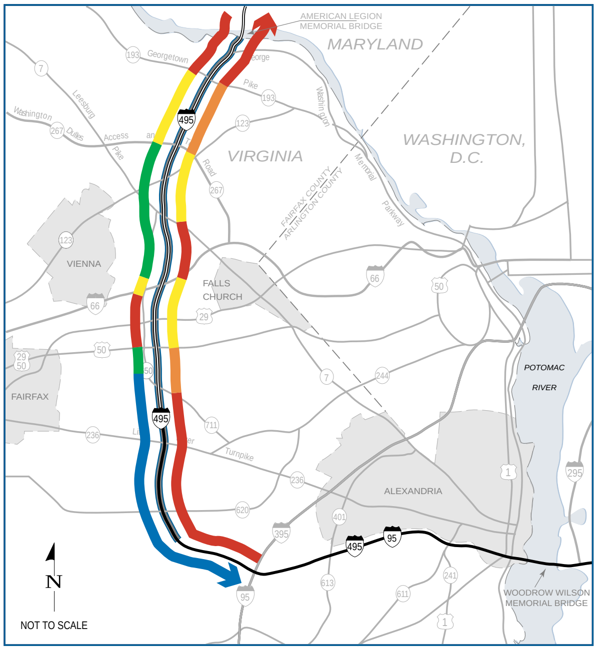
CAPITAL BELTWAY STUDY



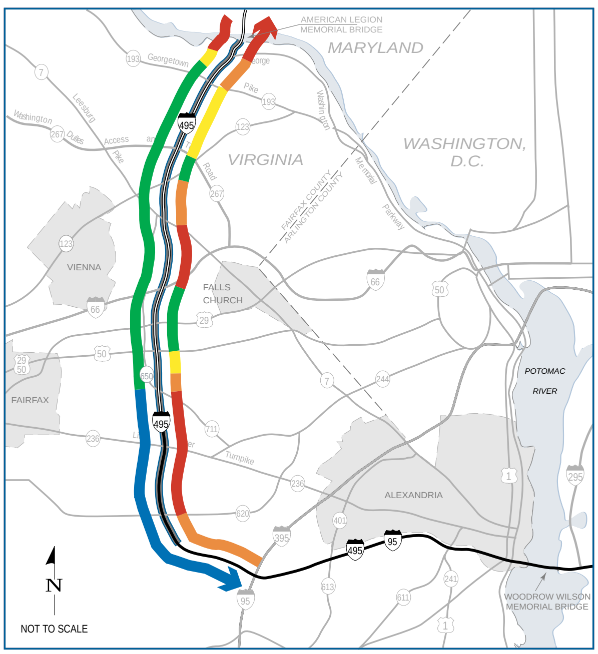
BLTWY100

2020 TRAVEL CONGESTION Figure 2-6

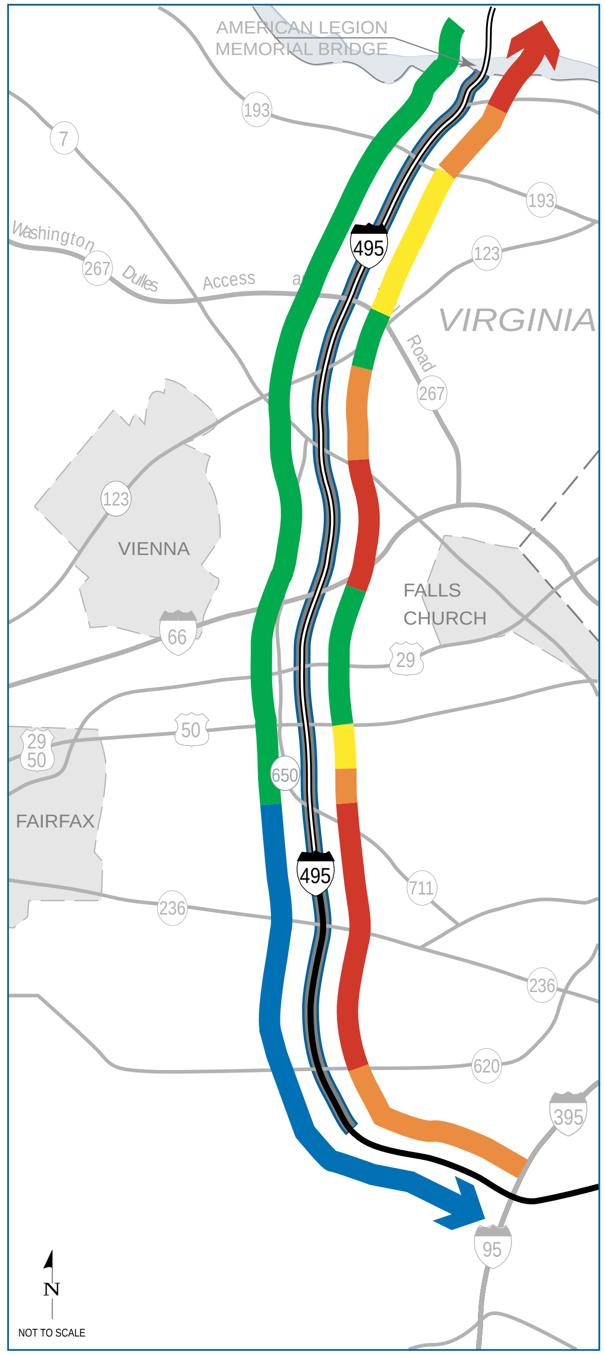
CAPITAL BELTWAY STUDY



No-Build



10-Lane HOV



12-Lane HOT/Managed Lanes

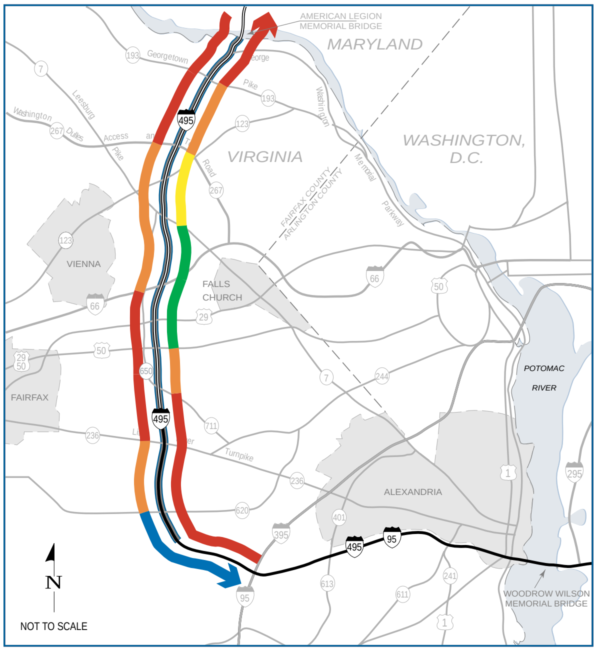
Legend:
= 0-20 mph *= 21-30 mph* *= 31-40 mph* *= 41-50 mph* *= 51> mph*

BLTWY101

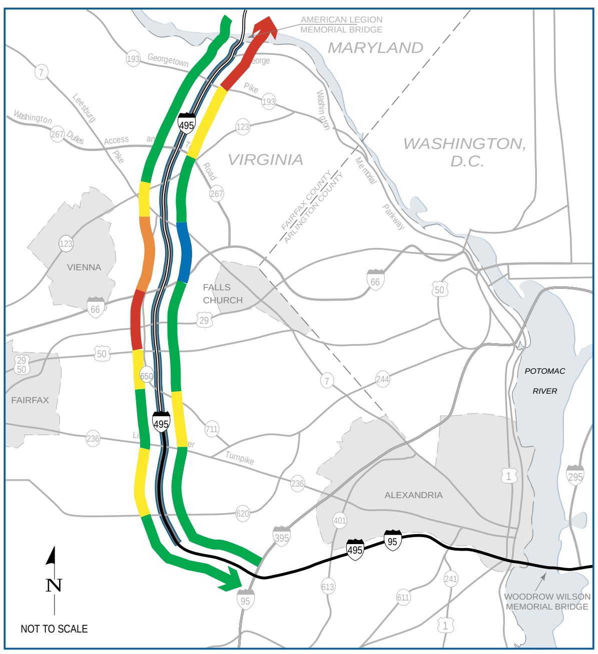
2020 TRAVEL SPEEDS (AM PEAK HOURS)

Figure 2-7a
(1 of 2)

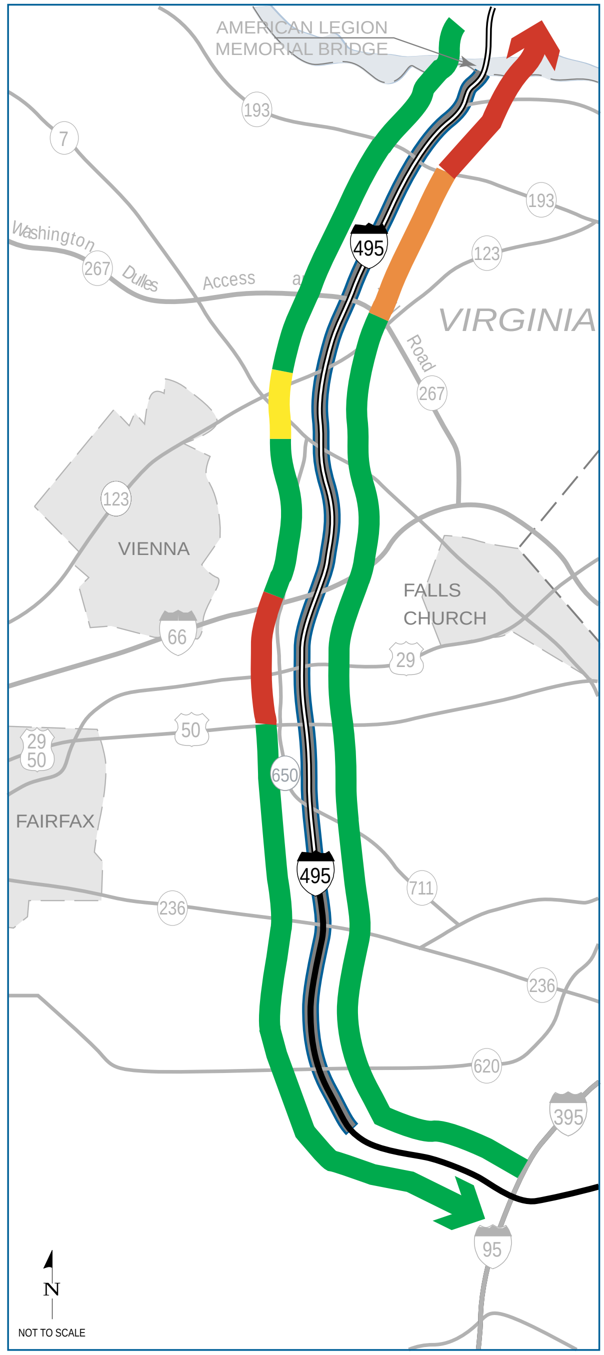
CAPITAL BELTWAY STUDY



No-Build



10-Lane HOV



12-Lane HOT/Managed Lanes

Legend:
= 0-20 mph *= 21-30 mph* *= 31-40 mph* *= 41-50 mph* *= 51> mph*

BLTWY102

2020 TRAVEL SPEEDS (PM PEAK HOURS)

Figure 2-7b
(2 of 2)

CAPITAL BELTWAY STUDY

conditions will be forced to find another route or to abort the trip completely. As discussed previously this will increase the amount of cut-through traffic on the local neighborhood streets, decreasing safety and increasing noise and local disruption.

Determining the appropriate capacity (size of facility) to provide has been and continues to be a subject of much debate. It has been argued that providing too much capacity will encourage additional growth in traffic demand. On the other hand, insufficient capacity with limited throughput results in additional traffic on the adjacent road network on both arterial and local streets. In developing alternatives and choosing the preferred alternative the objective was to provide a level of capacity that balanced reasonably well with the existing or approved road network that feeds traffic to and receives traffic from the Beltway.

As presented above it was found that the Preferred Alternative came the closest to meeting this objective. Congestion is restricted to the AM and PM peak periods in most locations. However, even with the additional capacity, operational performance in the general purpose lanes is expected to gradually decline. The HOT lanes will handle approximately 15% to 20% of the projected demand during peak periods.

2.4.3.4 Delay and Travel Times

Delay and travel times during the peak periods were calculated for each of the mainline alternatives. **Table 2-8** summarizes the number of minutes it will take to travel through the entire corridor during the AM. (5:00 to 10:00 AM) and PM (3:00 to 8:00 PM) peak periods and midday (10:00 AM to 3:00 PM), including the number of minutes of delay experienced in each of the alternatives. Again, the No-Build Alternative experiences the highest amount of delay, with the northbound Beltway forecasted to experience LOS F for most of the corridor, causing over 30 minutes of delay in the AM peak. The managed HOT lanes within the Preferred Alternative are forecasted to have substantially less delay (2 to 4 minutes).

Midday performance. During the middle of the day, both of the revised build alternatives will operate for several hours under free-flow conditions, with little congestion or delay. These mainline alternatives will operate at LOS A throughout the corridor. The No-Build Alternative, on the other hand, will not clear during the midday period.

In the PM peak the Outerloop LOS will vary throughout the corridor, with drivers experiencing approximately twenty minutes of delay. Delays in the PM peak will continue to be significantly less than those experienced in the AM Peak period. This is due to the limited capacity of the facilities feeding the Beltway, primarily from the Tysons Corner area.

2.4.3.5 Overall Performance

To compare the overall performance of alternatives, a number of criteria were examined, including the number of lane changes along the corridor, the vehicle miles traveled, and average speed. The number of lane changes along the corridor gives an indication of the level of turbulence on the facility and the adequacy of the design to accommodate desired traffic movements. Travel speeds reduce and the potential for accidents increase when vehicles change lanes; thus, the design of a facility attempts to minimize the number of required lane changes along the corridor. Average speeds and total vehicle miles give an overall assessment of the ability of the alternative to accommodate vehicle demand in a timely manner.

Table 2-8
2020 ESTIMATED TRAVEL TIME AND DELAY

		AM Peak		Midday		PM Peak	
	ALTERNATIVE	**Time**	**Delay**	**Time**	**Delay**	**Time**	**Delay**
Northbound Expected Delay (minutes)	No-Build	46	33	25	12	42	29
	Express-Local w/HOV	20	7	13	0	16	3
	Concurrent HOV	28	15	13	0	21	8
	Barrier Separated HOV	29	16	13	0	23	10
	Revised 10-Lane HOV	37	24	--	--	18	5
	Preferred 12-Lane HOT Alternative	46 (15)	33 (2)	--	--	20 (17)	7 (4)
Southbound Expected Delay (minutes)	No-Build	33	20	16	3	48	35
	Express-Local w/HOV	19	6	13	0	31	18
	Concurrent HOV	23	10	13	0	30	17
	Barrier Separated HOV	25	12	13	0	34	21
	Revised 10-Lane HOV	18	5	--	--	24	11
	Preferred 12-Lane HOT Alternative	17 (15)	4 (2)	--	--	19 (15)	6 (2)

Notes: 1. Travel Time and Delay values in parentheses are for the separated managed lanes (HOV/HOT)

2. Midday statistics are not available for the Revised 10-Lane HOV and the Preferred Alternative.

Table 2-9 summarizes the performance of the alternatives by these three criteria. These statistics were extracted from the CORSIM microsimulation model for the AM and PM peak hour. As shown in the table, when comparing operations in the general purpose lanes, the number of lane changes is lowest for the Preferred 12-Lane HOT Alternative given the physical separation of the HOV/HOT lanes from the general-purpose lanes and given that the majority of the access to the managed lanes is provided via direct ramps at interchanges. **Figure 2-8** illustrates the impact of lane changing on traffic flow. Although the additional lanes proposed under each of the build alternatives results in more total vehicle miles traveled (VMT) on the Beltway -- this increase is offset by the reduction in VMT on adjacent roadways (as discussed previously in Section 2.4.1) Finally, both of the build alternatives demonstrate substantial increases in travel speeds compared to the No-Build Alternative in most locations, as shown previously in Figure 2-7. In fact, the HOV/HOT lanes in the Preferred Alternative operate at free flow conditions.

Table 2-9
OPERATING PERFORMANCE

		EXISTING			NO-BUILD			REVISED 10-LANE HOV			PREFERRED 12-LANE HOT		
		Lane Changes	Vehicle Miles	Avg Speed	Lane Changes	Vehicle Miles	Avg Speed	Lane Changes	Vehicle Miles	Avg Speed	Lane Changes	Vehicle Miles	Avg Speed
AM Peak Hour													
Inner Loop	GP	155,727	110,338	38	165,789	106,280	17	156,868	96,695	22	119,549	92,809	17
	HOV / HOT	NA	NA	NA	NA	NA	NA	NA	16,790	45	20,707	33,120	61
	Total	155,727	110,338		165,789	106,280		156,868	113,485		140,256	125,929	
Outer Loop	GP	133,013	99,078	46	169,833	112,069	24	185,820	112,959	45	159,296	107,270	47
	HOV / HOT	NA	NA	NA	NA	NA	NA	NA	10,471	51	20,439	32,198	60
	Total	133,013	99,078		169,833	112,069		185,820	123,430		179,735	139,468	
PM Peak Hour													
Inner Loop	GP	128,692	96,506	47	158,287	112,750	19	176,407	120,088	45	142,257	106,030	40
	HOV / HOT	NA	NA	NA	NA	NA	NA	NA	12,606	50	16,618	26,970	61
	Total	128,692	96,506		158,287	112,750		176,407	132,694		158,875	133,000	
Outer Loop	GP	151,232	107,171	39	169,086	113,363	17	216,090	123,967	33	169,221	117,918	42
	HOV / HOT	NA	NA	NA	NA	NA	NA	NA	15,143	50	22,429	37,219	60
	Total	151,232	107,171		169,086	113,363		216,090	139,110		191,650	155,137	

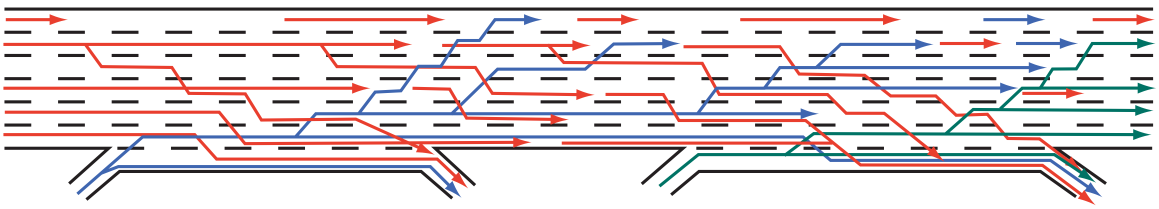
Note: GP = General Purpose lanes; HOV/HOT = High Occupancy Vehicle and High Occupancy Toll Lanes – There are no HOV/HOT lanes on the existing Beltway.

Despite the improvements, it should be noted that the average speed for a vehicle driving the length of the corridor on the Inner Loop during the AM and PM peak hours in the general purpose lanes will decrease somewhat with the build alternatives as compared to the No-Build Alternative. This speed reduction is cased by the congestion in the Tyson's Corner area. Specifically, the delays are caused by the queues that extend back on to the mainline from the Inner Loop to the westbound Route 123 ramp, where traffic exiting from the general purpose lanes yields to traffic exiting from the HOT lanes.

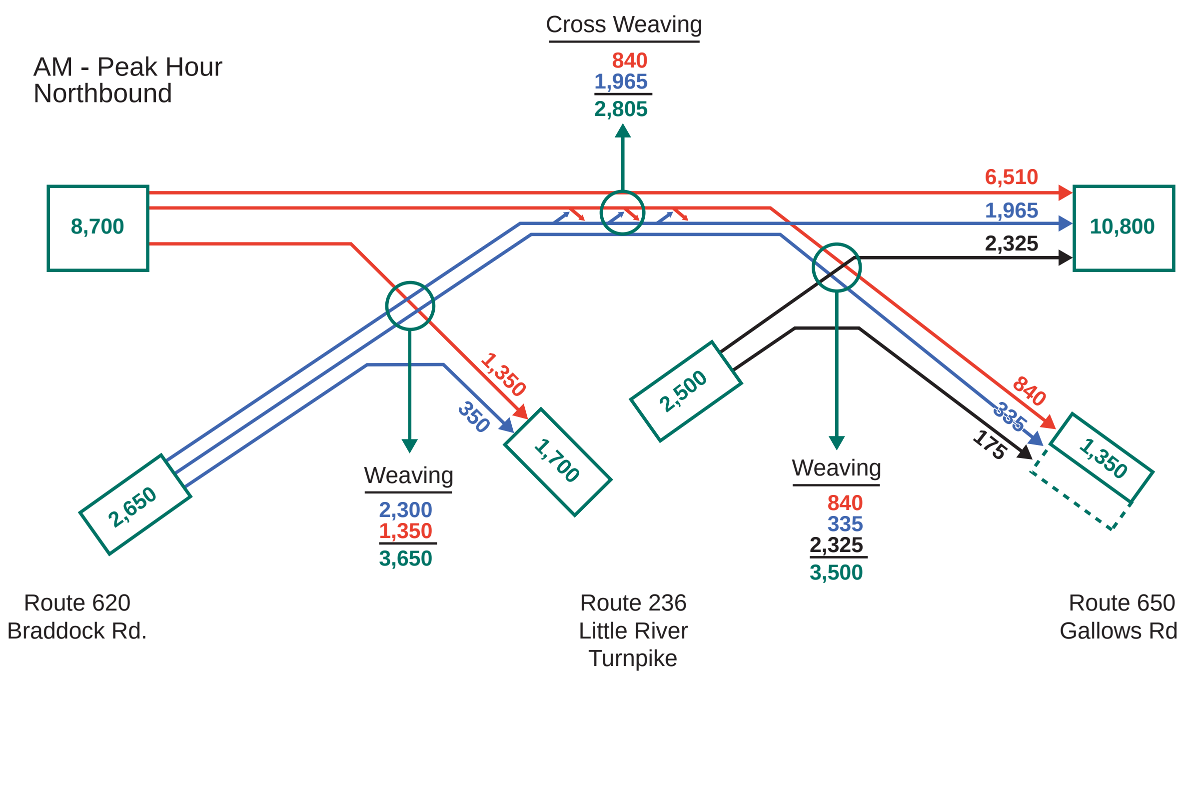
2.4.4 HOV/HOT Network

One of the objectives of the Beltway improvements is to include the Beltway in the regional HOV/HOT system, which would provide seamless travel between destinations on HOV/HOT facilities. The build alternatives meet this objective, while the No-Build Alternative does not. Under the No-Build Alternative, there are no time saving advantages for carpools or bus transit because all lanes are for general use.

The 10-Lane HOV Alternative provides some benefit, as there is a dedicated HOV lane provided during the peak periods. However, this alternative is limited in its benefits because HOV vehicles must first merge across four general-purpose lanes before accessing the HOV lane when there is no direct connection. In addition, there is not sufficient surplus capacity to implement a HOT lane. HOT lanes were developed to respond to situations where HOV lanes were under-utilized as way to increase the overall throughput on congested facilities. In the case of the Beltway there would only be room for 400 to 500 vehicles per hour with this alternative.



Excessive lane changing reduces speeds and increases congestion on the roadway



LANE CHANGING Figure 2-8

CAPITAL BELTWAY STUDY

The Preferred 12-Lane HOT Alternative provides better access to the HOV lanes than the Concurrent HOV Alternative, and provides capacity for 1,600 to 2,000 tolled vehicles per each direction as discussed in more detail in the following paragraphs. In addition this alternative provides capacity for the implementation of transit services along the Beltway and reliable travel times for express bus service.

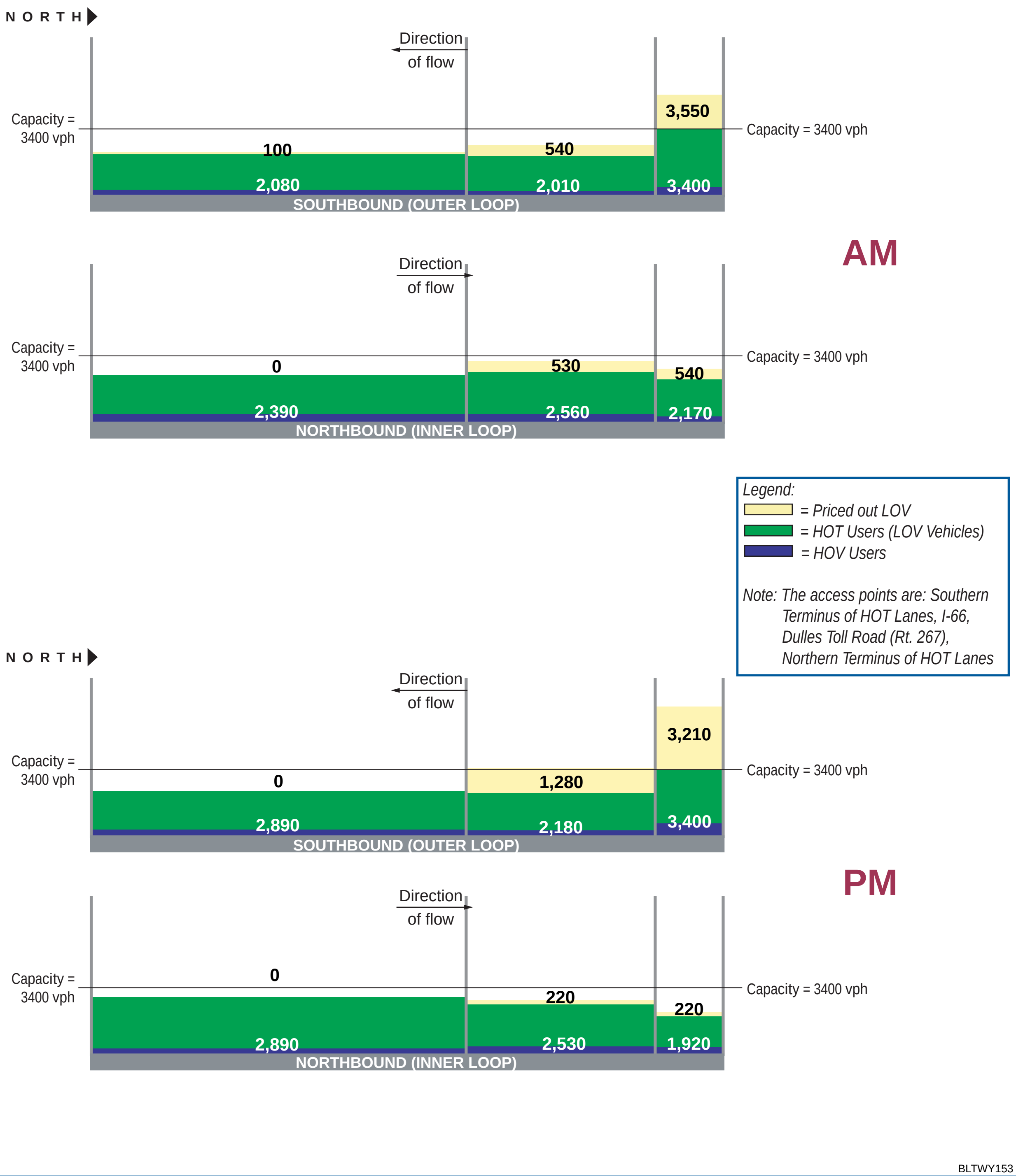
2.4.4.1 Assessment of Demand and Available Capacity for HOV and Tolled Vehicles

The origin-destination data extracted from the sub-area model (see Section 2.4.1) was used to identify the appropriate combination of access points to the HOV/HOT facilities that would optimize their performance. Originally, the system was designed to provide access at either end of the corridor and at the I-66 and Dulles Access/Toll Road interchanges, as both of these roadways currently have HOV facilities in operation. However, traffic assignments indicated that the HOV/HOT facilities would be underutilized given this configuration, as shown in **Figure 2-9a**. Therefore, upon evaluation of origin-destination patterns of users of the Beltway, additional access points were included at the Braddock Road interchange (where an HOV facility is planned for implementation), at the Route 123 interchange (to improve access to Tysons Corner), and at the Lee Highway (Route 29) crossing of the Beltway (to improve access to Merrifield). As shown in **Figure 2-9b**, this configuration maximizes the use of the HOV/HOT lanes.

In the figures, the HOV traffic that is able to use the facility given their origin and destination is shown in blue and the number of tolled vehicles that are able to use and that will be allowed to buy access into the managed lanes given the available capacity is shown in green. For purposes of this analysis, the capacity of the two lane facility was set at 3,400 vehicles per hour, or 1,700 vehicles per hour per lane, in order to maintain traffic operations at Level of Service C or better. The demand for the HOT lanes is higher on certain segments of the Beltway, and in these locations, the number of tolled vehicles that are able to use the HOT lanes exceeds the 3,400 vehicle per hour limit set for the managed facility. These excess vehicles will be “priced out” (where the cost to enter the lanes is raised to discourage further entry) and they are shown in yellow.

In the figures, the maximum volume of traffic in any section is limited by the section with heaviest demand. In some cases, sections run below the theoretical capacity in order to accommodate downstream demand. Actual volumes will vary in response to the level of tolls charged. However, it is estimated that an average volume of 1,400 vehicles per hour per lane could be maintained over the length of the corridor.

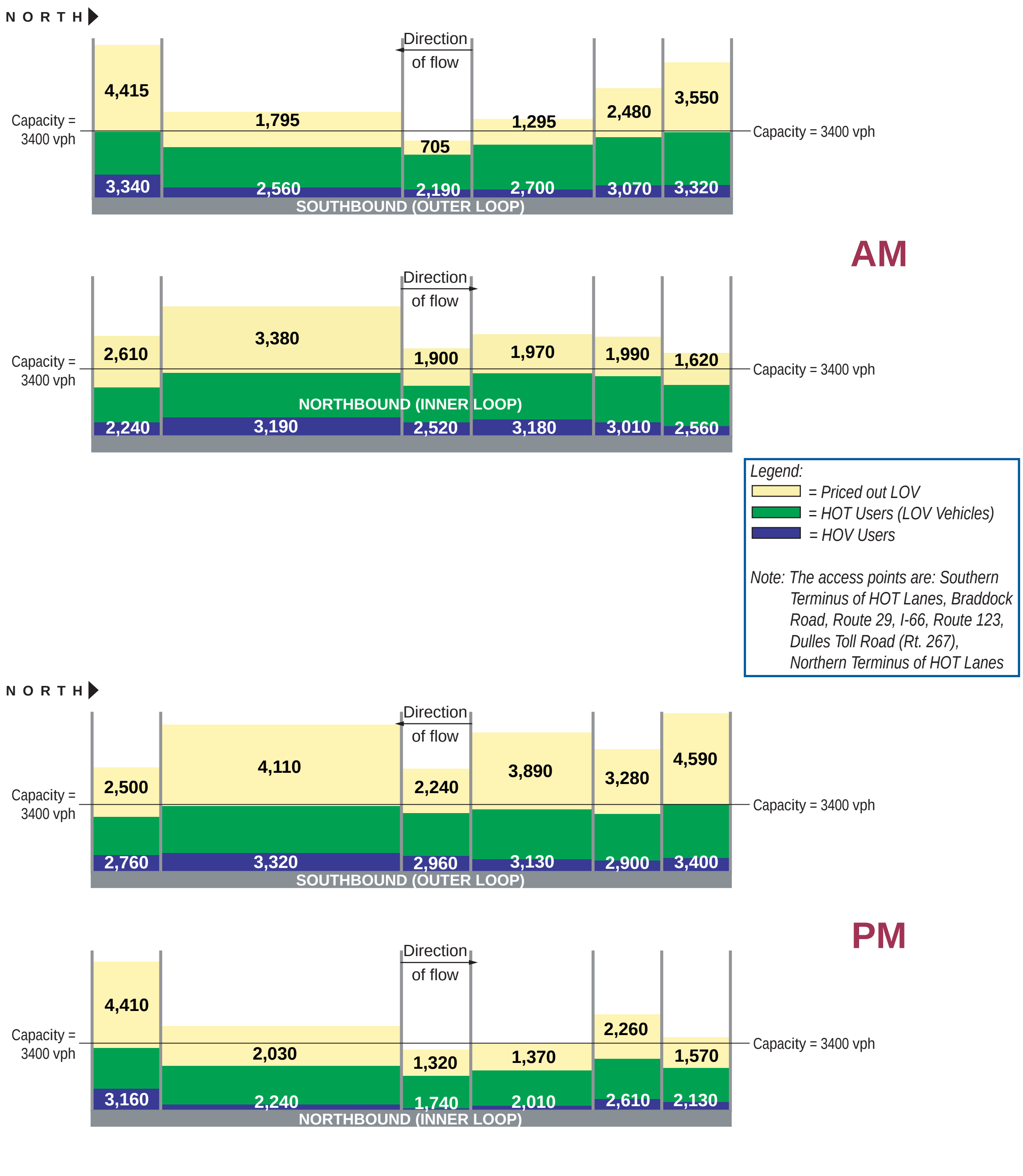
These calculations assume that all of the HOV vehicles that desire to use the HOT facility during the peak hour will be accommodated. However, in reality, this may not be the case as the arrival rates of the HOV traffic and the tolled vehicles will vary during that hour. If more tolled vehicles arrive first, they will enter the HOT facility, forcing it to reach capacity, and some of the HOV vehicles that arrive later in the hour may be part of the group that is “priced out”. The policy and operating decisions that will be made by the Commonwealth Transportation Board will address these types of issues. Revenue and pricing strategies were not conducted as part of this study; this analysis was conducted solely to determine the feasibility of HOT lanes.



HOV/HOT LANE UTILIZATION
Basic Access Points

Figure 2-9a
(1 of 2)

CAPITAL BELTWAY STUDY



HOV/HOT LANE UTILIZATION
Additional Access Points

Figure 2-9b
(2 of 2)

CAPITAL BELTWAY STUDY

2.4.5 Safety and Roadway Design

Construction of any of the build alternatives would substantially improve safety within the corridor. As discussed in Chapter 1, Purpose and Need, the number of accidents on this portion of the Beltway has steadily increased in recent years, primarily due to the increase in congestion, and will continue to rise as long as congestion becomes more severe. Other primary causes of crashes in the corridor include ramps with entrances and exits on the left, substandard acceleration and deceleration lanes, tight loop ramps, and closely spaced interchanges.

Without improvements, the number of crashes on the Beltway will continue to rise as congestion increases, and the safety performance of the Beltway would deteriorate substantially. The No-Build Alternative does not solve any of the current safety issues, exacerbating the existing problem. All of the build alternatives, on the other hand, would both reduce congestion and eliminate existing substandard design issues.

The greatest level of improvement would occur with the construction of the barrier-separated alternatives, particularly the Express-Local Alternative previously considered in the Draft EIS. However, with the inclusion of a 4-foot buffer between the HOV/HOT lanes and the general purpose lanes, the Preferred Alternative also provides additional safety benefits when compared to the existing Beltway. While not new, such concepts are increasingly being considered to resolve safety concerns in high-volume corridors, including:

- I-270 in Montgomery County, Maryland
- Dulles Access and Toll Road in Fairfax County, Virginia
- New Jersey Turnpike

The safety benefits provided by the Preferred Alternative are discussed below:

2.4.5.1 Fewer Traffic Conflicts

HOV and HOT vehicles traveling through the corridor within the managed lanes are separated from vehicles entering and exiting at local interchanges. This concentrates the weaving on the general purpose lanes, where drivers are expecting such conditions. With most express-local type systems such as the Preferred Alternative, the number of weaving maneuvers and lane changes required is usually reduced through the selective use of direct connections at high-volume entrances or exits or for special purposes, such as HOV connections. In addition to the required lane changes, many drivers change lanes in response to slowing traffic. With the buffer separation provided by the Preferred Alternative, the higher speeds will be separated from the slower vehicles in the congested lanes, which should also reduce the number of discretionary lane changes. The C-D roadways included in the 10-Lane HOV Alternative would also provide this benefit, but to a lesser extent.

2.4.5.2 Freeway Management

In congested corridors, it has become increasingly difficult for law enforcement and emergency response equipment to reach the scene of an incident. Vehicles responding to incidents have had to "fight" their way through the queue formed upstream of the incident.

With the Preferred12-Lane HOV/HOT Alternative, vehicles responding to an incident would be able to reach the scene using the unaffected lanes (managed or local) or using the shoulder. Crossing the painted four foot separation would be permitted for law enforcement and emergency response personnel when responding to an incident. However, unlike the express-local facilities cited above, in the event of a more serious incident, all lanes could be blocked by serious incidents.

2.5 ALTERNATIVES CONSIDERED AND ELIMINATED

The following section describes the various alternatives that were considered during the alternatives development and EIS process but eliminated for various reasons. These include the three Candidate Build Alternatives considered in the Draft EIS and the Revised 10-Lane HOV Alternative which was developed in response to public and agency comments on the original Candidate Build Alternatives. Other alternatives considered and eliminated include the conversion of existing lanes to HOV or HOT lanes, a rail transit alternative, express bus service, a transportation system management alternative, and various mainline and interchange configurations. Reasons for the dismissal of several of these alternatives were presented previously in the Draft EIS.

2.5.1 Revised Candidate Build Alternatives

As described previously in Section 2.1.3, the Candidate Build Alternatives contained in the Draft EIS were scaled back substantially in response to public and local government comments. The alternatives were also evaluated for their ability to accommodate HOT operations as proposed by a recent PPTA proposal. Of the six potential modifications to the original Candidate Build Alternatives, only two were considered viable for further study: the Preferred 12-Lane HOT Alternative and the 10-Lane HOV Alternative.

2.5.1.1 10-Lane HOV Alternative

This alternative is a scaled back version of the Concurrent HOV Alternative (described below). Like the Preferred Alternative, this reduced-scale alternative required substantially less new right-of-way than the original Candidate Build Alternatives and, in fact, slightly less than the Preferred Alternative. However, this alternative did not provide sufficient capacity in the two HOV managed lanes to accommodate any future consideration of HOT lane operations. Therefore, this alternative was not selected.

This alternative would add one HOV lane to the Beltway in each direction. No additional general-purpose lanes would be constructed. With this alternative, the Beltway would have a total of 10 through lanes: four general-purpose lanes and one HOV lane in each direction. The far left lane would be designated as an HOV lane and would be separated from the general-purpose lanes by a 4-foot buffer strip. The HOV lane would be used by high occupancy vehicles and buses.

The principle advantage of the 10-Lane HOV Alternative would be its smaller footprint and right-of-way impacts. The collector-distributor roadways would be barrier-separated from the mainline at interchanges and also between closely spaced interchanges for the reasons described previously. Continuous C-D roadways would be provided in both directions between Gallows Road and Route 50, extending to I-66, and only in the southbound direction between Route 123 and Route 7, extending to the Dulles Access/Toll Road. In addition, the two C-D roadway systems would extend to I-66 and to the Dulles Access/Toll Road, respectively. In general, connection to interchanges would be made via the C-D roadways; however, at selected locations, direct access/egress would also be provided from the main roadways. The locations where direct access/egress would occur are at I-66, only to and from the south, and southbound at the Dulles Access/Toll Road and Route 123 interchanges.

The HOV lanes would have direct access/egress to the HOV facilities at three interchanges: Braddock Road, I-66, and the Dulles Access/Toll Road. HOV traffic could also connect with Beltway interchanges by first merging (across the striped pavement) with the general-purpose lanes of the mainline roadway and then exiting to the C-D roadways. In addition to these three interchanges, direct HOV access would also be provided at the Route 123 interchange to improve access to Tysons Corner and to and from the south side of Route 29 to improve access to Merrifield.

Left exits and entrances from the mainline and the C-D roadways for non-HOV traffic would be eliminated, except in the northbound ramps and C-D lanes of Route 123 and the Dulles Toll Road. However, such connections would be provided from the HOV lanes for HOV traffic only.

At the northern end of the project segment, both the northbound and southbound portions of the 10-lane roadway configuration would transition to match the roadway cross-section south of the George Washington Memorial Parkway interchange. Similarly, at the southern end of the project segment, the I-495 mainline roadways would tie into the Springfield Interchange Project at Heming Avenue. At this location, the Beltway would have a 12-lane cross-section.

2.5.2 Draft EIS – Candidate Build Alternatives

Three Candidate Build Alternatives were discussed in the Draft EIS, and the reader should refer to that document for a detailed description of the physical and operational elements of each. Comments from the general public and local government suggested that none of the Candidate Build Alternatives as proposed in the Draft EIS should be considered for the Preferred Alternative. Accordingly, these alternatives are no longer under consideration and have been scaled back considerably in response to those comments as discussed previously.

2.5.2.1 Concurrent HOV Alternative

Like the Revised 10-Lane HOV Alternative, this alternative would add one concurrent HOV lane to the Beltway in each direction. No additional general-purpose lanes would be constructed. With this alternative, the Beltway would have a total of 10 through lanes: four general-purpose lanes and one HOV lane in each direction.

The principle advantage of a concurrent flow HOV roadway system would be its smaller footprint and right-of-way impacts. The C-D roadways would be barrier-separated from the mainline at interchanges and also between closely spaced interchanges for the reasons described above. Continuous C-D roadways would be provided in both directions between Gallows Road and Route 50, extending to I-66, and only in the southbound direction between Route 123 and Route 7, extending to the Dulles Access/Toll Road. In addition, the two C-D roadway systems would extend to I-66 and to the Dulles Access/Toll Road, respectively. In general, connection to interchanges would be made via the C-D roadways; however, at selected locations, direct access/egress would also be provided from the main roadways. The locations where direct access/egress would occur are at I-66, only to and from the south, and southbound at the Dulles Access/Toll Road and Route 123 interchanges.

The HOV lanes would have direct access/egress to the HOV facilities at three interchanges: Braddock Road, I-66, and the Dulles Access/Toll Road. HOV traffic could also connect with Beltway interchanges by first merging (across the striped pavement) with the general-purpose lanes of the mainline roadway and then exiting to the C-D roadways. In addition to these three interchanges, direct HOV access would also be provided at the Route 123 interchange to improve access to Tysons Corner and to and from the south side of Route 29 to improve access to Merrifield.

Left exits and entrances from the mainline and the C-D roadways for non-HOV traffic would be eliminated, except in the northbound ramps and C-D lanes of Route 123 and the Dulles Toll Road. However, such connections would be provided from the HOV lanes for HOV traffic only.

At the northern end of the project segment, the 10-lane roadway configuration would transition to match the roadway cross-section at the American Legion Bridge. Proceeding northbound from the Dulles Access/Toll Road, the I-495 mainline roadway cross-section would transition to match the section at the American Legion Memorial Bridge. The improvements to the southbound I-495 roadway would begin south of the George Washington Memorial Parkway.

Similarly, at the southern end of the project segment, the I-495 mainline roadways would tie into the Springfield Interchange Project at Heming Avenue. At this location, the Beltway would have a 12-lane cross-section.

2.5.2.2 Express/Local with HOV Alternative

This alternative would add two lanes (one HOV lane in each direction) and would reconfigure the Beltway to separate short- and long-distance trips. The "express" lanes (for longer trips) would be separated from the local lanes by a concrete barrier and shoulders. Access to these lanes would be provided at selected interchanges and at various points along the Beltway. One of the express lanes in each direction would be reserved for HOV-only use during peak periods. With this alternative, the Beltway would have a total of 10 through lanes (two local and three express lanes in each direction, i.e., a 2-3-3-2 configuration).

The advantage of an express/local roadway system is that, by efficiently catering to trip purpose and destination, most of the conflicts (weaving and merging) that routinely occur on concurrent lane roadways are eliminated. The local directional lanes function as a continuous C-D roadway, where connections can be made at every interchange and, at selected locations, to the express roadway. The express roadway better serves motorists making longer trips within the corridor, or just passing through the area. Alternatively, such traffic also can access the local roadway to terminate trips at designated interchanges or continue via the local roadway depending upon destination objective and perceived convenience. The express roadway would have direct access/egress at the I-66, Route 123, and the Dulles Access/Toll Road interchanges.

The HOV lanes would have direct access/egress to the HOV facilities at three interchanges: Braddock Road, I-66, and the Dulles Access/Toll Road. HOV traffic could also connect with Beltway interchanges by first merging (across the striped pavement) with the general-purpose lanes of the express roadway and then exiting to the local roadway. In addition to these three interchanges, direct HOV access would also be provided at the Route 123 interchange to improve access to Tysons Corner and to and from the south side of Route 29 to improve access to Merrifield.

Left exits and entrances from the general-purpose lanes of the express roadways for non-HOV traffic would be eliminated. However, as noted previously, such connections are provided from the HOV lanes, for use by HOV traffic only. With regard to the local roadways, left exits and entrances would be provided for the movement of traffic between them and the express roadways.

At the northern end of the project segment, the express/local roadway configuration would transition to match the roadway cross-section at the American Legion Bridge, and also to connect with the George Washington Memorial Parkway. The improvements to the southbound I-495 roadway would begin at the bridge. In the northbound direction, the necessary transition in the express/local cross-sections would begin north of the Dulles Access/Toll Road interchange.

Similarly, at the southern end of the project segment, the mainline I-495 express/local configuration would merge with the roadways and ramps of the I-95/I-395/I-495 interchange project immediately north of the bridge carrying the Beltway over Backlick Road.

Crossover ramps were considered at the following four locations between interchanges to allow traffic to move between the express/HOV lanes and the local lanes:

- Between Backlick Road and Heming Avenue.
- Between Little River Turnpike and Gallows Road.
- Between I-66 and Leesburg Pike.
- Between the Dulles Access/Toll Road and Georgetown Pike.

Two types of crossover ramps were considered: braided ramps and slip ramps.

Braided ramps involve a grade-separation of two nearly parallel ramps. The grade separation eliminates weaving conflicts of entering and exiting traffic. Braided ramps were considered at locations where traffic volumes warrant the additional capacity they provide, such as the connection between the I-95/I-395/I-495 interchange and the Beltway.

Slip ramps are diagonal ramps that connect parallel barrier-separated lanes at the same level or grade. In those cases where additional traffic capacity would not be needed, slip ramps were considered. Slip ramps are normally preferred over braided ramps because they are less costly and less intrusive.

2.5.2.3 Barrier-Separated HOV Alternative

This alternative would add four HOV lanes (two in each direction) and would reconfigure the Beltway to separate general-purpose and HOV traffic with a concrete barrier. Access to the HOV lanes would be provided at selected interchanges and by slip ramps at various points along the Beltway. The HOV lanes would be available to all traffic during off-peak periods. With this alternative, the Beltway would have a total of 12 through lanes (four general-purpose lanes and two HOV lanes in each direction, i.e., a 4-2-2-4 configuration).

The main advantage of this Barrier-Separated HOV roadway is the capacity it provides for HOV traffic, thereby encouraging car-pooling and bus ridership by facilitating movement throughout the HOV roadway network. Accordingly, the HOV roadways would have direct access/egress to the existing and anticipated HOV facilities at three interchanges: Braddock Road, I-66, and the Dulles Access/Toll Road. In addition, direct HOV access would also be provided at the Route 123 interchange to improve access to Tysons Corner and to and from the south side of Route 29 to improve access to Merrifield. HOV traffic would not be able to connect with any of the other Beltway interchanges, except where the barrier has been terminated prior to the Georgetown Pike and George Washington Parkway.

C-D roadways would be barrier-separated from the mainline roadways at interchanges and also between closely spaced interchanges to minimize movement conflicts and to improve safety and traffic operations. Continuous C-D roadways would be provided in both directions between Gallows Road and Route 50, extending to I-66, and in the southbound direction between the Dulles Access/Toll Road and Route 7. Generally, connection to interchanges would be made via the C-D roadways; however, direct access/egress would also be provided from the main roadways at selected locations. The locations where direct access/egress would occur are at I-66, only to and from the south, and southbound at the Dulles Access/Toll Road and Route 123 interchanges.

Left exits and entrances for non-HOV traffic, from the mainline and the C-D roadways, would be eliminated, except in the northbound ramps and C-D lanes of Route 123 and the Dulles Access/Toll Road. However, such connections would be provided from the HOV roadways, for use by HOV traffic only.

At the northern end of the project segment, the 12-lane roadway configuration would transition to match the roadway cross-section at the American Legion Memorial Bridge. Toward the bridge, the required transition in the I-495 mainline cross-section would begin after the Dulles Access/Toll Road. The improvements to the southbound I-495 roadways would begin south of the George Washington Memorial Parkway.

Similarly, at the southern end of the project segment, the I-495 mainline cross-section would tie into the I-95/I-395/I-495 interchange improvements immediately north of the Beltway bridge crossing over the Norfolk Southern Railway. At this location, the Beltway cross-section would consist of a 12-lane cross-section.

2.5.2.4 Interchange Improvement Options

The interchange improvement options evaluated in detail in the Draft EIS, as well those options developed after the publication of the Draft EIS but not selected as Preferred Concepts, are described below.

Braddock Road. Braddock Road (Route 620) has eight lanes immediately west of the Beltway and four lanes on the east. Interchange Concept E, a partial cloverleaf, was carried forward for detailed evaluation. Because HOV lanes are planned for Braddock Road between the Beltway and Burke Lake Road in the *Fairfax County Comprehensive Plan*, the Braddock Road interchange improvement option would include additional ramps that would provide direct Beltway access for HOV traffic. Center-access HOV lanes were selected to ensure that HOV traffic had access to and from the Ravensworth Industrial Park and could work with HOV lanes on either the inside or outside shoulder.

To eliminate the existing troublesome weave on the C-D roadway along northbound I-495, the existing loop ramp connecting northbound I-495 to westbound Braddock Road would be removed. That movement would be replaced by the single fly-over ramp that would tie into westbound Braddock Road on the far side of the Inverchapel Road intersection. To provide for traffic from the northbound C-D lanes of I-495 to locations on Braddock Road west of the interchange but east of the tie-in of the fly-over ramp, a left-turn lane would be provided to facilitate these movements in the form of a dog-leg extending from the northbound to the eastbound ramp. A traffic signal would be required at this location. The removal of the loop ramp would allow for improved alignment for the ramp carrying eastbound Braddock Road traffic heading north onto I-495.

The alignments of the other loop ramps in this interchange would be upgraded, and the profile of Braddock Road would be raised slightly to provide for the minimum vertical clearance between the Beltway and Braddock Road. The horizontal alignment of Braddock Road would remain the same as the existing alignment.

To allow for direct access to and from the HOV lanes on I-495 at Braddock Road, access ramps would be provided. These ramps, located in the center of the interchange, would facilitate movement of HOV traffic in all directions. Traffic signalization would be required to maintain proper traffic flow.

The pedestrian bridge from Americana Drive to Wakefield Park located north of the Braddock Road interchange would be replaced due to the widening of I-495.

Little River Turnpike. Interchange Concept B, a partial cloverleaf, was carried forward for detailed evaluation in the Draft EIS but eliminated from the Preferred Alternative. In an effort to minimize the impact of improvements to this interchange on the surrounding community, several of the interchange improvement concepts originally identified prior to the Draft EIS as reasonable alternatives for further study were also reconsidered.

Concept B. To reduce weaving problems that occur on the C-D roadways at the existing interchange, the loop ramp carrying traffic from northbound I-495 to westbound Little River Turnpike and the loop ramp carrying traffic from southbound I-495 to the eastbound direction would be removed in order to reduce weaving problems that occur on the C-D roadways at the existing interchange. Left turn lanes from the I-495 exit ramps would replace the movements previously provided by these ramps. For proper control of traffic, signalization would be provided along Little River Turnpike at the two locations described. By eliminating the loop ramps, improvements would be made to the alignments of the eastbound ramp from Little River Turnpike to southbound I-495, and the westbound ramp from Little River Turnpike to northbound I-495.

The horizontal alignment of Little River Turnpike would match the existing alignment, and the profile would be raised to maintain the required minimum vertical clearance with I-495. Alignment adjustments would also be required for Lafayette Village Drive, Americana Drive, and Accotink Parkway.

Concept B was ultimately eliminated in favor of a Preferred Concept that would lessen the impact of improvements at the Little River Turnpike interchange on the surrounding community.

Other Interchange Options Considered. An interchange design similar to Concept D, except with the ramp in the northeast quadrant redesigned to flyover the proposed loop ramp in that quadrant in an effort to minimize impacts, was also considered and eliminated. Concept E, which had been dropped prior to publication of the Draft EIS, was ultimately selected for inclusion in the Preferred Alternative and is described in Section 2.2.2 above.

Gallows Road. Two options for the Gallows Road interchange were carried forward for detailed evaluation in the Draft EIS: Concept A, a revised version of which was selected as the Preferred Concept and is described in Section 2.2.2 above, and Concept C.

Concept C. This concept involved a full diamond interchange at Gallows Road. The concept would require traffic signals at the ramp intersections on either side of the Beltway and at the reconfigured Woodburn Road intersection. Due to widening at the interchange, portions of Luttrell Road require would alignment modifications under this concept.

Other Interchange Options Considered. In addition, a Revised Concept A was developed and considered after the publication of the Draft EIS in an attempt to further reduce the impact of proposed interchange improvements at Gallows Road. This concept would be similar to the original Concept A, except that the loop ramp would be upgraded to a much higher design speed and the intersection with Woodburn Road improved. Due to the additional impacts that the Woodburn Road intersection improvements would cause in the northwest quadrant of the interchange and along Woodburn Road, Revised Concept A was eliminated, and the original Concept A was retained as the Preferred Concept.

Arlington Boulevard. Interchange Concept A, which was carried forward for detailed evaluation, was retained as the Preferred Concept for the Arlington Boulevard interchange.

Interstate 66. Three general options for the I-66 interchange were carried forward for detailed evaluation in the Draft EIS, all of which were eventually eliminated in favor of a Preferred Concept similar to the existing interchange footprint. Concepts A and B would be a directional interchange with full movements and I-66 reversible HOV lanes on the north. Concept A would apply only to the Concurrent HOV mainline alternative; Concept B would be identical in design and would apply to all other mainline alternatives. Concept C would be a directional interchange with partial (existing) SOV movements, full HOV movements, and I-66 reversible HOV lanes on the north. Concept E would be a directional interchange with full movements and I-66 reversible HOV lanes on the south.

Concept A. This proposed interchange would provide for full movement of traffic between the two interstate highways, whereas the existing interchange excludes two movements: southbound I-495 to eastbound I-66 and westbound I-66 to northbound I-495. The design now provides for direct access from the express, local, and HOV lanes of the Beltway to I-66 as well as the movement from I-66 to the express, local, and HOV lanes of the Beltway. This design would accommodate the widest typical section for I-66 proposed in the I-66 MIS.

Regarding the HOV facilities inside (east of) the Beltway, the current operation of I-66 as a peak direction HOV facility would remain unchanged. Outside (west of) the Beltway, the I-66 interchange design would have two reversible HOV lanes that operate eastbound in the morning and westbound in the afternoon. The reversible HOV lanes would be located in the middle of I-66 on the north side of the Metrorail tracks. Inside the Beltway, the reversible roadway would be connected to eastbound I-66 via a fly-over ramp crossing the Metrorail bridge. In the westbound direction, a two-lane gated exit immediately west of the Beltway and east of Gallows Road would connect I-66 to the reversible roadway.

Direct fly-over ramps would facilitate the movement of traffic between I-66 and I-495. The highest ramp would carry the westbound I-66 traffic to southbound I-495, and the high point would be located on the west side of the Beltway. The ramp carrying westbound I-66 traffic to northbound I-495 would cross over the Beltway and under I-66 before merging with the northbound roadways, while the ramps carrying southbound I-495 traffic to eastbound I-66 and northbound I-495 traffic to westbound I-66 would be positioned in the middle. This interchange design is compatible with the I-495 Concurrent HOV and Barrier-Separated HOV Alternatives evaluated in the Draft EIS.

A number of roadways and bridges in the vicinity of this interchange would have to be relocated and/or replaced to accommodate the proposed widening and to provide for required vertical clearance. These roadways include Shreve Road, Lee Highway (Route 29), Gallows Road, Virginia Lane, Barbour Road, Idylwood Road, Oak Street, and the Washington and Old Dominion Trail. The new bridges would be longer and slightly higher than the existing bridges. At Lee Highway and Gallows Road, the bridges would also be widened to accommodate anticipated future expansion.

Concept B. This proposed interchange would provide for full movement of traffic between the two interstate highways, whereas the existing interchange excludes two movements: southbound I-495 to eastbound I-66 and westbound I-66 to northbound I-495. The design now provides for direct access from the express, local, and HOV lanes of the Beltway to I-66, as well as the movement from I-66 to the express, local, and HOV lanes of the Beltway.

Inside the Beltway, current operation of I-66 as a peak direction HOV facility would remain unchanged. Outside the Beltway, the I-66 interchange design would have two reversible HOV lanes that operate eastbound in the morning and westbound in the evening during the peak periods. The reversible HOV lanes would be located in the middle of I-66 on the north side of the Metrorail tracks. Inside the Beltway, the reversible roadway would be connected to eastbound I-66 via a fly-over ramp crossing the Metrorail bridge. In the westbound direction, a two-lane gated exit immediately west of the Beltway and east of Gallows Road would connect I-66 to the reversible roadway.

Similar to Concept A, direct fly-over ramps would facilitate the movement of traffic between the two interstate highways. The highest ramps would carry the westbound I-66 traffic to southbound I-495 and the eastbound I-66 traffic to northbound I-495. The high points of these ramps would occur on the northwest and northeast quadrants of the Beltway. The ramp carrying the westbound I-66 traffic to northbound I-495 would cross over the Beltway, the HOV ramps, and I-66 before merging with the C-D roadways and express northbound I-495 roadways. The ramps carrying southbound I-495 traffic to eastbound I-66 and northbound I-495 traffic to westbound I-66 would be positioned in the middle. This interchange design is compatible with both the Express/Local with HOV and Barrier-Separated HOV Alternatives evaluated in the Draft EIS.

A number of roadways and bridges in the vicinity of this interchange would have to be relocated and/or replaced to accommodate the proposed widening and to provide for required vertical clearance. These roadways include Shreve Road, Lee Highway (Route 29), Gallows Road, Virginia Lane, Barbour Road, Idylwood Road, Oak Street, and the Washington and Old Dominion Trail. The new bridges would be longer and slightly higher than the existing bridges. At Lee Highway and Gallows Road, the bridges would also be widened to accommodate anticipated future expansion.

Concept C. This design is similar to Concepts A and B, except for the two missing movements that would serve non-HOV traffic: the southbound I-495 to eastbound I-66 and the westbound I-66 to northbound I-495. In other words, this design would provide for all traffic movements currently available between the two interstate facilities, plus HOV access in all directions. This interchange design is compatible with the three mainline alternatives evaluated in the Draft EIS.

Concept E. Depending on the Beltway typical section, the traffic movements in this interchange design are similar to Concepts A and B. However, this concept differs from all the other concepts considered in the Draft EIS in that the reversible HOV lanes on I-66, outside the Beltway, would be located on the south side of the Metrorail tracks. The reversible lanes would merge into eastbound I-66 to facilitate the movement of HOV traffic in the morning peak period. In the afternoon, a two-lane exit ramp crossing over the Metrorail bridge would connect westbound I-66 inside the Beltway with the reversible lanes outside the Beltway to facilitate the HOV movements in the evening.

Although the reversible HOV lanes and one HOV ramp would merge with eastbound I-66 at a single location inside the Beltway, the design could be modified to have two separate merges to reduce the cost of the interchange. The reversible lanes could merge with eastbound I-66 immediately outside the Beltway, and the HOV ramp could merge with I-66 eastbound inside the Beltway. The westbound connection with the reversible lanes would take place immediately west of the Beltway and east of the Gallows Road Bridge over I-66. This interchange design is compatible with the three mainline alternatives evaluated in the Draft EIS.

Leesburg Pike. Concept B, a directional interchange, was carried forward for detailed evaluation in the Draft EIS but later eliminated in favor of a Preferred Concept with fewer impacts on the surrounding community. Concept B would replace all the loops of the existing Leesburg Pike interchange with direct ramps, except for the loop in the southwest quadrant. The southwest loop ramp, which provides for southbound Beltway and northbound Route 123 traffic headed east on Leesburg Pike, would be retained.

Concept B would provide connections for all destinations currently available via the Beltway. Due to the proximity of Route 123, only access to the northbound Beltway would be provided in the vicinity of Route 123. However, Route 7 traffic headed to Route 123 would be able to access directly the Beltway ramps to Route 123, without using the local or express mainline Beltway roadways. Similarly, northbound Route 123 traffic headed to Route 7 would access the ramps to Route 7 without using the Beltway roadways. Direct access between these two interchanges would be made possible by the construction of two viaducts running parallel to and on top of the southbound local roadways and northbound exit ramp, thereby eliminating the merging and weaving that would prevail if the mainline Beltway were used for those movements. Southbound traffic from Route 123 to southbound I-495 would access Route 7 via the local lanes of the Beltway.

The profile of Route 7 crossing over the Beltway would be raised both to accommodate the widening of the Beltway and to maintain the minimum clearance over it. The widening of Route 7 in the vicinity of the interchange would require reconstruction or closure of a number of driveways and entrances on both sides of the Beltway. Furthermore, reconstruction of the Kidwell Bridge over Route 7, immediately west of the Beltway, as well as portions of Magarity Road east of the Beltway, would be required.

Chain Bridge Road. Interchange Concept C was carried forward for detailed evaluation in the Draft EIS but was later eliminated in favor of a Preferred Concept with fewer impacts on the surrounding community. Concept C would be a partial cloverleaf with center HOV access and directional (flyover) ramps for northbound Beltway to southbound Chain Bridge Road and northbound Chain Bridge Road to northbound Beltway traffic. This concept would provide for the proposed extension of Metrorail through the interchange.

Concept C. Under Concept C, the loop ramps for northbound I-495 to southbound Route 123 and the northbound Route 123 to northbound I-495 movements would be replaced with direct fly-over ramps, and the two loops on the northwest and southwest quadrants retained. The radii of the loops, although smaller than the existing ones, would meet current design criteria. Direct ramps from Route 7 and the northbound lanes of the Beltway to southbound Route 123, and from northbound Route 123 to Route 7 and the southbound express and C-D lanes of the Beltway, would eliminate weaving movements that would otherwise occur on the mainline Beltway. As noted previously, these ramps, which would be located on two viaducts running parallel to the Beltway, (one on top of the southbound C-D lanes and the other on top of the exit ramp from the northbound roadway), would facilitate the direct access between the roadways.

Direct access to and from HOV lanes on I-495 at Route 123 would be provided by center access depressed ramps. These ramps would provide for the movement of HOV traffic in all directions to and from Route 123. They would connect to Route 123 in the middle of the interchange where I-495 crosses over Route 123. A traffic signal would be required at this location to allow for orderly turning movements to and from the Beltway.

The profile of I-495 would be raised in the interchange area to provide the minimum clearance required where I-495 crosses Route 123. The horizontal alignment of Route 123 would remain the same as the existing alignment and is designed to accommodate its future expansion. The Tysons Corner Connector overpass crossing Route 123 immediately west of the Beltway would be reconstructed to allow for the widening of Route 123 and the ramps to and from the Beltway. The new bridges would be built slightly wider than required to better accommodate the maintenance of traffic during construction.

Other Interchange Options Considered. In addition to the Preferred Concept selected for inclusion in the Preferred alternative, two additional interchange options were developed after the publication of the Draft EIS in an effort to reduce the impact of improvements to the Chain Bridge Road interchange on the surrounding community. Option 1 would be similar to the Preferred Concept, except that instead of replacing the existing loop ramp in the northeast quadrant with left turn lanes, it would be replaced with a flyover ramp. However, this flyover ramp interfered with the proposed extension of Metrorail through the interchange and was therefore eliminated.

Like Option 1, Option 2 would replace the existing loop ramp in the northeast quadrant with a flyover ramp. However, Option 2 would not include the modified loop ramp in the southwest quadrant, and therefore would not address the weave issues along southbound I-495. This concept also interferes with the proposed extension of Metrorail through the interchange. For both of these reasons, Option 2 was eliminated.

Dulles Access/Toll Road. Concepts B and E were carried forward for detailed evaluation in the Draft EIS but were later eliminated in favor of a Preferred concept with fewer impacts to the surrounding community. Concept B involved a directional interchange with HOV access and a flyover ramp for eastbound Dulles Access/Toll Road traffic to and from the Beltway. Concept E involved a directional interchange with HOV access with dual flyover ramps for Dulles Access/Toll Road traffic and realignment of the Beltway. Both of these interchange options would include direct access to the HOV lanes on the Dulles Access/Toll Road.

Concept B. The general configuration of this interchange in terms of traffic movements would remain essentially unchanged. The two current missing movements, northbound I-495 to eastbound Route 267 and the reverse movement from westbound Route 267 to southbound I-495, would still be omitted for both HOV and non-HOV traffic. The left exits from the express roadways would be dedicated to HOV traffic only. For non-HOV traffic in the northbound direction, a right exit from the express roadway and a left exit from the local roadway would provide access to westbound Route 267. For non-HOV traffic in the southbound direction, one right exit would provide access to both westbound and eastbound Route 267.

Access for Route 267 traffic to northbound I-495 would be provided via the C-D roadways, and access for eastbound Route 267 traffic to southbound I-495 would be provided to both the C-D and express lanes. Direct HOV access would be provided between the Beltway and Route 267 to the west; however, direct HOV access to the east would be provided only from the southbound Beltway. HOV access from the east would be provided only to the northbound Beltway and only via the C-D lanes. This concept would allow for the movement of traffic between the Beltway and the Dulles Airport Access/Toll Road via both the HOV and non-HOV ramps.

The Beltway profiles over the Dulles Airport Access/Toll Road would be slightly raised to provide for the required minimum vertical clearance. North of Route 267, reconstruction of Lewinsville Road and Old Dominion Drive bridges and approaches would be required to allow for the proposed I-495 mainline improvements.

<u>*Concept E*</u>. This design concept is similar to Concept B in that Concept E would provide for all the movements currently allowed at this interchange to be maintained. However, there are several major differences in the layout of this design compared to Concept B:

- The southbound Beltway would be shifted to the east closer to the northbound Beltway, resulting in a smaller footprint. The shift would eliminate the right-of-way impact in the southwest quadrant of the interchange.
- Under Concept E, a loop ramp would replace the fly-over ramp from the southbound Beltway to eastbound Route 267, resulting in a somewhat longer weaving distance on eastbound Route 267 than under the Concept B design.
- The westbound Route 267 roadway between Route 123 and the Beltway would be reconfigured to eliminate the existing weaving movements in this segment of the roadway. The off ramp from southbound Route 123 would be split into two separate roadways: one for traffic headed to westbound Route 267 and one for traffic headed to the northbound Beltway. A left exit fly-over ramp from Route 267, before its merge point with the on ramp from Route 123, would be provided to facilitate the movement of traffic headed to the northbound Beltway. The two ramps carrying traffic headed for the northbound Beltway would merge first before merging with the C-D lanes of the Beltway. This configuration could be incorporated into Concept B as well.
- HOV access to westbound Route 267 from southbound I-495 would be provided via a direct fly-over ramp. Under Concept B, this movement would be provided via a loop ramp.
- This design would not provide direct HOV access from the southbound Beltway to eastbound Route 267. HOV traffic would access eastbound Route 267 via the general-purpose roadways and ramps.

Georgetown Pike. Concept A, an improved diamond interchange, was carried forward for detailed evaluation in the Draft EIS. This concept involved minor modifications to the existing interchange configuration, including the widening of the Georgetown Pike overpass and ramps to meet traffic demand and to improve operation, and a longer and slightly higher bridge to accommodate the widening of the Beltway and to ensure the required minimum vertical clearance over the Beltway. However, this concept was later eliminated in favor of a Preferred Concept with fewer impacts on the surrounding community.

George Washington Memorial Parkway. The George Washington Memorial Parkway begins at the Beltway near Great Falls and travels southeastward along the Potomac River through McLean, Arlington, and Alexandria to Mount Vernon into southeast Fairfax County. It serves as a commuter route during the peak periods for traffic from both Maryland and Virginia to the District of Columbia. Throughout the day, it serves as a convenient route connecting Arlington and Alexandria to Maryland.

Concept A, an improved trumpet, was carried forward for detailed evaluation in the Draft EIS. This concept would involve minor modifications would be made to the existing interchange configuration. A portion of Live Oak Drive and the bridge over I-495 may need to be reconstructed to accommodate the widening of the Beltway. The ramp from northbound I-495 to the southbound George Washington Parkway would be widened to two lanes, and the ramp from the northbound George Washington Parkway would be slightly modified to provide for an improved alignment.

However, unlike the Candidate Build Alternatives considered in the Draft EIS, the Preferred Alternative ties into the existing Beltway south of the George Washington Parkway interchange. Therefore, no improvements to this interchange are included in the Preferred Alternative.

2.5.2.5 HOV Direct Access Points

All of the HOV direct access points evaluated in the Draft EIS were incorporated into the various interchange improvements included in the Preferred Alternative. None of these direct access points has been eliminated.

2.5.3 Other Alternatives Considered and Eliminated

As a result of the alternatives refinement and screening that occurred prior to publication of the Draft EIS, several of the original improvement concepts were eliminated from further consideration and were not carried forward in the environmental process as reasonable alternatives. In addition, two new configurations were considered after the publication of the Draft EIS at the suggestion of the Environmental Defense Fund; however, these were ultimately determined unfeasible and eliminated as well. Reasons for elimination varied; only the best-performing concepts were retained at each stage of the screening process. The concepts dropped from further study and the rationale behind their elimination is summarized below.

2.5.3.1 Conversion of Existing Lanes to HOV or HOT

Based on comments on the Draft EIS by the Environmental Defense Fund, the potential to convert existing Beltway general-purpose lanes to HOV or HOT lanes, with or without adding additional capacity, was investigated. Two variations of this configuration were considered:

- **3-1-1-3 Alternative.** This alternative would involve the conversion of one existing lane in each direction to HOT lanes. No additional capacity would be added.
- **3-2-2-3 Alternative.** This alternative would also involve the conversion of one existing lane in each direction to HOT lanes, and would also add one new HOT lane in each direction.

However, after further evaluation, both of these alternatives were dismissed from further evaluation because:

- Projected demand exceeds the capacity to handle traffic without congestion lasting for most of the day resulting in significant diversion of trips to the adjacent street network (especially with the 3-1-1-3 alternative where capacity on the single HOV/HOT lane would be quickly used up, negating any benefit it would provide when compared to the general purpose lanes).
- Due to the close spacing of interchanges and origin destination patterns in Northern Virginia, lane changing and weaving movements would result in significant speed reductions in the HOT lanes when compared to alternatives that maintain four general purpose lanes in each direction.
- Converting general purpose lanes to special use lanes has not been well received in Virginia and elsewhere throughout the country (most recently in Minneapolis). A public backlash could easily undermine an otherwise successful project. With the Preferred Alternative, if the HOT lanes are well utilized the Beltway could be re-striped in the future to provide three general purpose lanes and three HOT lanes in each direction.
- Lastly, neither of these two alternatives were determined to be fundamentally different (e.g., location/configuration; operations or impacts) from the preliminary alternatives developed during the Draft EIS. Nor did either satisfy the project's Purpose and Need as well as the revised Candidate Build Alternatives discussed in this Final EIS; these alternatives actually congest the Beltway and are ineffective at removing cut-through traffic from the adjoining and parallel road network, contrary to one of the components of the purpose and need.

2.5.3.2 Rail Transit

The feasibility of circumferential rail, parallel to the existing Beltway, has been analyzed extensively in a number of studies, including MISs performed in both Virginia and Maryland. The MIS analyses included studying the potential for a circumferential rail system running the entire length of the Beltway. It was concluded that rail transit alone cannot fully meet future travel demand or provide the design and operational enhancements needed to increase Beltway capacity and safety. In 1997, VDOT concluded the Capital Beltway MIS with a recommended multi-modal strategy for further consideration. The recommendation was comprised of two components:

- Lane management strategies in the Beltway Corridor that support high occupancy vehicles and bus transit use, and
- Rail transit planning for connectivity of radial lines.
- The MIS recommended that each component be studied separately, in parallel, by the appropriate agencies. Hence, the Capital Beltway Study (EIS Phase) and the Capital Beltway Corridor Rail Feasibility Study were undertaken. The studies were launched with the direction that any widening

of the Capital Beltway should be constructed so as not to preclude transit in the corridor and the development of transit should not prevent widening of the Beltway. The rail feasibility study also concluded that the effect of introducing rail transit in the corridor does not eliminate the need for roadway improvements. A summary of the Capital Beltway Corridor Rail Feasibility Study is included in Chapter 2 of the Draft EIS.

2.5.3.3 Express Bus Service

The MIS analyses also evaluated express bus services in the Beltway Corridor, but it was concluded that the implementation of such services alone would not preclude the need for other improvements to the Beltway. For express bus service to be effective, highway facilities that provide higher-speed routes would be needed to ensure travel time saving during peak hours. It is clear that neither the existing Beltway nor any other nearby highway is capable of providing such a route.

Though not effective as a stand-alone alternative, expansion of available express bus services is nevertheless desirable. Alternatives that feature HOV facilities would provide the necessary high-speed route to make such services more viable and attractive to potential users. A number of new bus routes and operational assumptions were developed to test the effects of Beltway express bus service on regional travel demand and Beltway traffic volumes. The results indicated that if improvements contained a managed lane or lanes (HOV or HOT), then express bus service could be implemented, but would be the responsibility of others. Express bus service on I-495 has been included in the 2000 *Long Range Transportation Plan for the National Capital Region* for implementation by 2010.

2.5.3.4 Transportation System Management

The MIS analyses included examining various strategies to manage the existing transportation system more effectively, such as increased enforcement, additional driver education, and new technologies to improve traffic flow. These strategies were determined to be ineffective in reducing congestion or improving mobility on the Beltway. Transportation control measures to reduce trip generation and transportation demand management measures to reduce travel demand were also evaluated and were found to have only a minimal effect on overall Beltway traffic volumes and travel demand.

A more capital-intensive Transportation System Management (TSM) Alternative was developed and evaluated as part of the NEPA process to determine if there were viable alternatives to expanding the Beltway. The TSM Alternative would involve actions designed to improve traffic operations and maximize the efficiency of the existing roadway network, such as upgrading existing arterial roadways, providing new or additional turning lanes, optimizing traffic signal timing, and enhancing the regional bus system.

Evaluation of traffic, operational, safety, and environmental factors showed that implementing the TSM Alternative alone would not meet the project's purpose and need. Though not effective as a stand-alone alternative, some TSM elements would nevertheless be beneficial as part of the Beltway improvements. Some elements were incorporated into the various build alternatives, and others could become components of an overall transportation plan for the region that would be evaluated as independent projects in separate studies when more definite proposals are made.

2.5.3.5 Beltway Mainline Configurations

Several levels of screening were developed to identify mainline configurations that would reasonably increase Beltway capacity and improve operations without causing unacceptable community and environmental disruption by requiring significant land outside of the existing right-of-way. As a result, 11 of the mainline alternatives shown in Table 2-2 were eliminated from detailed consideration in the Draft EIS. The reasons for their elimination are discussed in detail in the Alternatives Development Technical Report and are summarized below.

Non-HOV Roadway Concepts. Concepts that did not include HOV lanes were eliminated from further consideration because construction of Beltway improvements without HOV lanes would preclude completion of the regional HOV system; would preclude or prevent effective express bus operations on the Beltway; would not be consistent with state, regional, and local land use and transportation plans; would provide 25 percent less person-capacity in this highly congested corridor; would increase travel times for HOV and express bus traffic; and would introduce operational and safety problems, including additional merges and weaves between the Beltway and intersecting roadways with dedicated HOV lanes.

***Single-Lane Barrier-Separated Roadway Concepts*.** Concepts that included only a single barrier-separated HOV lane in each direction were eliminated from further consideration because the cost of required infrastructure improvements (e.g., direct access ramps, shoulders, and barriers) would be high relative to the modest improvements in capacity and operations they would provide. A single-lane separated HOV system would require infrastructure investments similar to those required for a two-lane separated HOV system or an express/local system with HOV, yet would not provide the same benefits of these concepts. In addition, a single-lane barrier-separated configuration would be the least flexible for future roadway modifications and for incident or accident management; would not allow vehicles to pass one another; could be rendered inoperable by a minor accident or incident which may not be cleared expeditiously; and would require pavement widths approaching those of a two-lane system to meet current AASHTO standards.

Roadway Concepts with Two Express Lanes. Concepts that included only two express lanes were eliminated from further consideration because of the operational and safety problems arising from having only one express lane in each direction for general-purpose traffic (the other lane would be reserved for HOV traffic). A single lane for all general-purpose express traffic is insufficient to meet projected demand and would result in an imbalance between the local and express roadways. Moreover, this configuration would not meet the standards of a freeway (which requires two or more lanes in each direction for all traffic). An incident or accident in a non-HOV express lane would block the entire express roadway, and additional slip ramps would be required.

Express/Local with HOV Roadway Concepts. The 10- and 12-lane express/local configurations on the Beltway were consolidated to create an optimized Express/Local with

HOV alternative. It was determined that the 12-lane option provided some additional capacity in the local lanes, but did not perform substantially better than the 10-lane alternative. The 12-lane concept also had the largest footprint of any configuration considered and required additional lanes (collector-distributor roadways) at several interchanges. These additional lanes and short weaving distances in several locations would reduce the safety and operating efficiency of the roadway. Therefore, the decision was made to begin the design of the Express/Local alternative with two local and three express lanes in each direction, which were continuous throughout the corridor. Subsequently, locations were identified where an additional express or local lane could be implemented to improve operational performance without the environmental effects caused by the 12-lane alternative. The final Express/Local Alternative is neither the original 10- or 12-lane option, but a hybrid which optimizes the lane balance and continuity throughout the entire corridor, while minimizing the environmental impacts of this type of configuration.

2.5.3.6 Interchange Improvement Options

Each of the 44 interchange concepts listed in Table 2-3 was evaluated for their traffic operations, safety, engineering considerations, and potential environmental impacts during the development of the Draft EIS. Concepts were eliminated at various stages of the alternatives development process, although several were re-evaluated after the Draft EIS in an effort to reduce impacts in the vicinity of interchanges. A summary of the reasons that the concepts were dismissed is provided below. Further details are provided in the Draft EIS Alternatives Development Technical Report.

Braddock Road Interchange. Interchange Concepts A, B, C, and D for the Braddock Road interchange were dropped. Concepts A, B, and C, all full cloverleaf designs, were dropped because they would not provide sufficient capacity to service the design hour or peak period demand. The high weaving volumes northbound on the mainline would cause lowered throughput past Braddock Road during both peak periods. Due to the high traffic volumes, vehicles would not be able to enter and exit the Beltway in the short merging area between the loop ramps. This, in turn, would result in back-ups along the Beltway itself. Concept A also included a northbound-to-westbound flyover with the full cloverleaf; however, not enough vehicles could use the flyover due to their destination. Therefore, the heavy northbound weave on the mainline remains. Concept D, which included elevated ramps to/from the Beltway HOV lanes, was dropped because of the HOV ramps' effects on Braddock Road traffic operations and environmental (visual) impacts to the surrounding community. This concept would also eliminate direct access to the Ravensworth Industrial Park for HOV traffic; instead, vehicles would have to make a U-turn at Inverchapel Road.

Little River Turnpike Interchange. Six concepts considered for the Little River Turnpike interchange were dropped: A, C, D, E, F, and G. Concepts A, D, E, and F would require additional right-of-way and would have insufficient weaving capacity to handle projected traffic volumes. As a result:

- Concept A would fail southbound on the Beltway and westbound on Little River Turnpike.

- Concept D would fail northbound and southbound on the Beltway and eastbound and westbound on Little River Turnpike.
- Concept E would fail northbound and southbound on the Beltway and eastbound and westbound on Little River Turnpike.
- Concept F would fail northbound on the Beltway and westbound on Little River Turnpike.

Concept C, a single-point diamond design, could provide sufficient capacity, however two left-turn lanes would be required for the eastbound Little River Turnpike to northbound Beltway movement. This would require realignment and further widening of Little River Turnpike and the structure crossing the Beltway.

Concept G, a non-traditional interchange design for urban interstates, would not provide sufficient capacity. This concept would require three roadway levels and additional ramps or pavement to serve the heavy right-turn volumes.

However, in an effort to minimize the impacts of interchange improvements at Little River Turnpike on the surrounding community, Concept E was revisited subsequent to the publication of the Draft EIS and ultimately selected as the Preferred Concept.

Gallows Road Interchange. Concept B for the Gallows Road interchange was dropped because of excessive environmental impacts in the southwest quadrant of the interchange (due to an additional loop ramp that would not markedly improve traffic operations). This concept would also introduce a weave on the southbound Beltway, which is not present today.

I-66 Interchange. Concepts D, F, and G considered for the I-66 interchange were dropped or consolidated. Concept D would have insufficient weaving capacity to handle projected traffic volumes at two locations due to lack of access to/from I-66 for vehicles traveling in the express lanes. Vehicles from the southbound express lanes would have to weave across the local lanes to access the ramp to I-66, while local vehicles would attempt to move to the express lanes. A similar situation would occur as entering I-66 traffic would attempt to access the Beltway express lanes. Concepts F and G were dropped after they were revised to accommodate vertical alignments and constructability issues. Concept F was dropped because it would be similar to Concept B; Concept G was dropped because it would be similar to Concept E.

Leesburg Pike Interchange. Concepts A, C, D, and E considered for the Leesburg Pike interchange were dropped or consolidated. Concepts A, C, and D were all similar to Concept B. Concept E would have a failing weave on westbound Leesburg Pike. Also, the northbound to westbound loop ramp in Concept E would not provide sufficient capacity for that movement.

Chain Bridge Road Interchange. Seven concepts considered for the Chain Bridge Road interchange were dropped or consolidated: A, B, D, E, F, G, and H. Concept A was dropped because the vertical alignment for the directional ramp from northbound I-495 to southbound Chain Bridge Road would conflict with the proposed Metrorail vertical alignment. The Metrorail alignment would have to be relocated approximately 125 meters north of Route 123 to make it compatible with this interchange concept. In addition, Concept A would provide less storage capacity and slower ramp speeds than Concept C, which was retained. Concepts B, D, and G were similar to Concept A and were dropped for the same reasons.

Concepts E, F, and H would have insufficient weaving capacity to handle projected traffic volumes. As a result:

- Concept E would fail on the roadway servicing vehicles traveling from eastbound and westbound Route 123 to the northbound Beltway and westbound Dulles Toll Road.
- Concepts F and H would fail on the northbound mainline roadway, south of the interchange.

Dulles Access/Toll Road Interchange. Three interchange concepts considered for the Dulles Access/Toll Road interchange were dropped or consolidated during the alternatives screening process. Concept A was similar to Concept B, which would provide an additional connection from the Dulles Access lanes directly onto the local lanes of the Beltway. For analysis purposes, Concept A was dismissed.

Concept C was a modification of Concept B, and would have the same operational characteristics. The modification was intended to remove Concept B's right-of-way impact to the residences in the northwest quadrant of the interchange. However, it would result in additional commercial right-of-way impacts. Through refinement, Concept B would no longer affect the residential property. Therefore, Concept C was eliminated.

From an operational, capacity, and safety standpoint, Concept D was dropped from further consideration because it would result in an interchange inferior to the existing one. It would introduce weave conditions on the Beltway and the Dulles Access/Toll Road, and would be designed with substandard loop radii and insufficient weave lengths.

Georgetown Pike Interchange. Concept B, a partial cloverleaf for this interchange was dropped from further consideration because it:

- Would increase residential impacts compared to Concept A.
- Would connect a Beltway ramp to a local street.
- Would have an at-grade street crossing on a ramp.
- Would introduce a weave on Georgetown Pike.
- Was strongly opposed at the Citizen Workshops.

3

AFFECTED ENVIRONMENT

This chapter characterizes the existing social, economic, and environmental setting potentially affected by the Beltway improvement alternatives outlined in Chapter 2. First, a discussion regarding how potential environmental issues were identified is presented. Next, information on land use, socioeconomics, natural resources, parklands, noise, air quality, historic resources, visual characteristics, and hazardous materials is presented. Effects on these resources are discussed in Chapter 4. Finally, an overview of other activities occurring in the project area is presented. This information provides the context within which cumulative effects are discussed in Chapter 4.

3.1 ISSUES IDENTIFICATION

Consistent with Council on Environmental Quality (CEQ) regulations implementing the National Environmental Policy Act of 1969 (NEPA), this document focuses on the most important environmental issues, and de-emphasizes less important issues (40 CFR 1501.1(d)). The environmental issues were identified based on input from citizens recorded at a number of public information meetings, comments from agencies during the scoping and interagency review process, mapping and aerial photography from various sources, other existing data sources, and visual observations of human and natural resources in the corridor. See Chapter 7 for discussion of public and agency coordination.

Table 3-1 lists several environmental issues with remarks indicating their relevance to the project. Some issues involve resources that receive a relatively high level of protection under environmental laws and regulations. Others were identified by the public as important, or particularly sensitive to potential adverse effects. Some of the issues involve resources likely to experience only minor effects from the proposed project and some involve resources that are not present in the corridor, or that have only a limited presence in the corridor.

3.2 LAND USE

3.2.1 Current Land Use

Fairfax County encompasses 399 square miles (1,033 square kilometers). Over the past 50 years, Fairfax County has changed from a primarily rural and agricultural area to an

Table 3-1
ENVIRONMENTAL ISSUES

Issue	Remarks
Noise	By far, the most frequently expressed concern of citizens. Numerous residences and recreation areas along corridor. Existing noise walls.
Home Displacements, Community Impacts, Property Damage	Frequently expressed concern of citizens. Numerous homes and neighborhoods in proximity to the Beltway.
Air Quality	Frequently expressed concern of citizens. Comments from U.S. Environmental Protection Agency, Virginia Department of Environmental Quality, and Environmental Defense. High traffic volumes in congested area with numerous points of human exposures (residential yards, schools, and other outdoor activity areas). Region is nonattainment for ozone and fine particulate matter.
Parks and Recreation Areas	Important parks and recreational properties adjacent to corridor. Comments from local parks and recreation officials and from citizens. High level of protection under Section 4(f) regulations.
Historic and Archaeological Resources	One potential district and one archaeological site near the corridor. One historic resource (W & OD Railroad Regional Park) crosses the Beltway. High level of protection under Section 4(f) and Section 106 regulations.
Streams/Water Resources/Wetlands	Mentioned by some citizens and by state and federal agencies. Wetlands are mostly marginal; many streams are heavily channelized and already influenced by surrounding urbanization. Nevertheless, high level of protection afforded under Clean Water Act and permits required for construction. Comments from the US Army Corps of Engineers, Federal Emergency Management Agency, and Virginia Department of Environmental Quality's Water Protection Permit Program.
Vegetated Buffers	Mentioned by some citizens. Existing tree areas along right-of-way provide screen between the Beltway and adjacent neighborhoods.
Visual Impacts	Mentioned by some citizens. Urbanized area with a few somewhat scenic visual attractions.
Lighting and Light Pollution	Mentioned by some citizens. Urbanized area with lights from numerous sources other than Beltway.
Wildlife and Habitat	Urbanized area with few substantial blocks of natural habitat.
Environmental Justice Populations	Some populations present, but impacts not likely to be disproportionate.
Land Use/Secondary & Cumulative Effects	Mentioned by some citizens. Comments from U.S. EPA. Widespread perception that major highway improvements stimulate development.
Hazardous Material Sites	A number of sites containing potentially hazardous materials are situated along the Beltway. The potential human health effects of such materials and the potentially high costs of acquiring and cleaning up such sites make them a concern.
Forest Land	This is an urban corridor with no substantial forest resources (but see issue regarding vegetated buffers). Comments from Virginia Department of Forestry.
Farmland	No prime farmland in Corridor. Comments from Virginia Department of Agriculture and Consumer Services and U.S. Natural Resources Conservation Service.
Public Water Supplies	No surface or groundwater public water supplies in corridor. Comments from Virginia Department of Health.
Navigable Waterways	None in Corridor. Comments from U.S. Coast Guard.
Endangered Species	No federally listed threatened or endangered species in corridor. Comments from U.S. Fish and Wildlife Service, Virginia Department of Agriculture and Consumer Services, Virginia Division of Natural Heritage, Virginia Department of Game and Inland Fisheries.
Scenic Rivers/Scenic Byways	None in corridor. Comments from Virginia Department of Conservation and Recreation.
Coastal/Marine Resources	None in corridor. Comments from Virginia Institute of Marine Science.

urbanized metropolitan area. The county, particularly the eastern portion, is now largely developed, and includes a mixture of low-density residential, commercial, industrial, and public land uses. About 54 percent of the land in Fairfax County is used for residences. Industrial and commercial land uses each account for almost four percent of the total developed acreage. Other major land uses include parklands (12 percent) and public facilities or institutions (11 percent). About 16 percent of the land in Fairfax County is now vacant or undevelopable open space.

As shown in **Figure 3-1**, the distribution of land uses along the Beltway is similar to the land use distribution countywide, although offices and retail uses are more prevalent than in other areas. Some adjacent development predates the Beltway, but most of it was built after the roadway was constructed in the early 1960s. Commercial, industrial, and mixed uses tend to predominate near interchanges. Other land uses along the Beltway include parks and recreation areas, institutional land uses (schools, hospitals, and community facilities), public utilities, and transportation facility rights of way. There are more than 2,600 buildings within 500 feet of the Beltway. More than 88 percent are residences, primarily single-family detached dwellings. Another five percent are businesses or offices. Less than one percent is institutions or community facilities.

Backlick Road to Gallows Road. Between Backlick Road and Gallows Road, most of the land along the Beltway is residential use, mainly in the form of single-family housing in established neighborhoods. Multi-family housing is concentrated near the Little River Turnpike interchange. Two industrial areas and a number of parks also lie along this section of the Beltway.

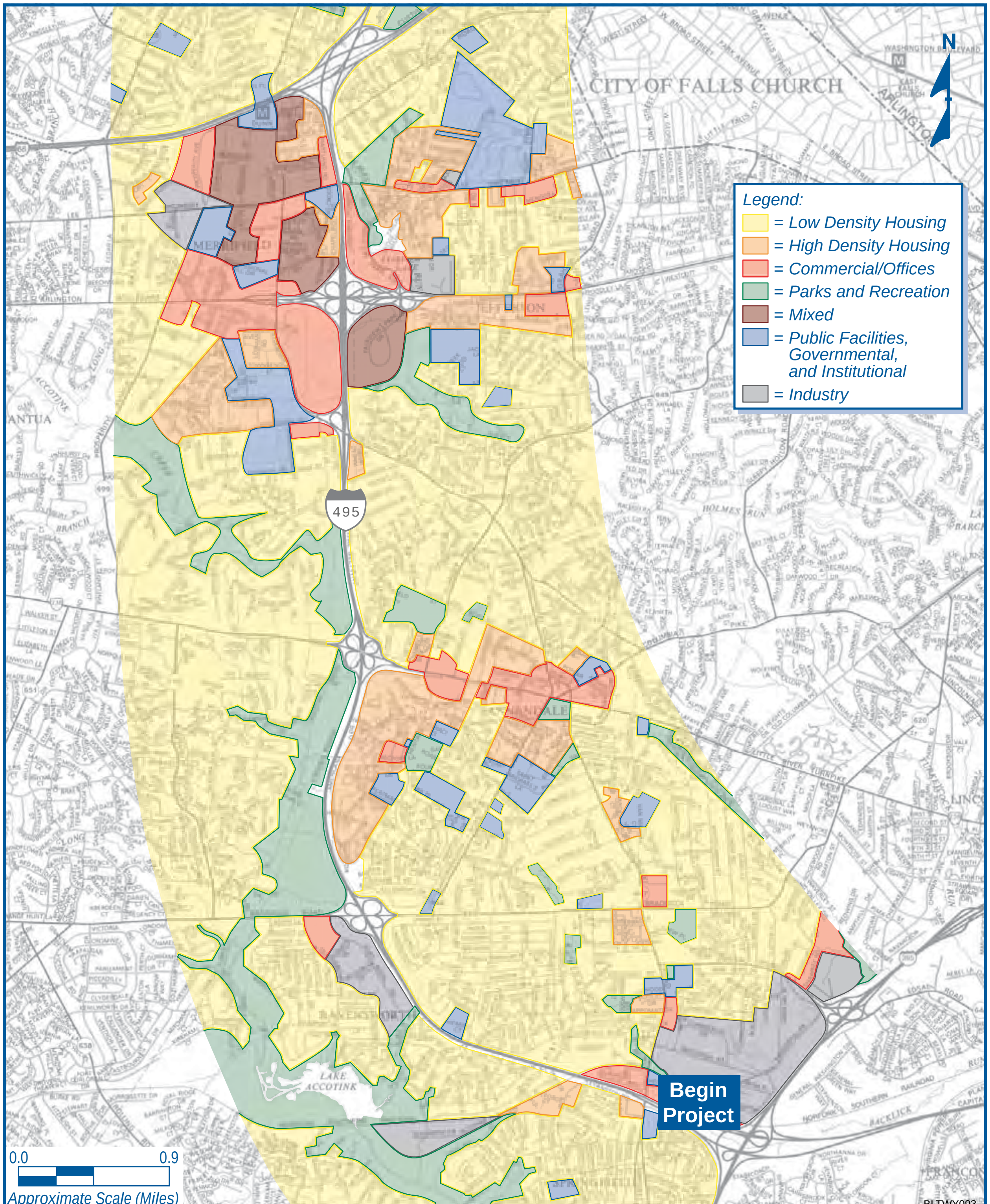
Gallows Road to Interstate 66. Between Gallows Road and I-66 is a mixture of residential and commercial developments. Commercial uses are concentrated around the Arlington Boulevard interchange (Merrifield area). Residential uses, including single-family and multi-family housing, are interspersed among the commercial developments on both sides of the Beltway.

Interstate 66 to Dulles Access/Toll Road. Between I-66 and Leesburg Pike, the predominant land use is residential, primarily low-density single-family housing. In recent years, infill residential development has occurred along the Beltway north of the I-66 interchange. This section also includes some multi-family housing and offices (near the Leesburg Pike interchange), parkland, and community facilities (Marshall High School). From Leesburg Pike to the Dulles Access/Toll Road, the Beltway runs through the Tysons Corner area. Land uses along this section are almost entirely office and retail, although there is some multi-family housing east of the Beltway.

Dulles Access/Toll Road to the American Legion Bridge. Between the Dulles Access/Toll Road and the American Legion Bridge, the land use along the Beltway consists of low-density residential development, parklands, and private open space.

3.2.2 Land Use Plans and Future Land Use

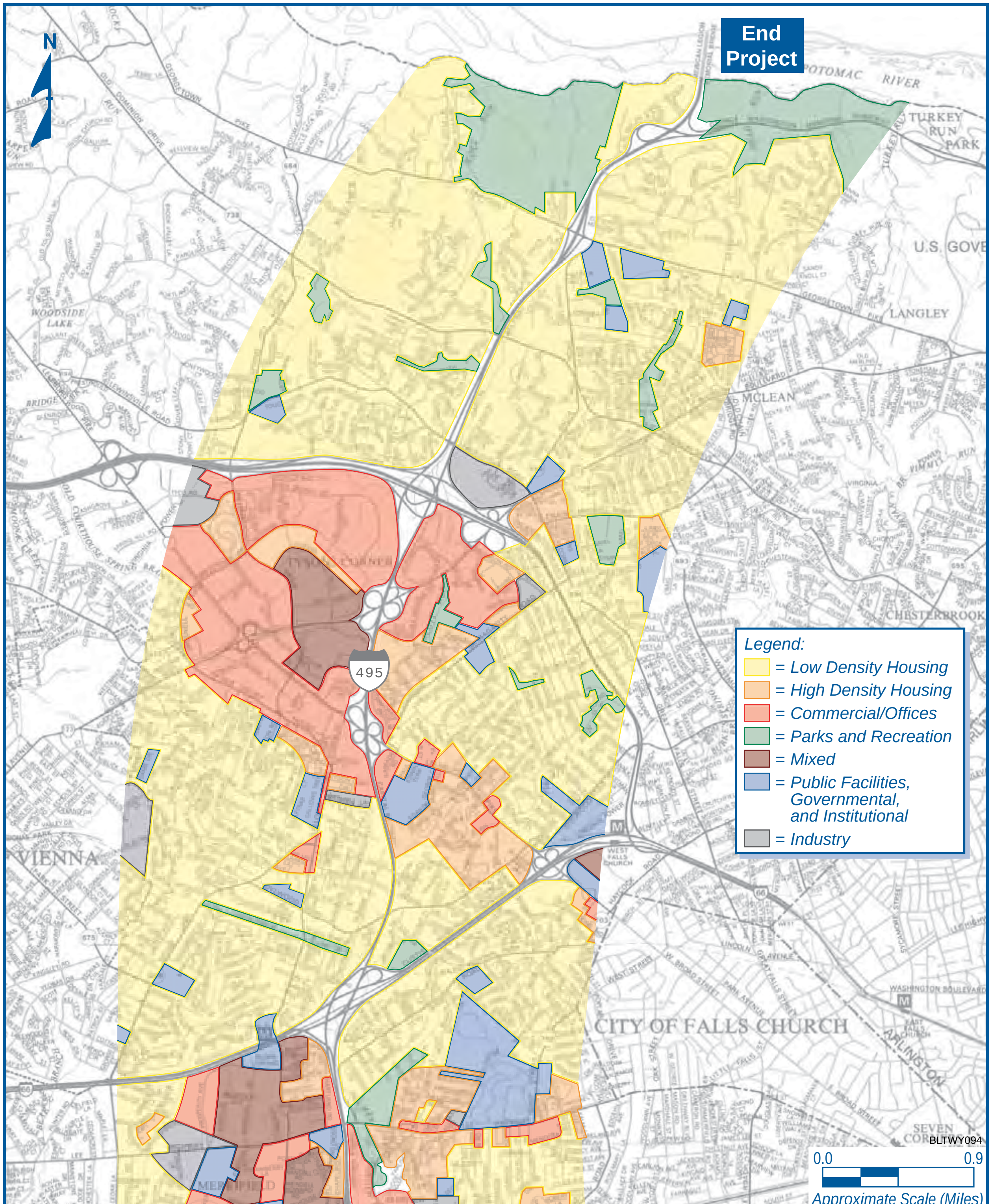
The *Comprehensive Plan for Fairfax County* and County ordinances guide land use planning in Fairfax County. The Plan, first adopted in 1975, was last updated in August 2002. The Comprehensive Plan for Area I, which includes the Annandale and Jefferson



EXISTING LAND USE
I-95/I-395/I-495 Interchange to I-66

Figure 3-1a
(1 of 2)

CAPITAL BELTWAY STUDY



EXISTING LAND USE

I-66 to American Legion Memorial Bridge

Figure 3-1b
(2 of 2)

CAPITAL BELTWAY STUDY

planning districts, was updated in 2003. Area II's Comprehensive Plan, which includes the Vienna and McLean planning districts, also was updated in 2003. The *Plan* has several components, including a policy plan, a land use classification system, and area plans for each planning district that contain specific development recommendations for vacant or underutilized lands. General land uses and development patterns planned for the county are shown in **Figure 3-2**.

The proposed Beltway improvements cross portions of four Fairfax County planning districts: Annandale, Jefferson, Vienna, and McLean (see **Figure 3-3**). Based on the County's current land use plan, the established land use patterns in the districts along the Beltway are not expected to change substantially in the future. Most of these areas are already largely developed, and complete build-out is expected by 2020. As shown in **Table 3-2** and **Table 3-3**, no major changes to current land use patterns or the distribution of land uses along the Beltway are indicated in future land use plans. The *Comprehensive Plan* calls for the continued urbanization of the Tysons Corner area, further development of suburban activity centers, maintenance of existing residential neighborhoods, and retention of the county's existing industrial base. Additional infill housing is anticipated in the Vienna and McLean planning districts (primarily in and around the Tysons Corner area), while the share of commercial land uses will increase in the Jefferson planning district (mostly in the Merrifield area).

Table 3-2
CURRENT AND FUTURE LAND USE DISTRIBUTION BY PLANNING DISTRICT

	Annandale Planning District		Jefferson Planning District		Vienna Planning District		McLean Planning District	
Land Use	**1997**	**2020**	**1997**	**2020**	**1997**	**2020**	**1997**	**2020**
Residential	89%	91%	76%	78%	87%	93%	84%	94%
Commercial	3%	3%	11%	14%	5%	5%	5%	5%
Industrial	5%	6%	7%	8%	2%	2%	1%	1%
Vacant	3%	0%	6%	0%	6%	0%	11%	0%

Note: Figures represent share of total acreage for the three major zoning classifications and vacant developable land; parks, community facilities, and undevelopable open space or natural areas are not included in these totals.
Source: Fairfax County Department of Management and Budget

3.2.3 Activity Centers

As Fairfax County has evolved from a residential suburb to a multi-faceted urbanized area, concentrations of land use and economic activity have developed throughout the county, mostly along major regional roadways, such as the Beltway, I-95, Arlington Boulevard, I-66, and the Dulles Access/Toll Road. Two regional activity centers (Merrifield and Tysons Corner) and a local activity center (Ravensworth Industrial Park) are located just off the Beltway. The Beltway plays a major role in linking customers, suppliers, and employees to these activity centers. A number of smaller activity centers in Fairfax County, including the Annandale, McLean, and Vienna business districts, also rely partially on the Beltway for their economic viability. In addition, the Beltway carries portions of many trips to other regional activity centers beyond the limits of the study corridor, such as Springfield (via I-95), Fairfax/Fair Oaks and Arlington/Falls Church (via I-66), Reston/Herndon (via the Dulles

LOCATIONS OF MIXED-USE CENTERS

Urban Center
1. Tysons Corner Urban Center

Suburban Centers
2. Fairfax Center
3. Dulles (Route 28 Corridor)
4. Reston-Herndon
5. Merrifield
6. Flint Hill
7. Centreville
8. Lorton-South Route 1

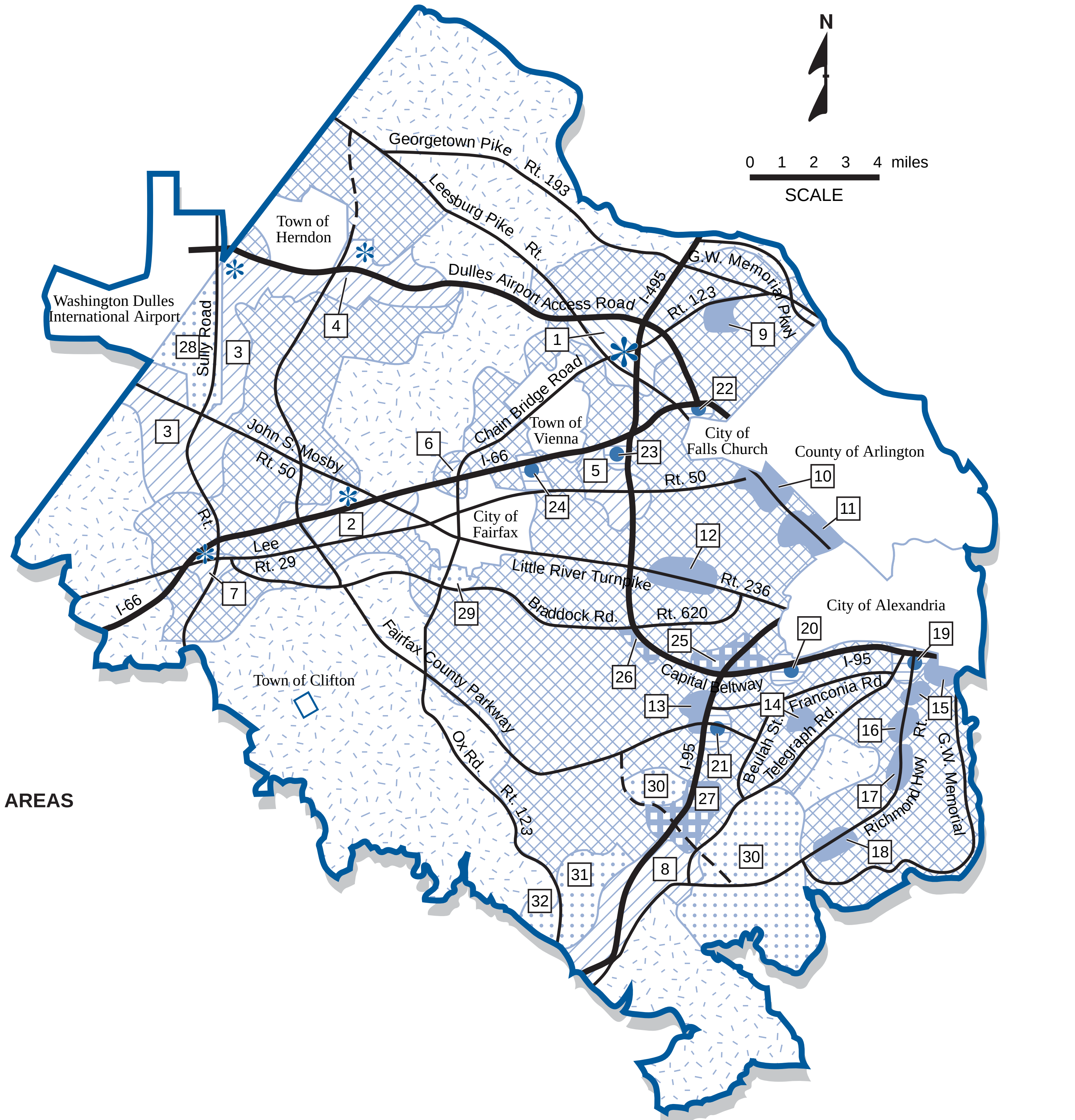
Community Business Centers
9. McLean
10. Seven Corners
11. Baileys Crossroads
12. Annandale
13. Springfield (West)
14. Kingstowne
15. North Gateway and Penn Daw
16. Beacon/Groveton
17. Hybla Valley/Gum Springs
18. Woodlawn

Transit Station Areas
19. Huntington Metro Station
20. Van Dorn Metro Station
21. Franconia/Springfield Metro Station
22. West Falls Church Metro Station
23. Dunn Loring Metro Station
24. Vienna Metro Station

LOCATIONS OF LARGE INSTITUTIONAL AND INDUSTRIAL AREAS

Industrial Areas
25. Beltway South
26. Ravensworth
27. I-95 Corridor

Large Institutional Land Areas
28. Washington Dulles International Airport
29. George Mason University
30. Fort Belvoir (Main Post and Engineer Proving Ground)
31. Land Fill / Resource Recovery / Park
32. Water Authority Facility



Legend:

Suburban Neighborhoods (Residential density ranges defined in Area Plans; 0.15-0.23 FAR for neighborhood-serving non-residential use)*

*Low Density Residential Areas (Residential density of 0.1 to 0.5 du/ac**, specific density ranges in Area Plan; Non-residential use intensity 0.05 to 0.1 FAR)*

Tysons Corner Urban Center Core (1.0-1.65 FAR; 35-60 du/ac) Non-core (0.25-1.0 FAR; 8-45 du/ac

Suburban Centers Core (0.3-0.8 FAR; 15-35 du/ac) Non-core (0.15-0.30 FAR; 5-25 du/ac)

Community Business Centers (0.20-0.50 FAR; 5-25 du/ac; if a core is designated, intensities of up to 0.70 FAR may be allowed)

Transit Station Areas (0.30-1.00 FAR; 8-45 du/ac)

Industrial Areas (0.25-0.50 FAR for Industrial Uses)

Large Institutional Land Areas

* FAR - floor area ratio
** du/ac - dwelling units per acre

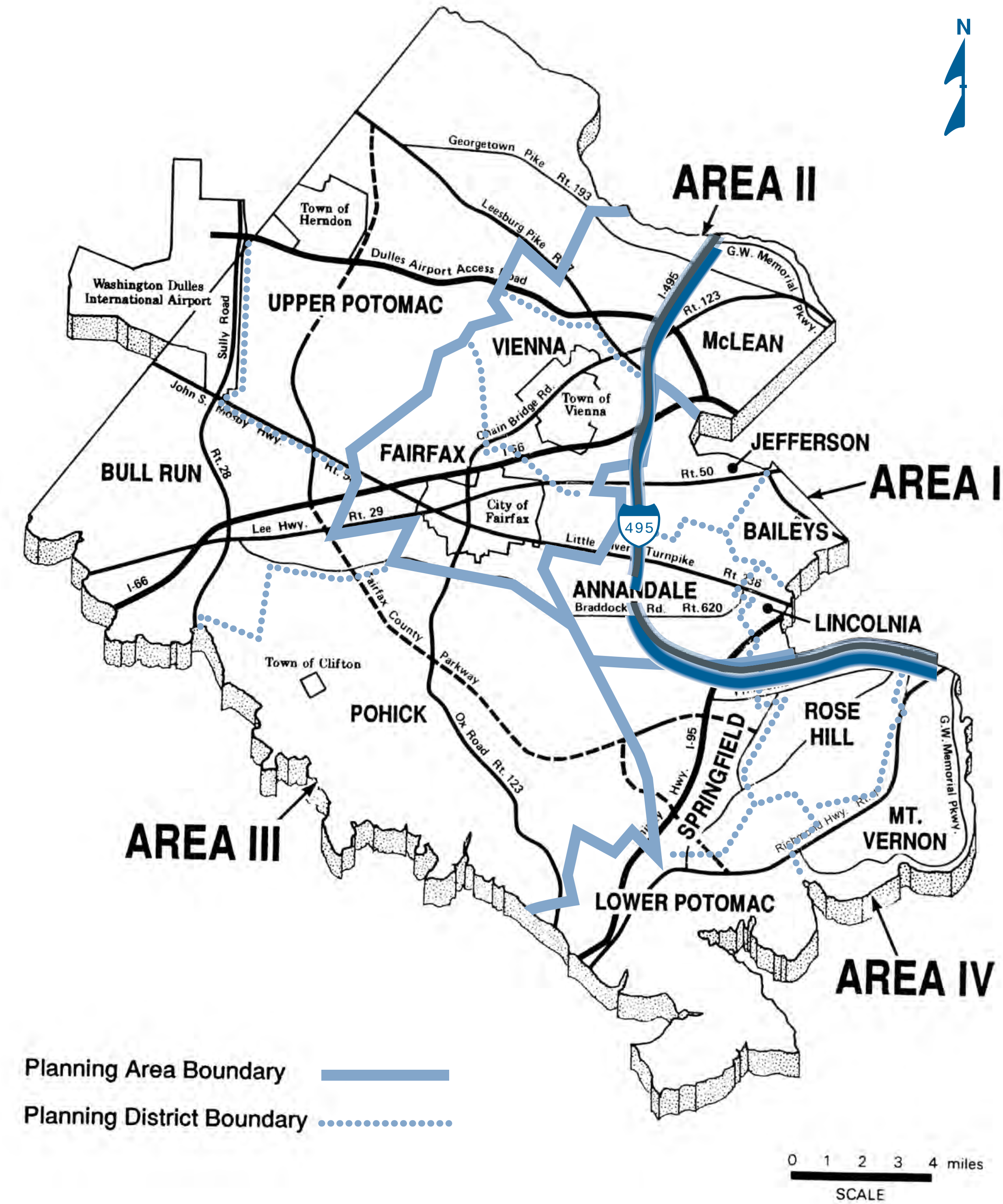
Source: The Comprehensive Plan for Fairfax County and Amendments (1999)

BLTWY033

FUTURE LAND USE IN FAIRFAX COUNTY

Figure 3-2

CAPITAL BELTWAY STUDY



Source: The Comprehensive Plan for Fairfax County and Admendments (1999)

BLTWY032

FAIRFAX COUNTY
PLANNING AREAS AND DISTRICTS

Figure 3-3

CAPITAL BELTWAY STUDY

Table 3-3

DEVELOPMENT POTENTIAL BY PLANNING DISTRICT

Land Use	Developed to Date	Development Potential per Comprehensive Plan	% of Build-Out Completed
ANNANDALE			
Residential	8,934 acres	9,197 acres	97.1%
Commercial	298 acres	305 acres	97.7%
Industrial	498 acres	580 acres	85.9%
Vacant	352 acres	0 acres	0 %
JEFFERSON			
Residential	3,920 acres	4,055 acres	96.7%
Commercial	595 acres	736 acres	80.8%
Industrial	364 acres	387 acres	94.1%
Vacant	299 acres	0 acres	0 %
VIENNA			
Residential	8,895 acres	9,511 acres	93.5%
Commercial	512 acres	556 acres	92.1%
Industrial	212 acres	216 acres	98.1%
Vacant	664 acres	0 acres	0 %
McLEAN			
Residential	13,777 acres	15,401 acres	89.5%
Commercial	734 acres	912 acres	80.5%
Industrial	129 acres	147 acres	87.8%
Vacant	1,820 acres	0 acres	0 %

Note: Figures show total acreage for the three major zoning classifications and vacant developable land; totals do not include parks, community facilities, and undevelopable open space or natural areas.

Source: Fairfax County Department of Management and Budget

Access/Toll Road) and Montgomery County, Maryland (via I-270). Continued development of these activity centers and increases in employment are anticipated by 2020.

Ravensworth Industrial Area. This mixture of warehouses, distribution facilities, and offices is a county-designated Industrial Area and a location for businesses that provide services or supplies to industrial companies, operate wholesale operations, or serve as warehouse/distribution facilities. The Ravensworth Industrial Area is already largely developed; currently it includes 25 businesses with more than 3,000 employees.

Merrifield. Located between Gallows Road and I-66, Merrifield is a mixture of office, retail, and residential land uses in a cohesive setting, which allows residents to live near work places. It has about 7 million square feet of office space and 4 million square feet of industrial or “hybrid” space (more than 10 percent of the Fairfax County total). The Merrifield area is home to several major employers (Exxon Mobil, INOVA Fairfax Hospital), as well as retail establishments and numerous firms providing business and household services. There are more than 250 businesses, and more than 36,000 people work in the Merrifield area. Fairfax County's recent amendments to the *Comprehensive Plan* include conversion of industrial-zoned properties into mixed-use areas and a substantial increase in housing in the area. The plan amendments identify four distinct areas (Core Areas, Adjacent Areas, Non-Core Areas, and Edge Areas) to be developed over the next 20 to 30 years. When fully built out, the area could include as much as 22 million square feet of non-residential space and 12 million square feet of residential space.

Tysons Corner. The Tysons Corner area, encompassing more than 2,000 acres on both sides of the Beltway between Leesburg Pike and the Dulles Access/Toll Road, is one of the largest activity centers in the region. It has the region's largest concentration of employment outside downtown Washington, D.C., with more jobs than Crystal City in Arlington County, Virginia, and Bethesda, Maryland, combined. Often referred to as "the economic engine of Fairfax County," Tysons Corner is home to more than 700 businesses employing almost 90,000 people. It has 29 million square feet of office space (33 percent of the Fairfax County total), which is more than downtown Miami. It is the preferred location in Northern Virginia for law firms, real estate companies, accountants, and consultants (the Reston/Herndon/Dulles area is favored by local high-technology firms). Tysons Corner is also one of the premier shopping destinations in the region, with more than 7 million square feet of retail space and two of the region's largest shopping centers (Tysons Corner Center and Tysons II Galleria). Ten hotels with 3,500 rooms are located in the Tysons Corner area. Several new office buildings are now planned or are currently under construction along the Beltway, and an expansion of Tysons Corner Center is underway.

The *Comprehensive Plan* calls for the creation of high-density office, retail, and residential land uses in a pedestrian-oriented, urban environment at Tysons Corner, in keeping with its designation as the urban core or "downtown" for Fairfax County. An emphasis will be placed on developing a balanced central city form, which would be populated all day long, and would provide sufficient density to encourage efficient use of transit. The goal is a more urban environment that retains the best features of a suburban activity center. Tysons Corner is envisioned to contain more housing within walking distance of jobs, circulation systems that are not automobile-dependent, and a wide variety of community-level retail and service uses that meet the daily needs of workers and residents alike.

Although only about 6 percent of the land in Tysons Corner is still undeveloped, it is expected that, through infill and redevelopment, Tysons Corner will continue to be a major center for new development. By the time full build-out is completed, Tysons Corner could have as much as 55 million square feet of non-residential space, more than 125,000 jobs, and almost 13,000 dwelling units. The total amount of additional development will depend largely on whether a planned rapid rail system is constructed to serve Tysons Corner. If a rail system is built, the *Comprehensive Plan* allows parcels adjacent to (or near) the rail line and station areas to be developed at higher densities. However, even if rail transit service is not provided, there is substantial potential for additional development. Non-residential floor space and dwelling units could increase more than 70 percent under the current *Comprehensive Plan*.

The build-out plan for Tysons Corner establishes three major areas for development, each with distinct land-use types and long-range plans: 1) a "core" area with intense office and retail land uses; 2) "non-core" areas with a mixture of office, retail, and residential land uses; and 3) "transition" areas to integrate the Tysons Corner area with surrounding residential neighborhoods.

3.2.4 Utilities

Electrical transmission lines, electrical substations and transformers, telecommunications lines and towers, and water and sewage delivery systems are located along the Beltway, as shown in **Figure 3-4.**

3.2.5 Beltway Right-of-Way

The existing VDOT right-of-way for the Beltway ranges from 308 to 410 feet (94 to 125 meters) wide along the length of the mainline roadway, and extends outward at the interchanges. This right-of-way was acquired in the late 1950s, before the initial construction of the Beltway. The current Beltway uses about 50 to 70 percent of the available right-of-way along the mainline and most of the right-of-way at each interchange location. Portions of the remaining right-of-way include noise barriers and wooden screening fences; the rest has been left in its natural (mostly wooded) state. Additional details on the amount of available right-of-way and the width of the existing roadway are provided in **Table 3-4**.

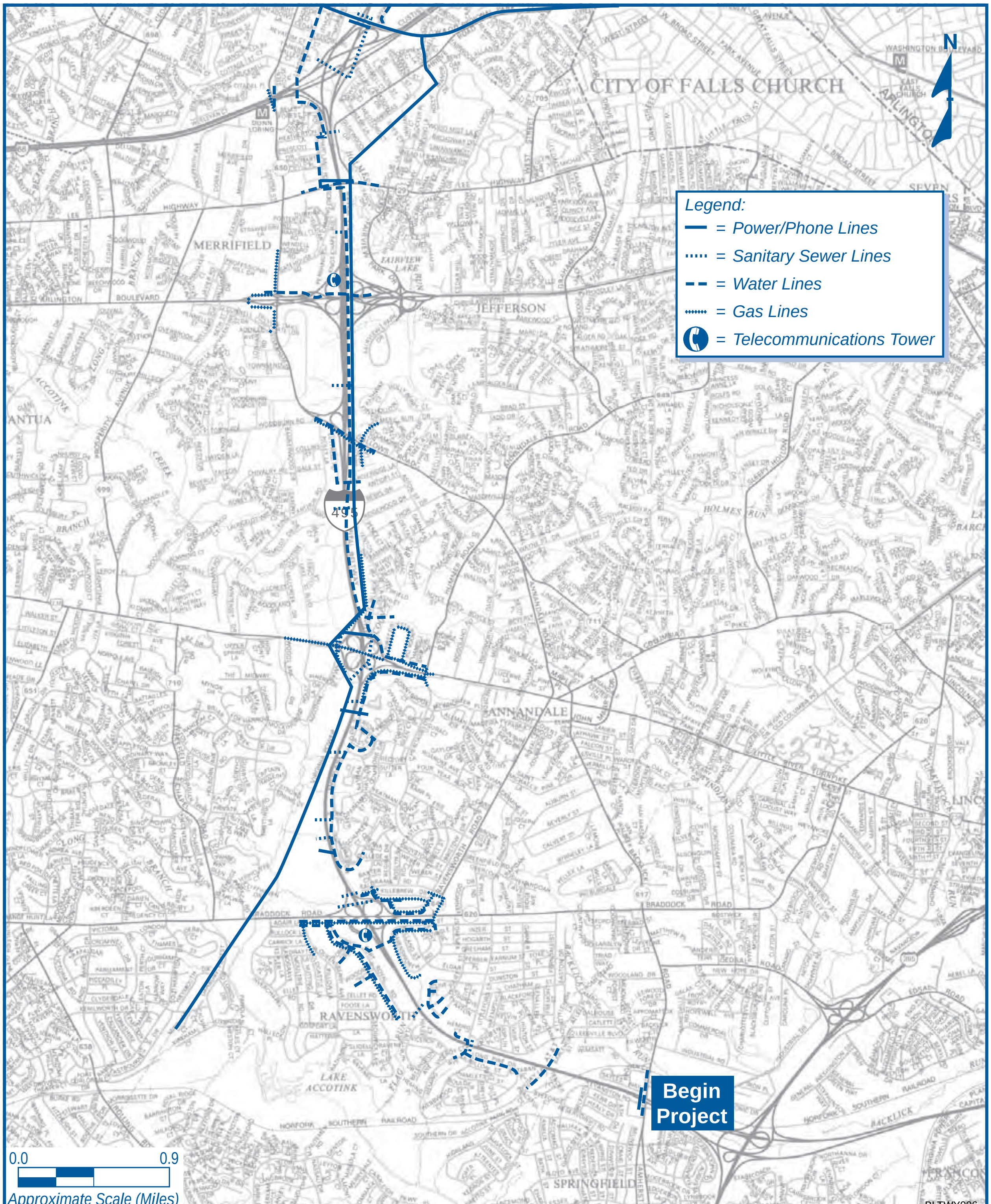
Table 3-4
EXISTING BELTWAY RIGHT-OF-WAY

Roadway	Average Right-of-Way Width	Roadway Width
Backlick Road to Braddock Road	312 feet (95 meters)	138 to 171 feet (42 to 52 meters)
Braddock Road to Little River Turnpike	348 feet (106 meters)	164 to 216 feet (50 to 66 meters)
Little River Turnpike to Gallows Road	361 feet (110 meters)	164 to 223 feet (50 to 68 meters)
Gallows Road to Arlington Boulevard	344 feet (105 meters)	187 to 197 feet (57 to 60 meters)
Arlington Boulevard to Interstate 66	394 feet (120 meters)	171 to 230 feet (52 to 70 meters)
Interstate 66 to Leesburg Pike	308 feet (94 meters)	138 to 230 feet (42 to 70 meters)
Leesburg Pike to Chain Bridge Road	308 feet (94 meters)	164 to 226 feet (50 to 69 meters)
Chain Bridge Road to Dulles Access/Toll Road	367 feet (112 meters)	167 to 269 feet (51 to 82 meters)
Dulles Access/Toll Road to Georgetown Pike	390 feet (119 meters)	144 to 272 feet (44 to 83 meters)
Georgetown Pike to GW Memorial Parkway	380 feet (116 meters)	194 to 210 feet (59 to 64 meters)
GW Memorial Parkway to American Legion Bridge	410 feet (125 meters)	135 to 184 feet (41 to 56 meters)

3.3 SOCIOECONOMICS

3.3.1 Population Characteristics

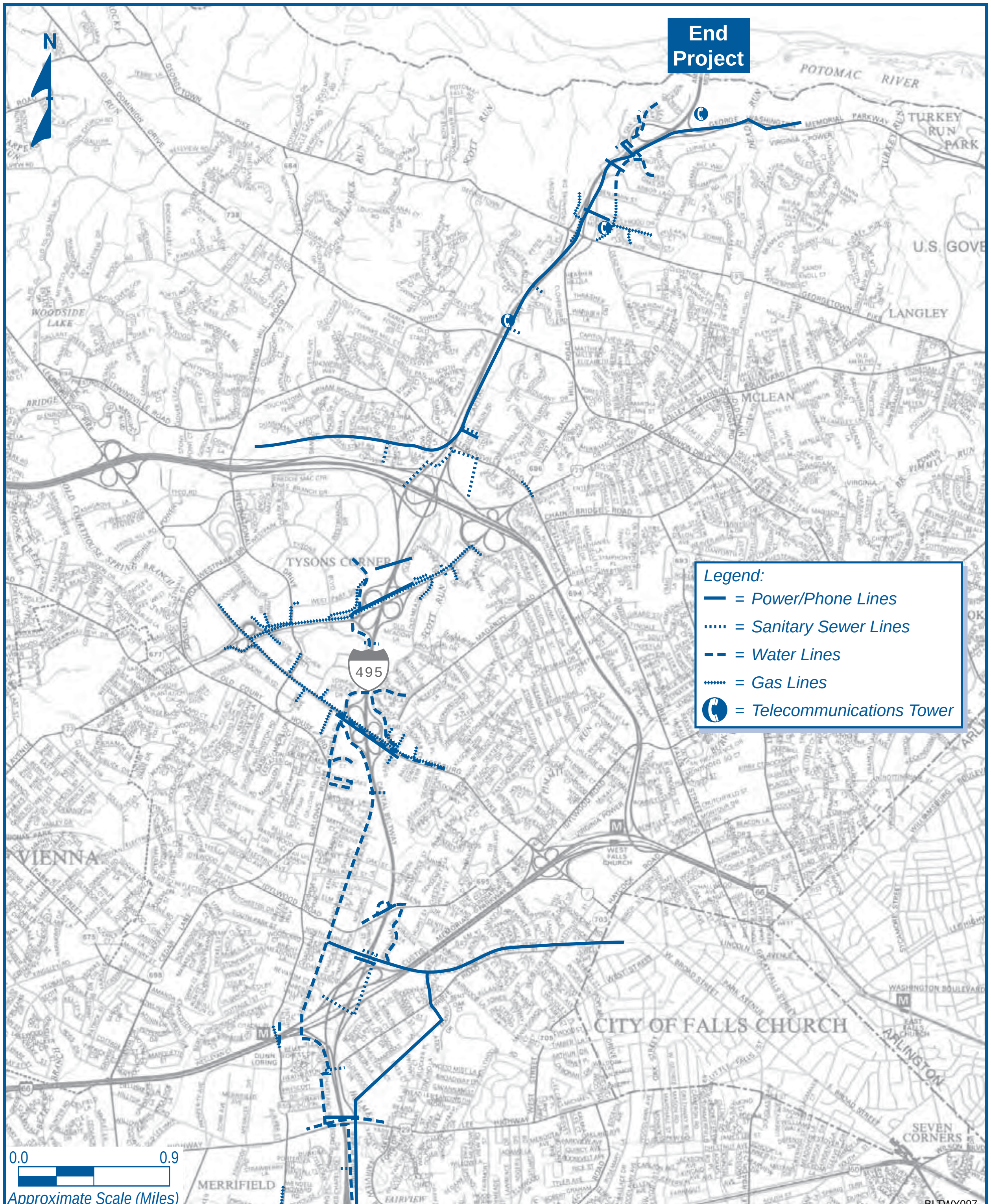
In 2000, Fairfax County had more than 969,000 residents, who comprised 51 percent of the population in Northern Virginia and 21 percent of the Washington, D.C. metropolitan area population. Nearly 15 percent of the county's total population (140,000 residents) lives in census tracts along or near the Beltway (see **Figure 3-5**). The population density along the Beltway is approximately 2,800 persons per square mile, 15 percent greater than the density of Fairfax County as a whole.



UTILITIES
I-95/I-395/I-495 Interchange to I-66

CAPITAL BELTWAY STUDY

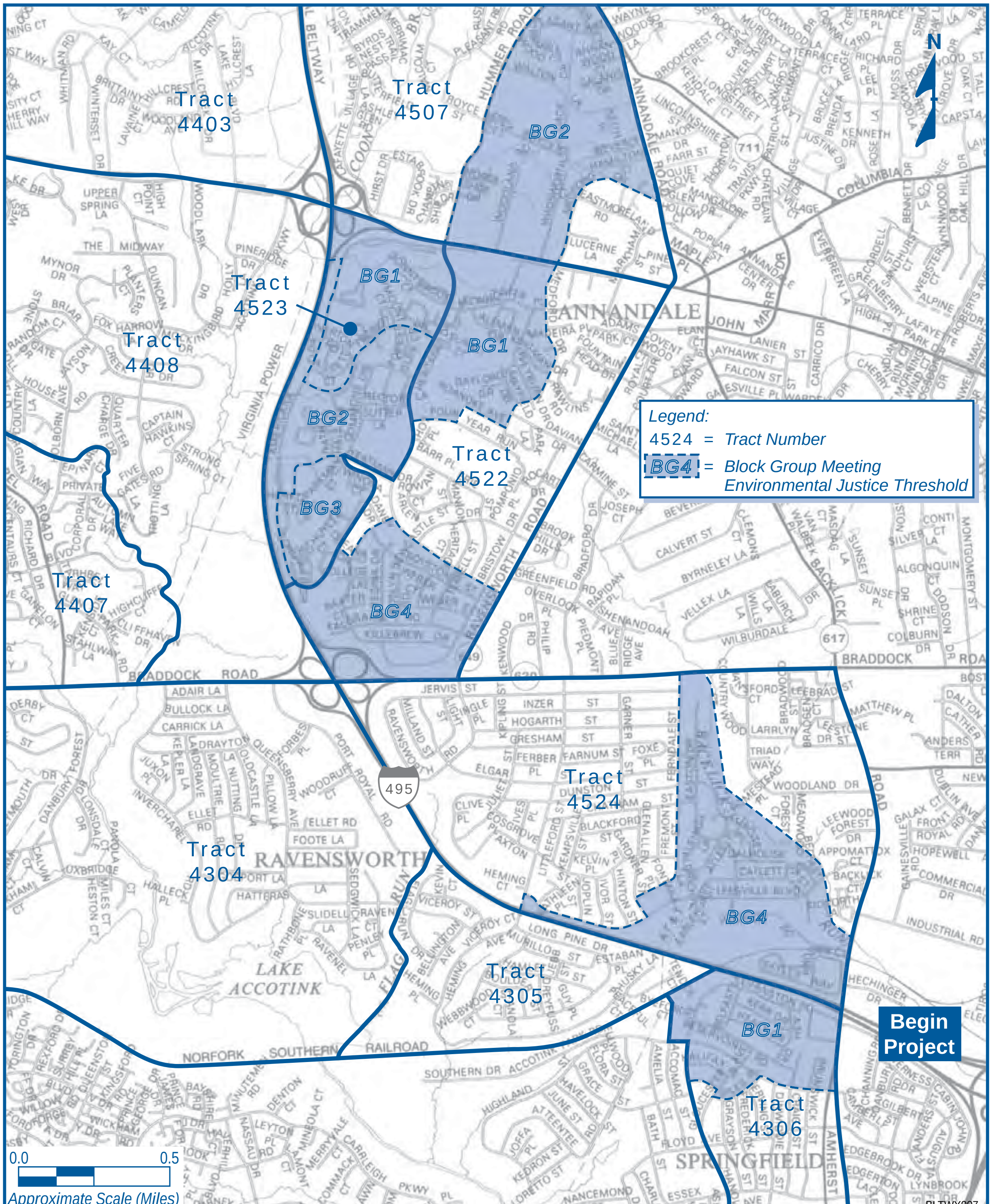
Figure 3-4a
(1 of 2)



UTILITIES
I-66 to American Legion Memorial Bridge

Figure 3-4b
(2 of 2)

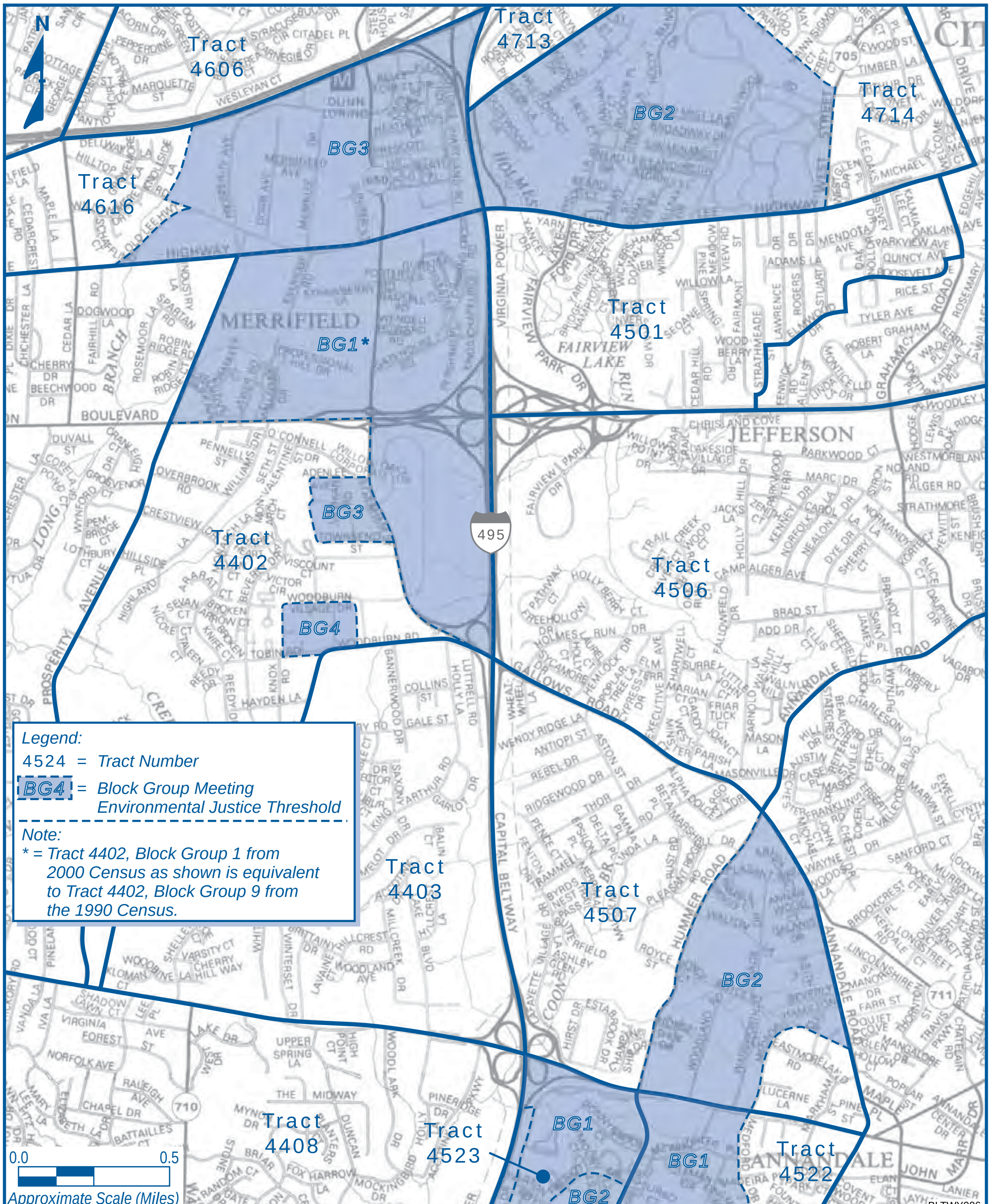
CAPITAL BELTWAY STUDY



CENSUS TRACTS
I-95/I-395/I-495 Interchange to Little River Turnpike

CAPITAL BELTWAY STUDY

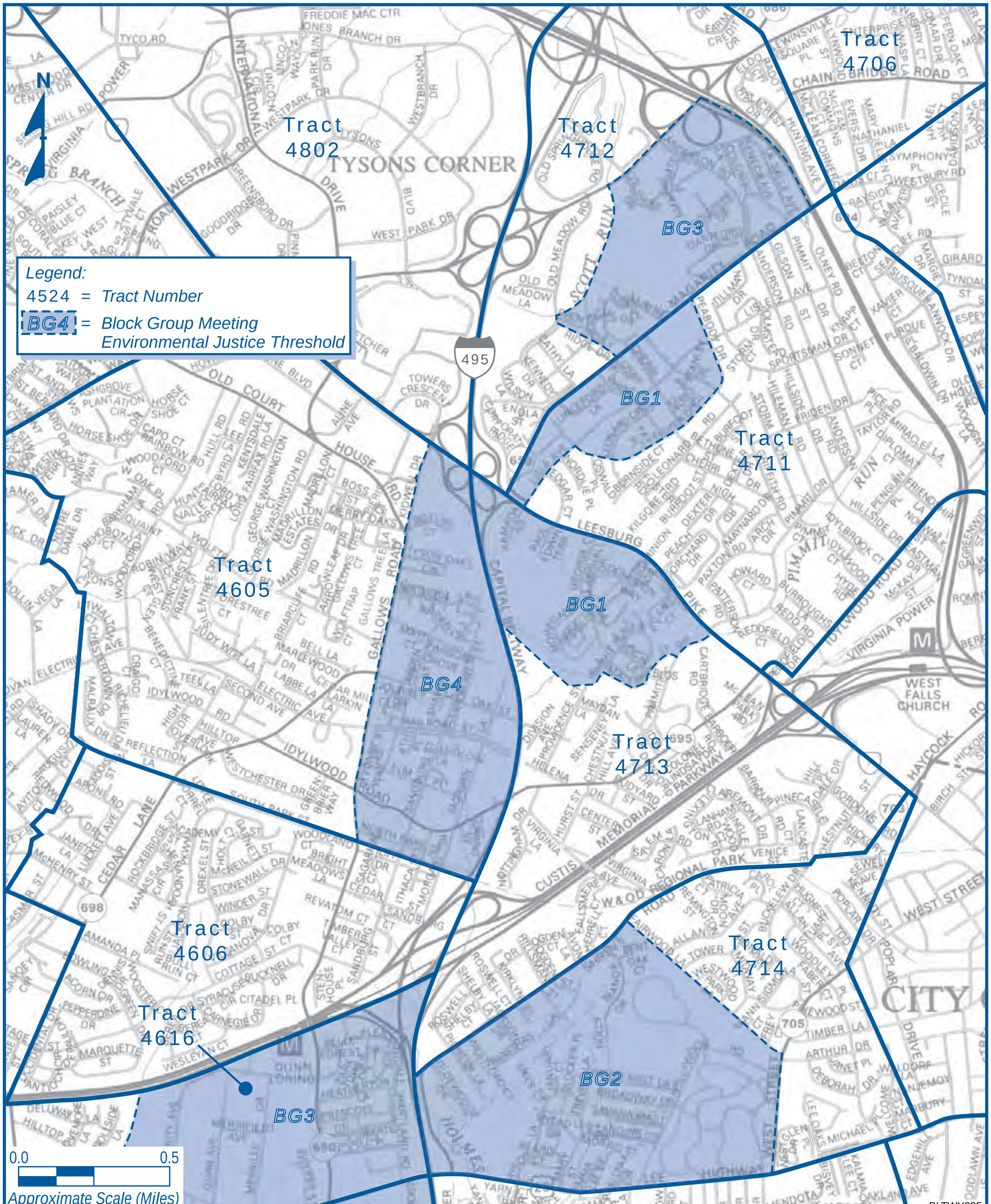
Figure 3-5a
(1 of 4)



CENSUS TRACTS
Little River Turnpike to I-66

Figure 3-5b
(2 of 4)

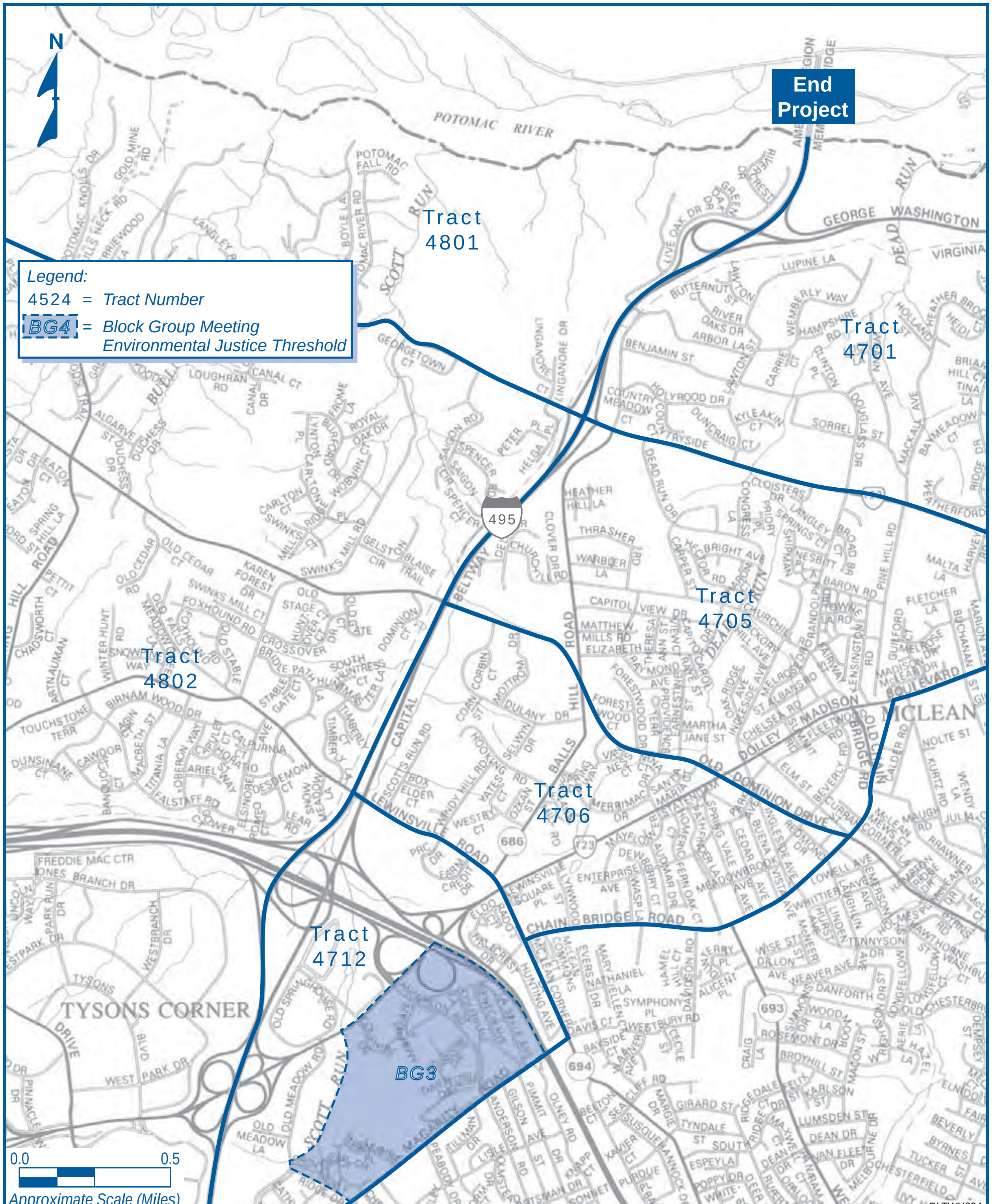
CAPITAL BELTWAY STUDY



CENSUS TRACTS
I-66 to Dulles Access/Toll Road

Figure 3-5c
(3 of 4)

CAPITAL BELTWAY STUDY



CENSUS TRACTS
Dulles Access/Toll Road to American Legion Memorial Bridge
CAPITAL BELTWAY STUDY

Figure 3-5d
(4 of 4)

In the future, regional and local population growth will continue. Population trends and projections for the project area, Fairfax County, and the Northern Virginia area are summarized in **Table 3-5**. **Table 3-6** lists racial and age distributions and income characteristics.

Table 3-5
CURRENT AND FUTURE POPULATION

Area	2000 Population	2020 Population	% Change (2000-2020)
Project Area	140,216	159,537	13.8%
Fairfax County	969,749	1,158,549	27.0%
Northern Virginia	1,907,643	2,464,200	39.2%

Sources: Fairfax County Office of Management and Budget and MWCOG, Round 6a Cooperative Forecasts

Table 3-6
POPULATION CHARACTERISTICS (2000)

Characteristic	Project Area	Fairfax County
Racial Distribution:		
White	66.9%	69.9%
Black	4.7%	8.6%
Asian	18.5%	13.0%
Native Hawaiian/Pacific Islander	0.1%	0.1%
American Indian/Alaska Native	0.3%	0.3%
Other Single Race	5.5%	4.5%
Two or More Races	4.0%	3.7%
Age Distribution:		
Less than 15	18.7%	18.6%
15 – 24	11.3%	11.1%
25 – 34	17.9%	17.9%
35 – 44	17.6%	17.6%
45 – 54	15.2%	15.4%
55 – 64	9.5%	9.6%
65 and Older	9.9%	9.9%
Median Age	36.5	35.9
Median Family Income	$70,140	$65,201
Persons Below Poverty Level	3.4%	3.5%

Source: 2000 Census of Population and Housing, Summary File 1 and Summary File 3A

3.3.2 Housing Characteristics

The project area's share of housing units is consistent with its share of the county's population, and most housing units (primarily single-family detached dwellings) are owner-occupied. However, there are some differences in housing characteristics. Compared to all of Fairfax County, areas next to the Beltway have more multi-family housing units (apartments and condominiums), fewer single-family dwellings and townhouses, more renters, smaller households, and higher housing values. **Table 3-7** lists key housing characteristics for the project area and Fairfax County.

Although overall housing characteristics are not expected to change substantially, the number of housing units will continue to increase. It is estimated that Fairfax County will have an additional 100,000 housing units (a 30 percent increase) by 2020, when the county is expected to be fully built out. Nearly 14,000 (a 25 percent increase) of these will be located within the project area, mostly between Leesburg Pike and the American Legion Bridge.

Table 3-7
HOUSING CHARACTERISTICS (2000)

Characteristic	Project Area	Fairfax County
Total Housing Units	54,982	359,411
Housing Unit Type:		
Single-Family Detached	48.0%	50.1%
Single-Family Attached	13.3%	24.3%
Garden Apartments	31.0%	20.4%
Mid-Rise Apartments	0.9%	0.9%
High-Rise Apartments	6.7%	3.9%
Mobile Home/Other	0.0%	0.5%
Occupied Housing Units:	53,453	350,714
Owner-Occupied	62.5%	71.0%
Renter-Occupied	37.5%	29.0%
Persons per Household	2.62	2.74
Housing Values and Rent:		
Median Housing Value	$262,231	$226,825
Median Monthly Rent	$834	$989

Source: 2000 Census of Population and Housing, Summary File 1, Fairfax County Department of Systems Management for Human Services

3.3.3 Environmental Justice Populations

Table 3-8 lists Block Groups meeting the race thresholds for environmental justice considerations under Executive Order 12898. The Census tract maps in Figure 3-5 show their locations. One block group, 4402 BG1, also met the threshold for low-income population.

3.3.4 Neighborhoods and Community Characteristics

Communities along the Beltway include Annandale, Falls Church, Merrifield, Vienna, Tysons Corner, McLean, and Great Falls. Within these communities, there are a number of residential neighborhoods and subdivisions that are shown in **Figure 3-6**. Most of these neighborhoods are characterized by low-density suburban residential development (two to three units per acre), and contain primarily single-family residences. Pockets of higher-density housing (townhouses and apartments) are located near some interchanges.

Because most of the surrounding neighborhoods were not fully developed until after the Beltway was constructed in the early 1960s, the Beltway has not historically separated or bisected any neighborhoods. Instead, as these areas were developed, they were platted to make full use of the land up to the Beltway right-of-way. Today, with build-out of these areas completed, the edges of several subdivisions now abut the Beltway.

Table 3-8
CENSUS BLOCK GROUPS THAT MEET ENVIRONMENTAL JUSTICE RACE THRESHOLDS

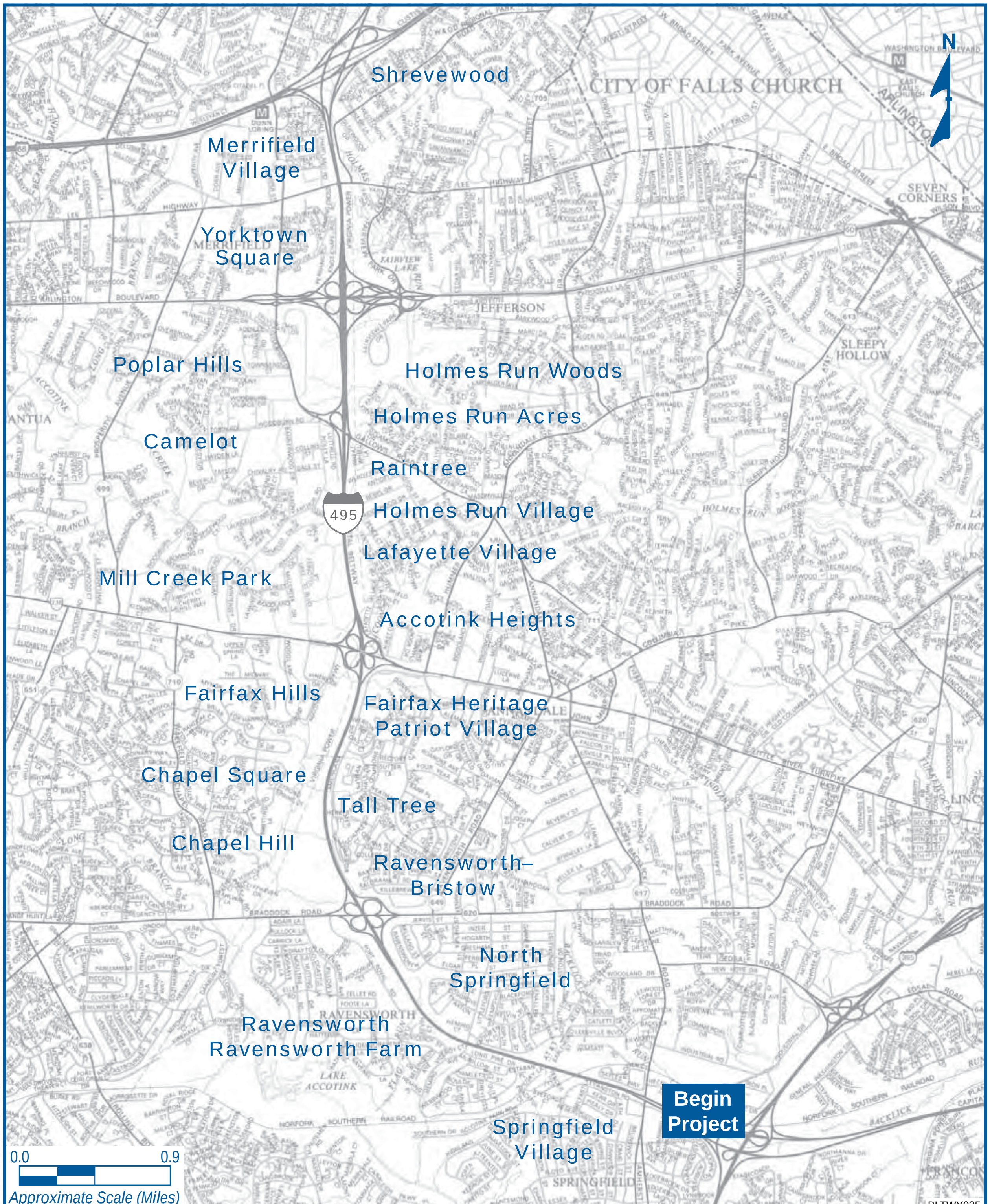
Tract/Block Group	% Black	% Asian	% Hispanic	% Minority
4306 BG1	7.60%	20.43%	**35.53%**	**66.00%**
4524 BG4	6.70%	16.21%	**25.51%**	**52.93%**
4522 BG4	2.29%	**30.44%**	11.16%	**46.18%**
4523 BG3	8.13%	20.49%	**27.05%**	**59.46%**
4523 BG2	8.30%	**43.36%**	17.48%	**74.13%**
4523 BG1	8.59%	22.05%	18.44%	**52.45%**
4522 BG1	8.19%	**35.55%**	**21.50%**	**70.10%**
4507 BG2	6.01%	18.02%	**40.97%**	**67.17%**
4402 BG4	9.42%	17.53%	**27.25%**	**57.34%**
4402 BG3	9.29%	**27.09%**	**34.92%**	**74.51%**
4402 BG1	14.07%	**24.43%**	**30.24%**	**74.81%**
4616 BG3	5.44%	**35.50%**	11.87%	**55.75%**
4714 BG2	**15.31%**	20.56%	**23.22%**	**60.69%**
4605 BG4	3.10%	**23.21%**	3.43%	34.79%
4713 BG1	6.96%	**26.43%**	22.71%	**58.20%**
4711 BG1	4.26%	10.83%	**24.56%**	41.49%
4712 BG3	3.17%	**24.21%**	9.72%	40.97%
Project Area	4.72%	18.52%	13.24%	39.71%
Fairfax County	8.57%	13.00%	11.03%	35.62%

*Racial categories that meet EJ thresholds are bolded for emphasis.
Source: 2000 Census of Population and Housing, Summary File 1, P8: Hispanic or Latino by Race

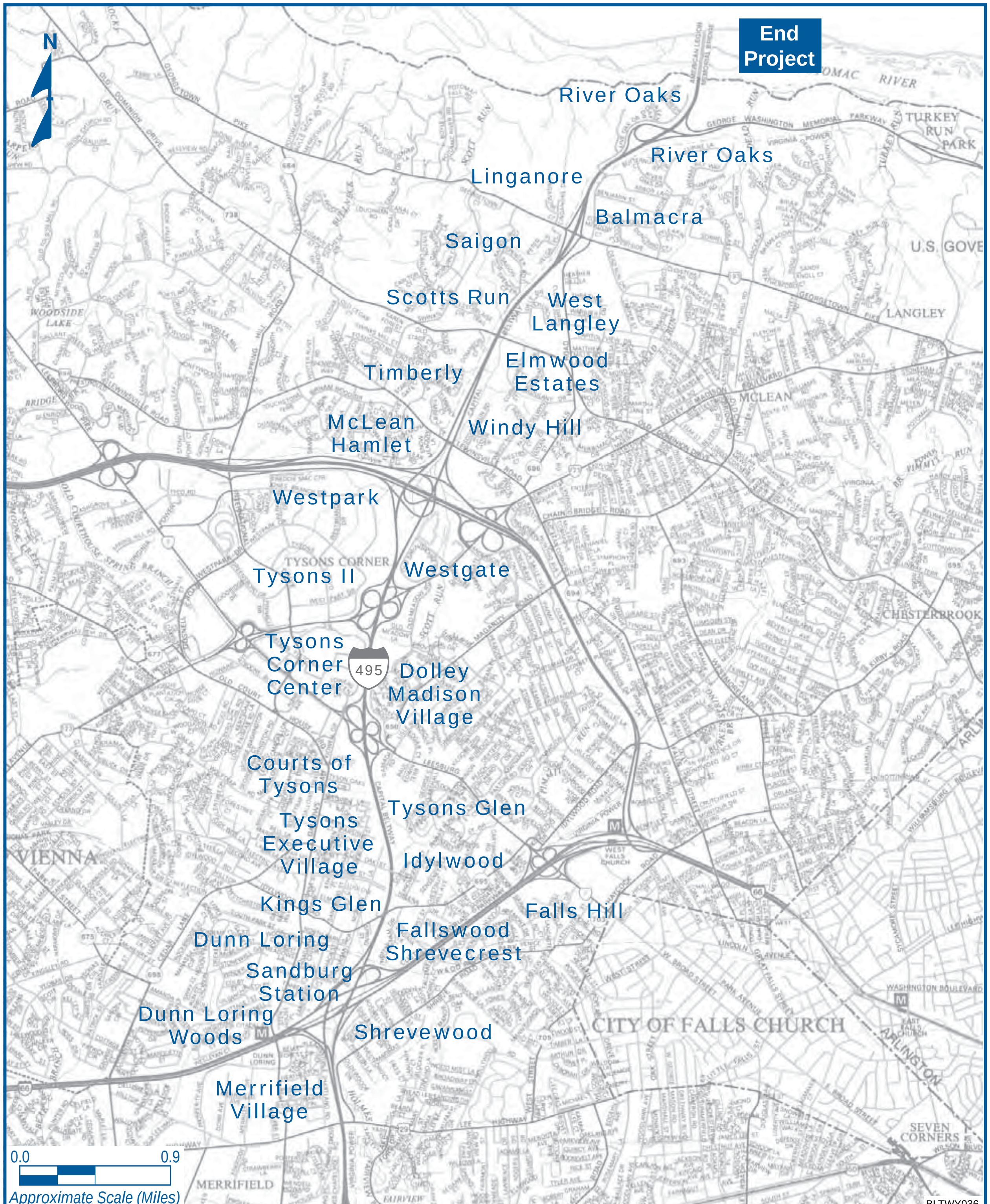
3.3.5 Community Facilities and Services

Community facilities and services located near the Beltway are shown in **Figure 3-7**. The most prevalent community facilities are schools and churches. Three elementary schools (North Springfield, Woodburn, and Stenwood), one middle school (Cooper), and one high school (Marshall) are located near the Beltway within the project area. North Springfield Elementary is the only school property which directly abuts the Beltway right-of-way. Similarly, Stenwood Elementary is immediately adjacent to Interstate 66. The Beltway and adjoining streets provide access to each of these public schools. The Beltway is also an important means of access (via Little River Turnpike) to the Northern Virginia Community College's Annandale campus, located just west of the Beltway.

Five churches are also within the project area. Three medical facilities, the INOVA Fairfax Hospital, the Woodburn Center for Mental Health in Merrifield, and the Iliff Rehabilitation Center (located northwest of the I-66/I-495 interchange) are located in the project area. The North Springfield Post Office is located just west of the Braddock Road/I-495 interchange.



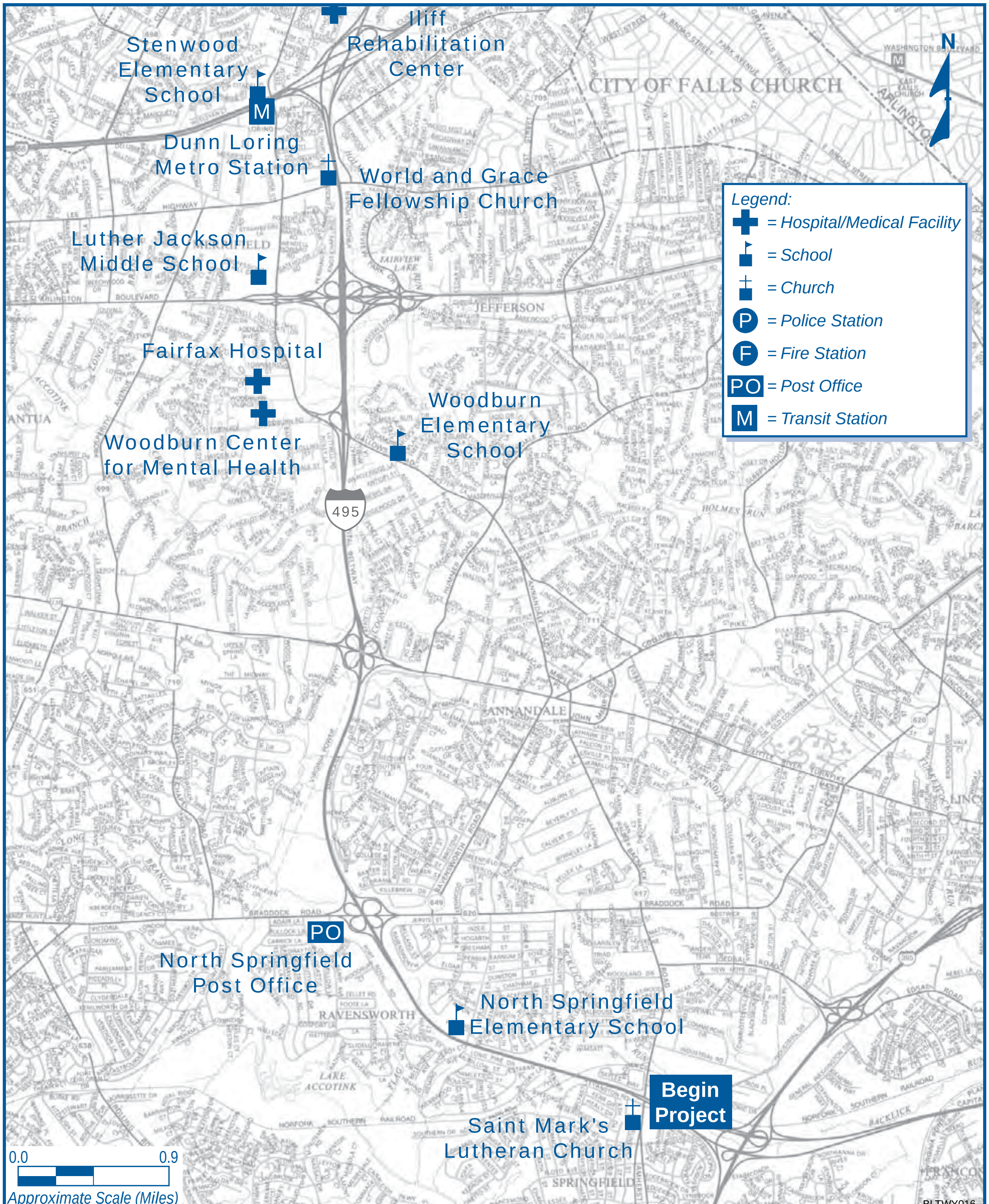
NEIGHBORHOOD AND COMMUNITY AREAS
I-95/I-395/I-495 Interchange to I-66
Figure 3-6a
(1 of 2)
CAPITAL BELTWAY STUDY



NEIGHBORHOOD AND COMMUNITY AREAS
I-66 to American Legion Memorial Bridge

Figure 3-6b
(2 of 2)

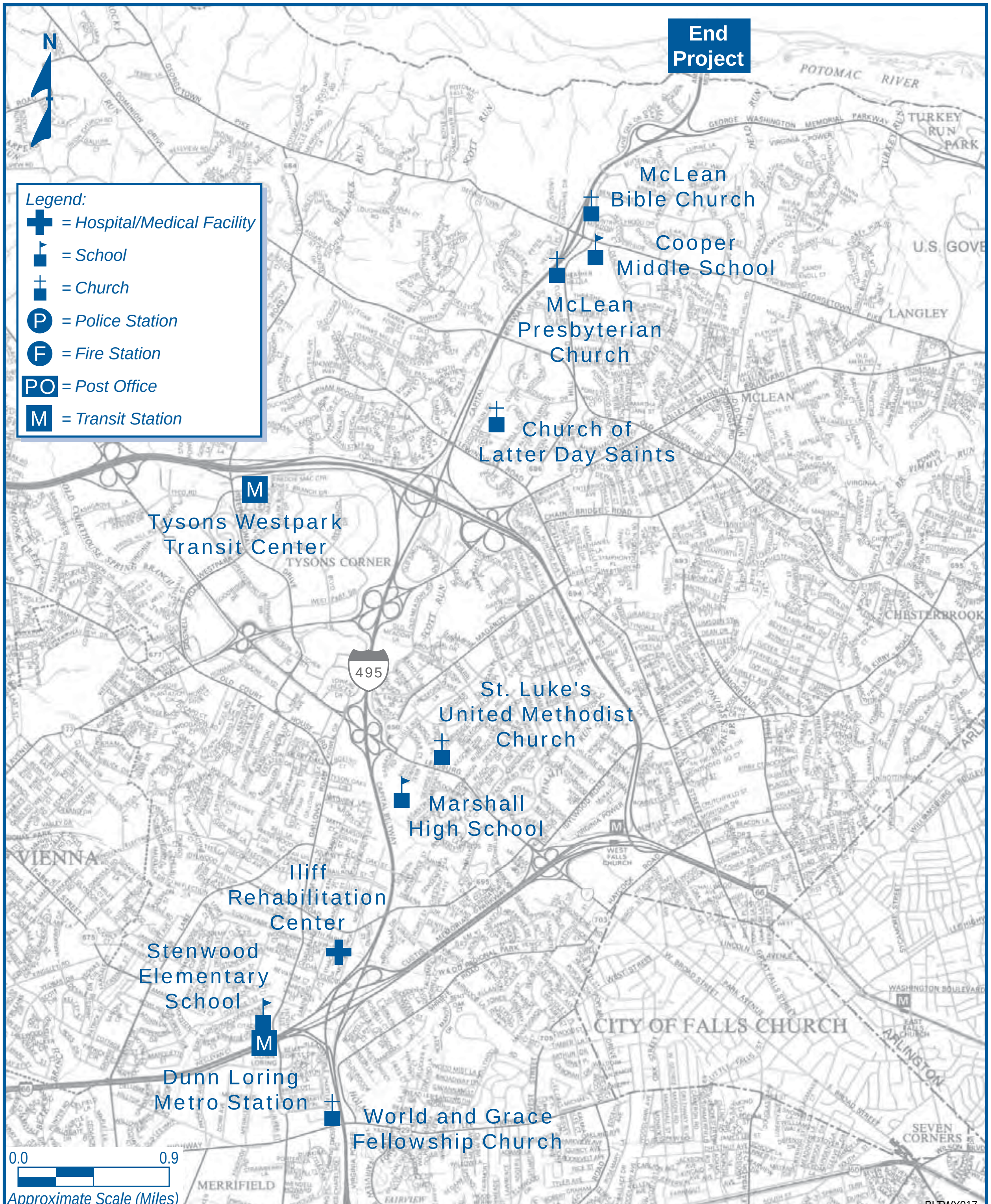
CAPITAL BELTWAY STUDY



COMMUNITY FACILITIES
I-95/I-395/I-495 Interchange to I-66

Figure 3-7a
(1 of 2)

CAPITAL BELTWAY STUDY



COMMUNITY FACILITIES
I-66 to American Legion Memorial Bridge

Figure 3-7b
(2 of 2)

CAPITAL BELTWAY STUDY

The Fairfax County Police serve the communities along the Beltway including the Franconia, West Springfield, Mason, and McLean Districts. The Virginia State Police are responsible for traffic enforcement and safety on the Beltway. In addition, VDOT maintains a safety patrol that provides motorist assistance on major highways in the region, including the Beltway. Fire and rescue services are also provided by Fairfax County. Each of the following stations covers a portion of the project area along the Beltway: Companies 1 (McLean), 8 (Annandale), 13 (Dunn Loring), 18 (Jefferson), 23 (West Annandale), 29 (Tysons Corner), and 30 (Merrifield). No police or fire stations are located within 1 mile of the Beltway.

3.3.6 Economic Setting and Employment

Once focused and largely dependent on the federal government, the economy of the Washington, D.C. region has become a diversified information economy. Northern Virginia, and Fairfax County in particular, has been at the forefront of this economic shift. The economic base of the Washington, D.C. region now includes high technology services, corporate and regional headquarters operations, trade and business associations, and business and financial services firms. In 1995, the total employment in Northern Virginia was 941,000, 34 percent higher than the total employment in the District of Columbia.

About half of all jobs in Northern Virginia are now located in Fairfax County, home to more than 27,000 businesses. This employment is concentrated in three sectors: services (47 percent), wholesale/retail trade (19 percent), and government (12 percent). Fairfax County and other jurisdictions in Northern Virginia have high labor force participation rates. Nearly 80 percent of all eligible workers are employed (compared to 65 percent nationally), and the region ranks first in the share of women participating in the labor force. Almost three-quarters of all households in Northern Virginia have two full or part-time workers, with each adult often working in different parts of the metropolitan area.

Fairfax County, with 93 million square feet of office space, is the largest commercial office market in the Washington, D.C. metropolitan area and the Commonwealth of Virginia. As

a suburban office market, Fairfax County ranks tenth in the nation, with several of its submarkets (notably Tysons Corner and Reston) also ranking among the nation's largest. The county has more than 30 million square feet of retail space and is home to four of the largest shopping centers in the metropolitan area (Tysons Corner Center, Tysons II, Fair Oaks Mall, and Springfield Mall).

Development of new office space throughout Northern Virginia is continuing at a rapid pace. Vacancy rates in existing buildings have been declining since 1990 and several new buildings are under construction. In 2000, more than 8.6 million square feet of new commercial construction was started in Fairfax County; two-thirds of this space was pre-leased. This new office construction is concentrated in the Tysons Corner area and along the Dulles Access/Toll Road.

3.3.7 Tax Base

More than half (53 percent) of Fairfax County's annual revenue is generated from real estate taxes, primarily from residential properties. Real estate is assessed annually and property is taxed on 100 percent of market value. In 2001, the total value of real property in Fairfax County was $99.8 billion. Residential properties accounted for 71 percent of total valuation ($70.9 billion); commercial and other non-residential properties made up the remaining 29 percent ($28.9 billion). At a tax rate of $1.23 per $100 of assessed value, property taxes generated $1.1 billion in tax revenue in 2001. Of that total, $779 million was raised from taxes on residential properties and another $321 million from taxes on commercial and business properties.

Another 20 percent ($426.4 million) of the county's revenues are from taxes on personal property, such as cars and boats. Taxes on professional occupations and businesses, consumer utilities, cigarettes, gasoline, hotels, and the local sales tax generate another 17 percent of revenues ($339.1 million). The rest of the county's revenues come from permit fees, fines, service charges, interest and income on assets, and direct transfers from the state and federal governments.

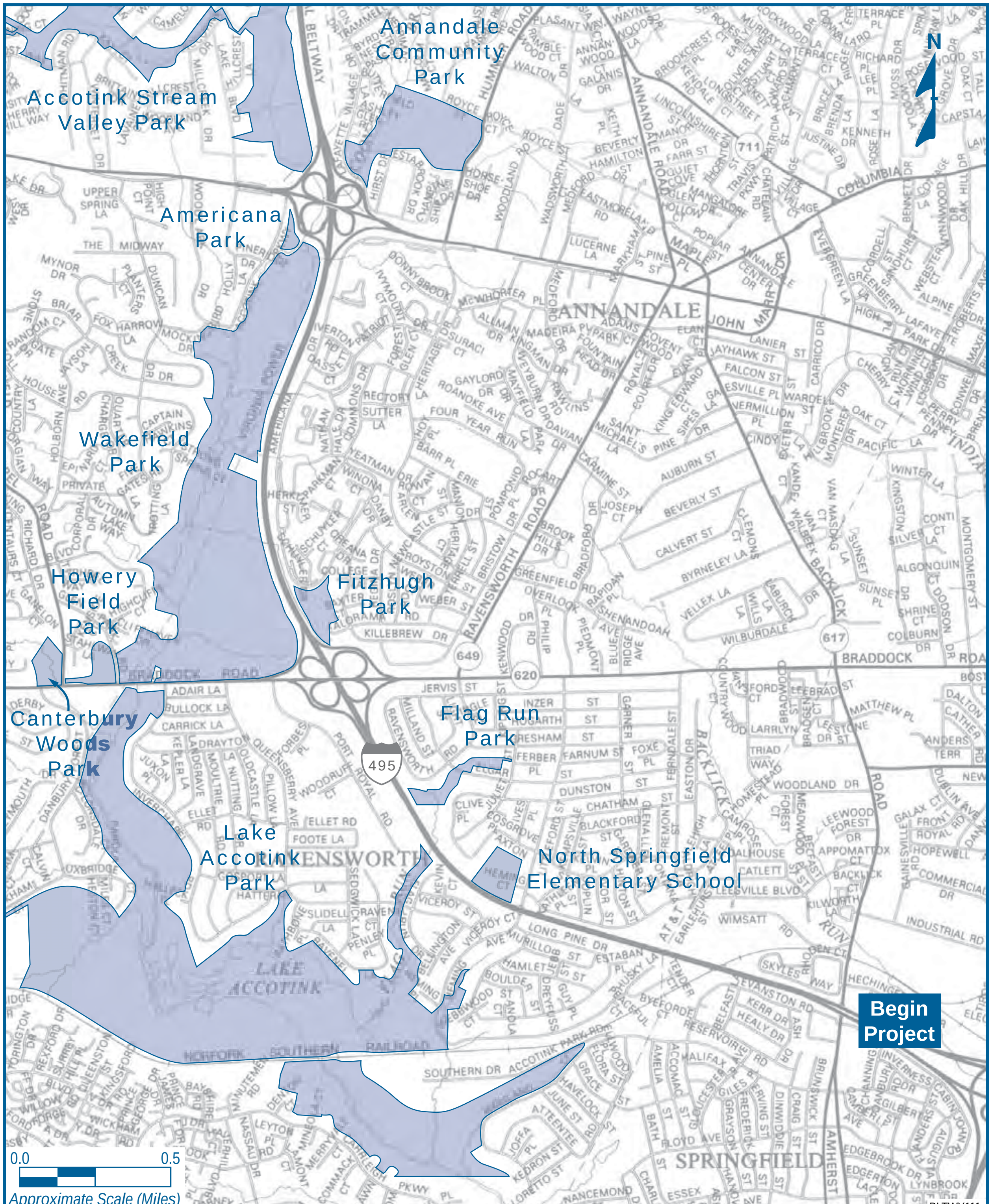
Fairfax County, like all cities and counties in Virginia, levies a local sales and use tax (1 percent), which is collected at the point of sale along with the state's 3.5 percent sales and use tax. In 2000, Fairfax County's taxable sales of $13.9 billion generated more than $485 million in tax revenue for the Commonwealth of Virginia, 19 percent of the state's total.

3.4 PARKS AND RECREATION AREAS

A variety of public parklands and recreation areas, including county parks, regional parks, and national parks, are located adjacent to the Beltway within the project area. These parklands are owned and operated by the Fairfax County Park Authority, Northern Virginia Regional Park Authority, Fairfax County School Board, and the National Park Service. The location of each park or recreation area is shown in **Figure 3-8**. **Table 3-9** provides a summary of the specific facilities and amenities available at each park or recreation area. Additional information on these parks is included in Chapter 8 (*Section 4(f) Evaluation)*.

3.4.1 County Parks

The Fairfax County Park Authority (FCPA), an independent unit of the Fairfax County government, operates and maintains 357 parks and recreational facilities, totaling more than 17,000 acres (6,880 hectares) throughout the county. Within the project area, there are 16 parks and 1 nature preserve owned or maintained by the FCPA. These parks include undeveloped stream valley parks, neighborhood parks with fields and play equipment, community parks with recreational or community facilities, and district parks with major facilities such as golf courses and recreation centers. An overview of each FCPA park located within the project area is provided below. The FCPA also maintains a network of trails in its various parks along major streams and tributaries.

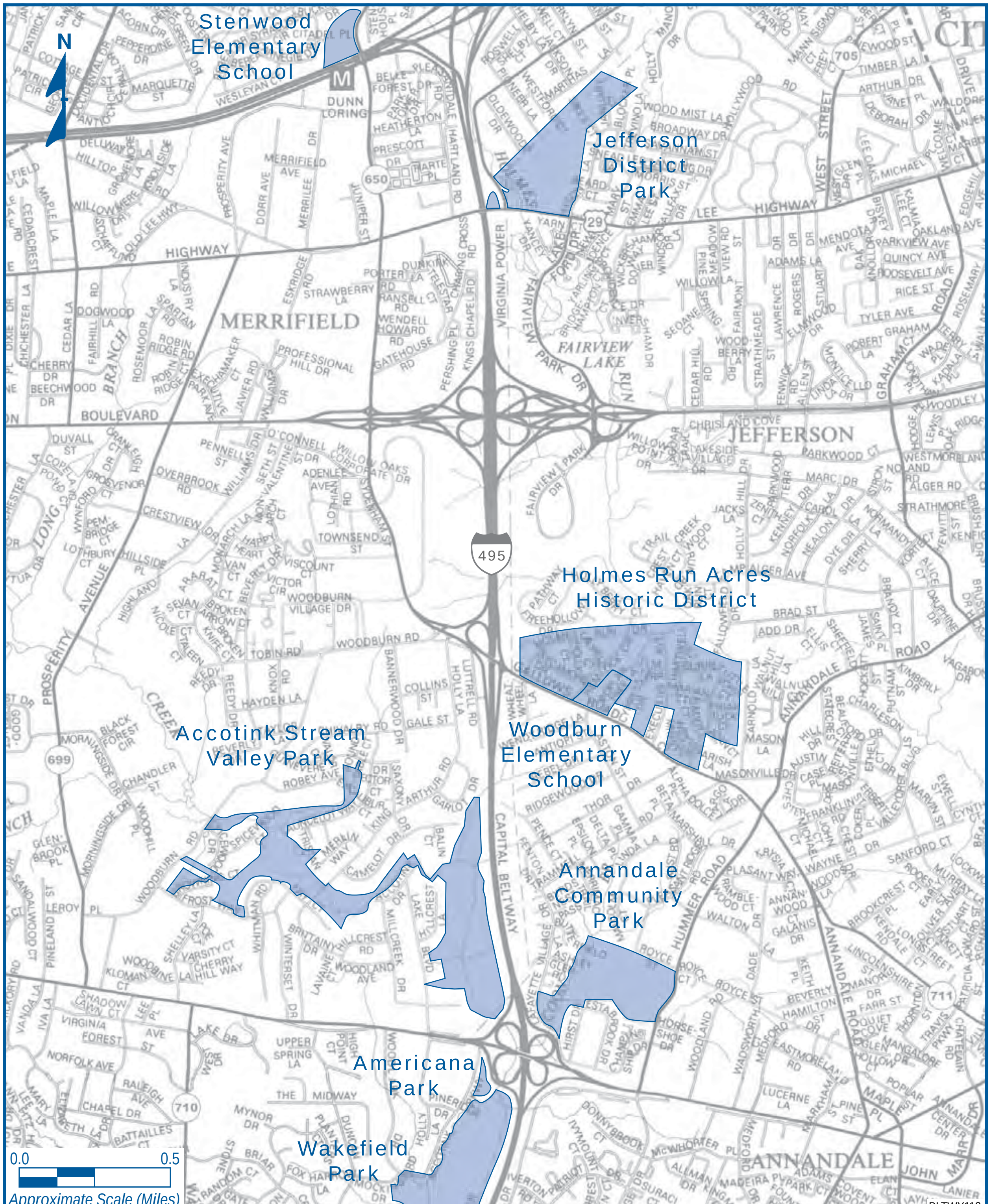


PARKS AND PUBLIC RECREATION AREAS

I-95/I-395/I-495 Interchange to Little River Turnpike

Figure 3-8a
(1 of 4)

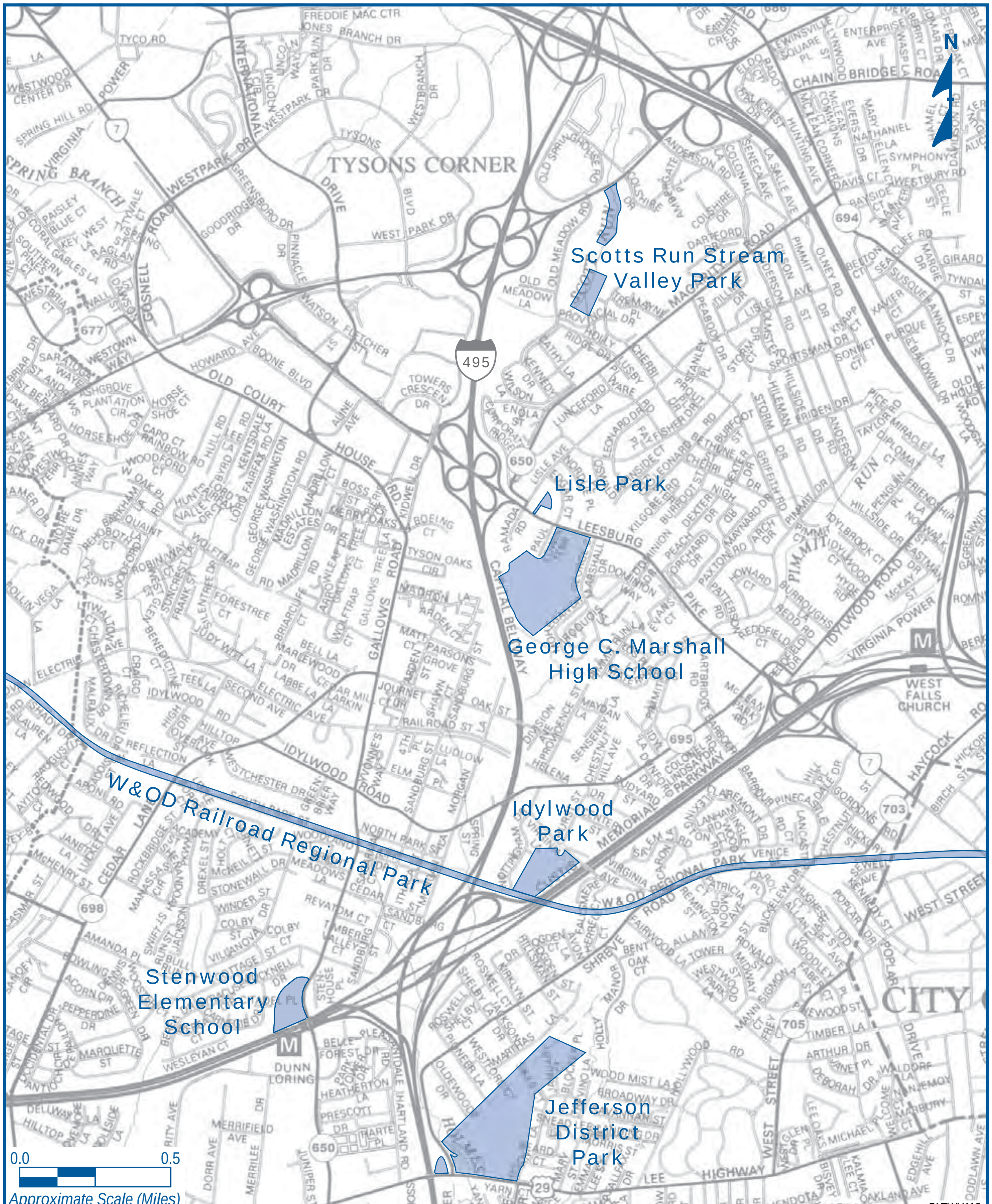
CAPITAL BELTWAY STUDY



PARKS AND PUBLIC RECREATION AREAS
Little River Turnpike to I-66

Figure 3-8b
(2 of 4)

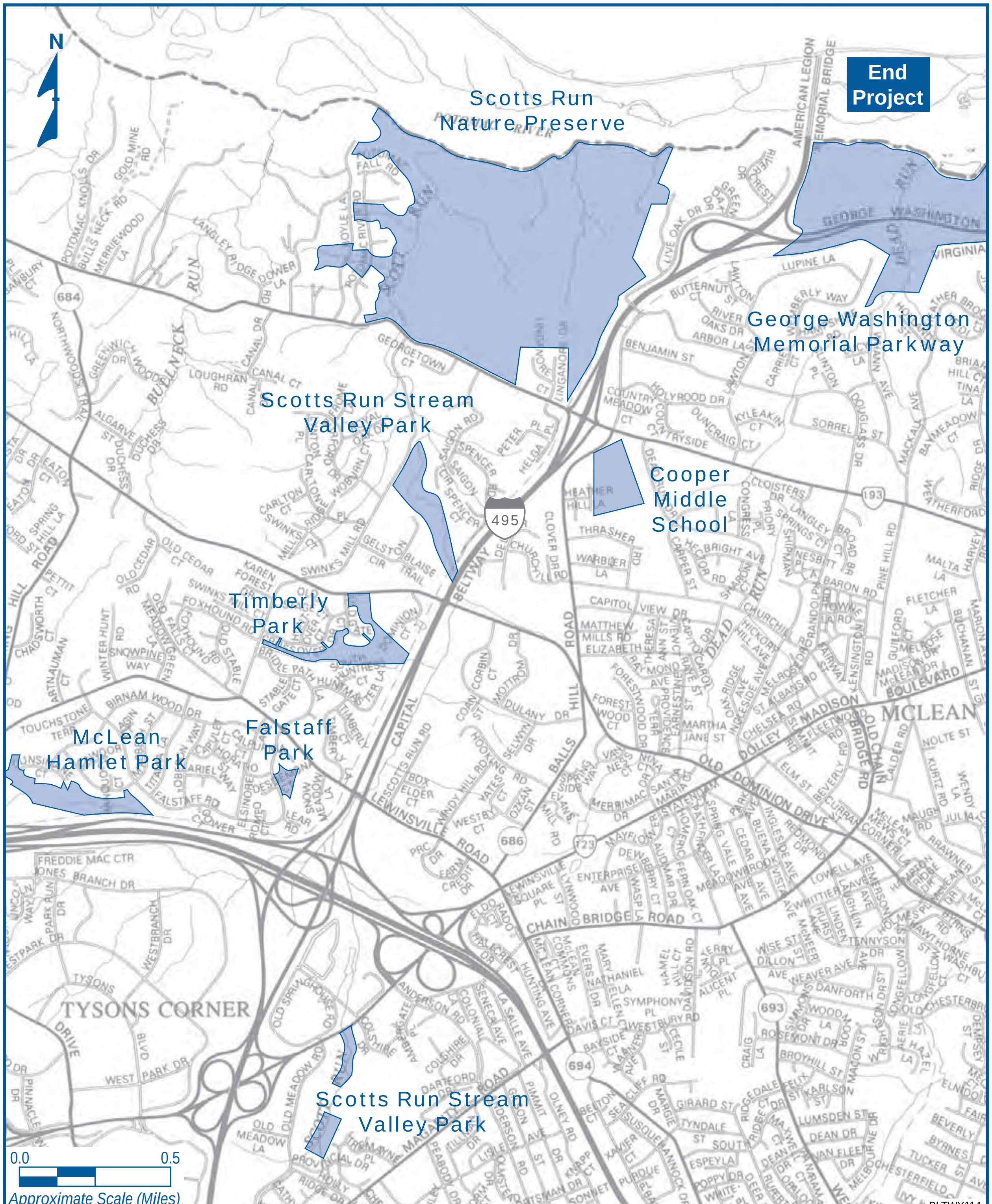
CAPITAL BELTWAY STUDY



PARKS AND PUBLIC RECREATION AREAS
I-66 to Dulles Access/Toll Road

Figure 3-8c
(3 of 4)

CAPITAL BELTWAY STUDY



CAPITAL BELTWAY VIRGINIA

PARKS AND PUBLIC RECREATION AREAS
Dulles Access/Toll Road to American Legion Memorial Bridge

CAPITAL BELTWAY STUDY

Figure 3-8d
(4 of 4)

Table 3-9
PARKLANDS AND PUBLIC RECREATION AREAS

Name	FACILITIES/AMENITIES											
	Indoor Recreation Center	Community Center	Ball Diamond(s)	Multi-Use Field(s)	Basketball/ Multi-Use Court(s)	Tennis Courts	Golf or Miniature Golf Course	Recreational Trail(s)	Playground or Tot Lot	Picnic Area(s)	Natural Area(s)	Open Space
North Springfield Elementary School			✔	✔	✔				✔			
Lake Accotink Park				✔	✔		✔	✔	✔	✔	✔	✔
Flag Run Park								✔			✔	
Canterbury Woods Park					✔			✔				✔
Howery Field Park			✔	✔								
Wakefield Park	✔	✔	✔	✔	✔	✔		✔	✔	✔	✔	✔
Fitzhugh Park					✔			✔	✔		✔	
Americana Park			✔					✔				
Annandale Community Park		✔	✔		✔	✔		✔	✔	✔	✔	✔
Accotink Stream Valley Park								✔			✔	
Woodburn Elementary School			✔		✔	✔						
Jefferson District Park					✔	✔	✔					
Stenwood Elementary School			✔	✔	✔				✔			
Washington & Old Dominion Trail								✔			✔	
Idylwood Park			✔	✔	✔	✔		✔				✔
George Marshall High School			✔	✔	✔	✔						
Lisle Park					✔				✔			✔
Scotts Run Stream Valley Park								✔			✔	
McLean Hamlet Park											✔	✔
Falstaff Park										✔	✔	✔
Timberly Park											✔	
Cooper MIddle School			✔	✔	✔	✔						
Scott's Run Nature Preserve								✔			✔	
George Washington Memorial Parkway								✔			✔	

Lake Accotink Park. This 479.5-acre (194.0-hectare) multiple resource park offers a wide variety of facilities and activities including sports fields, numerous trails, a large lake with boating and fishing facilities, miniature golf, and picnic and playground areas. Only a small portion of this park is within the project area: an undeveloped area where Flag Run crosses the Beltway and another undeveloped area where Accotink Creek crosses Braddock Road.

Flag Run Park. This 8.6-acre (3.5-hectare) neighborhood park is located along Flag Run adjacent to the east side of the Beltway. It is primarily wooded and includes a recreational trail along Flag Run. Flag Run Park is located off of Elgar Street in the North Springfield neighborhood.

Canterbury Woods Park. This 4.7-acre (1.9-hectare) neighborhood park contains a basketball court, open space, and a trail along Long Branch. The park's parking lot is used as an informal park-and-ride lot by commuters during the workweek. Canterbury Woods Park is located west of the Beltway at the intersection of Braddock and Wakefield Chapel Roads.

Howery Field Park. This 7.5-acre (3-hectare) community park includes three lighted baseball diamonds, a multi-use field, a biking/hiking trail, and a small parking lot. It is used by local residents and organized youth leagues. Howery Field Park is located west of the Beltway and north of Braddock Road on Glen Park Road.

Wakefield Park. Wakefield Park is one of the county's largest and most heavily used parks. The 293-acre (118.6-hectare) multiple resource park offers a wide range of indoor and outdoor facilities. Outdoor facilities include picnic areas, playgrounds, community gardens, 4 baseball diamonds, outdoor restrooms, a concession stand, 2 multi-use fields, 2 basketball courts, 13 tennis courts (including platform tennis), shuffleboard courts, horseshoe pits, and large amounts of undeveloped open space and natural areas. The indoor recreation center includes a pool, sun deck, fitness equipment, squash and racquetball courts, meeting rooms, and a gymnasium. An extensive network of trails within the park is used by both hikers and mountain bikers. These trails connect to trails in Lake Accotink Park and Accotink Stream Valley Park. A Virginia Power easement with high-voltage transmission wires also extends through the park and an FCPA maintenance facility is located on site. Wakefield Park is located on the west side of the Beltway between Braddock Road and Little River Turnpike.

Fitzhugh Park. A 10.9-acre (4.4-hectare) neighborhood park with a multi-use court, a playground/tot lot area and recreational trail, Fitzhugh Park is located east of the Beltway and north of Braddock Road on Americana Drive. Most of the park's facilities are located off Americana Drive; the remainder of the park and the portion closest to the Beltway is an undeveloped wooded area.

Americana Park. This 3.9-acre (1.6-hectare) community park is located next to the southeast quadrant of the I-495/Little River Turnpike interchange on Accotink Parkway and abuts the northern edge of Wakefield Park. Its facilities include a baseball diamond (without lighting), a small parking area, and a trail connection to Wakefield Park. The baseball diamond is used by local residents and organized youth leagues.

Annandale Community Park. A moderately sized district park that encompasses 50.8 acres (20.6 hectares), Annandale Park is located off Hummer Road east of the Beltway and north of Little River Turnpike. Facilities at the park include two baseball diamonds, a basketball court, two tennis courts, a playground and tot lot, picnic areas, and a series of trails through the wooded and undeveloped portions of the park. The park also contains an FCPA maintenance garage, the Hidden Oaks Nature Center, which is used for community educational programs, and the Packard Center, a community center that is often used by local civic groups for public meetings. The Packard Center also includes a gallery and gift shop for locally produced artwork. Two streams, Coon Branch and an unnamed tributary, run through the park

Accotink Stream Valley Park. This 728.65-acre (294.86-hectare) stream valley park is a collection of unconnected parklands along Accotink Creek, which extends through Fairfax County between the City of Fairfax and the Potomac River. Stream valley parks are intended preserve natural areas for environmental corridors, provide riparian habitat, and to protect local water quality. They are often located within the floodplains of streams and rivers. Only a small portion (62.75 acres/25.4 hectares) of this park is located near the Beltway. Within the project area, the park is heavily wooded and has no structures; a recreational trail is located along Accotink Creek as it winds through the park. There is no vehicular access to the park within the project area, but pedestrian access is provided via a trail along Accotink Creek. The nearest trailhead is at King Arthur Road, nearly two-thirds of a mile (one kilometer) from the Beltway.

Jefferson District Park. This 60.8-acre (24.6-hectare) district park features a nine-hole golf course, a clubhouse, an 18-hole miniature golf course, a concession stand, 12 tennis courts, and 2 multi-use courts. An FCPA maintenance facility is also located on site. The park also includes a small, undeveloped parcel located between Shreve Road and the Beltway. Jefferson District Park is located east of the Beltway between Lee Highway and a Virginia Power transmission easement.

Idylwood Park. This 13.8-acre (5.6-hectare) neighborhood park is located on Virginia Lane in the northeast quadrant of the I-66/I-495 interchange. Pedestrians can also access the park via Nottingham Drive and the Washington & Old Dominion (W&OD) Railroad Regional Park. Idylwood Park was built in the late 1970s on a site formerly owned by the Fairfax County School Board and once reserved for construction of a new school. Facilities at the park include an unlit baseball diamond, a soccer field, a basketball court, and four tennis courts. The FCPA also maintains a connector trail for the W&OD Railroad Regional Park through Idylwood Park.

Lisle Park. A small (0.9-acre/0.4-hectare) neighborhood park located north of Leesburg Pike between Edgar Court and Magarity Court, Lisle Park is completely surrounded by neighboring homes; access to the park is provided via a path from Leesburg Pike. Facilities at the park include a basketball court and a playground area.

Scotts Run Stream Valley Park. This 26.2-acre (10.6-hectare) stream valley park includes three separate parcels located along Scotts Run. Two of these parcels are located east of the Beltway and south of Chain Bridge Road; the other is north of Old Dominion Drive west of the Beltway. The southern parcels, which include a hiking trail, are connected through a portion of Westgate Park. Access to these parcels is provided at trailheads located at Colshire Drive and Provincial Drive. The northern parcel of this park is actually a long-term easement on private land located along Scotts Run between Old Dominion Drive and Georgetown Pike. This portion of the park includes a hiking trail and bridle path. It is maintained and managed by the FCPA.

McLean Hamlet Park. This 17.1-acre (6.9-hectare) neighborhood park, consisting of open space and an adjacent wooded area, is located west of the Beltway in the McLean Hamlet neighborhood. It provides a buffer between the houses and Dulles Access/Toll Road to the south. Pedestrian access to the park is provided via MacBeth Street and adjoining properties.

Falstaff Park. This 3.7-acre (1.5-hectare) neighborhood park is also located in the McLean Hamlet neighborhood west of the Beltway and north of the Dulles Access/Toll Road. It includes a playground and picnic areas. Access to the park is provided via Falstaff Road.

Timberly Park. This 23.1-acre (9.4-hectare) community park is located west of the Beltway and south of Old Dominion Drive. Timberly Park is a group of undeveloped, wooded parcels bisected by a small stream (Bradley Branch). Pedestrian access to the park is provided via Swinks Mill Road, Old Dominion Drive, or from adjoining properties.

Scotts Run Nature Preserve. This 384.3-acre (155.6-hectare) natural resource park protects environmentally sensitive areas in the northeastern portion of the county. Its limited facilities include an extensive trail network and a fishing area. The preserve is managed and maintained by the FCPA even though a large portion of the park's land is owned by the Fairfax County Board of Supervisors. Scotts Run Nature Preserve is located on the west side of the Beltway between Georgetown Pike and the Potomac River. Vehicular access to parking areas is provided via Georgetown Pike; access to most of the park is provided via the trail network and adjoining road.

3.4.2 Regional Parks

One regional park, the W&OD Railroad Regional Park, is located within the project area. The W&OD Park is a multi-use trail that runs along the right-of-way for the former W&OD railroad and extends from Arlington County to Loudoun County. It was developed between 1974 and 1988, and is owned and maintained by the Northern Virginia Regional Park Authority (NVRPA). The W&OD Park crosses the Beltway just north of the I-66/I-495 interchange on a dedicated overpass.

The 100-foot-wide (30-meter) park runs for 45 miles between Arlington and Purcellville in Loudoun County, providing a continuous linear park from the Potomac River to foothills of the Blue Ridge Mountains. It also connects a series of wayside parks and provides access to the rural countryside beyond the Beltway. A paved trail runs from Shirlington in Arlington County, through Falls Church, Vienna, Reston, and Herndon and into Loudoun County, and is heavily used bikers, joggers, and walkers. An adjoining bridle trail between Vienna and Purcellville is used extensively by area horseback riders. It was designated a National Recreation Trail by the U.S. Department of Interior in 1987 and is included on its national register of trails.

3.4.3 State Parks

There are no state-owned or operated parks, recreational areas, or nature preserves located within the project area.

3.4.4 National Parks

One national park, the George Washington Memorial Parkway, is located at the northern end of the project area along the Potomac River. This 7,200-acre (2,914-hectare) park, owned and maintained by the National Park Service, includes the Parkway itself (a four-lane roadway) and the adjoining land to the Potomac shoreline. The Parkway was developed as a memorial to George Washington; the first segment (between Memorial Bridge and Mount Vernon) it was completed in the 1930s to connect various sites associated with his life. The northern portion of the Parkway, including an interchange with the Beltway, was constructed in the 1950s and 1960s. Numerous natural, historic, and memorial sites have been developed along its route, which extends from the Beltway south to Mount Vernon, passing through Arlington and the City of Alexandria.

The portion of the Parkway property located next to the Beltway is wooded and undeveloped, but includes a part of the Potomac Heritage Trail. This section of the Potomac Heritage Trail, which runs for 10 miles (16 kilometers) from Roosevelt Island to just north of the Beltway, is a part of a proposed 700-mile (1,127 kilometer) trail that would trace the natural and cultural features of the Potomac River Basin. The trail winds along the Potomac River through the hillsides and palisades (cliffs) and forested stream valleys. Access to the trail is provided at many points south of the Beltway and from Live Oak Drive just north of the Beltway. Although the trail is located on National Park Service property, it is maintained by the Potomac Appalachian Trail Club (and its volunteer members).

3.4.5 School Recreational Facilities

In addition to parks or recreation areas owned and operated by the FCPA or the NVPRA, recreational areas or facilities are located at a number of schools within the project area as shown in Figure 3-8. These facilities are owned and maintained by the Fairfax County School Board, though in some cases, the Fairfax County Department of Community Recreation uses these facilities for its organized activities and instructional classes. The recreational facilities located at these schools (e.g., ball fields, basketball courts, and tennis courts) are also used by neighborhood residents and the general public during non-school hours. Schools within the project area with recreational facilities open to the public are summarized below.

North Springfield Elementary School. Recreational facilities open to the public at this school include: a playground (with equipment), three basketball courts, two baseball diamonds and an open field. North Springfield Elementary School is located adjacent to the east side of the Beltway just north of Heming Avenue. The recreational facilities are located behind the school, which fronts to the Beltway.

Woodburn Elementary School. Recreational facilities open to the public at this school include: a playground (with equipment), a basketball court, two tennis courts, and a baseball diamond. The tennis courts at this location are owned and maintained by the FCPA. Woodburn Elementary School is located east of the Beltway at the intersection of Gallows Road and Hemlock Drive. The recreational facilities are located behind the school.

Stenwood Elementary School. Recreational facilities open to the public at this school include: a playground (with equipment), two baseball diamonds, two basketball courts, and a soccer field. Stenwood Elementary School is located on Gallows Road and is directly across I-66 from the Dunn Loring Metrorail station. The southern portion of the school's recreational fields abut the westbound lanes of I-66.

George C. Marshall High School. Recreational facilities open to the public at this school include: softball and baseball fields, a track and football stadium, seven tennis courts, three basketball courts, and a soccer/football practice field. Marshall High School is located between Leesburg Pike and the Beltway. A portion of the school's recreational (athletic) fields border the Beltway right-of-way.

***Cooper Middle School*.** Recreational facilities open to the public at this school include: a baseball diamond, two basketball courts, four tennis courts, and a soccer field with a track. The tennis courts at this location are owned and maintained by the FCPA. Cooper Middle School is located just east of the Georgetown Pike/I-495 interchange on Balls Hill Road. The recreational facilities are located behind the school, which faces the Beltway and Georgetown Pike.

3.4.6 Recreational Trails

FCPA, in conjunction with the Fairfax County Non-motorized Transportation Committee maintains maps of the existing and planned trails within Fairfax County. In addition, VDOT recently completed the Northern Virginia Regional Bikeway and Trail Network Study.

Table 3-10 lists the existing recreational trails located along Beltway. The FCPA maintains recreational trails or paved pathways for hiking, biking and exercise through a number of its parks. Where possible, these trails connect to adjoining parklands. The FCPA also maintains a network of nature trails in its various stream valley parks located along major streams and tributaries. While most of these trails are located on FCPA parkland, in some cases they are located on easements the FCPA has obtained from private property owners. Trails that are located on easements are maintained by the FCPA. Other trails in the project area include the W&OD Railroad Regional Park and the Potomac Heritage Trail.

According to the Countywide Trails Plan Map, which was adopted by the Fairfax County Board of Supervisors in 2002, a trails are planned along the length of the Capital Beltway within the project limits and at each of the existing crossings of the Beltway. The I-495 trail is designated as a part of the major regional trail system which is a system of planned trails that would run along major roadways intersecting at interchanges.

In late 2003, the Northern Virginia Regional Bikeway and Trail Study was completed by VDOT. This study was completed as a first step in developing a coordinated and strategic approach to developing a regional transportation system for bicycling in Northern Virginia. A major recommendation included in this study is to provide bicycle access across major barriers such as the Capital Beltway. The Study includes a map of a recommended trail network which includes crossings of the Beltway at Braddock Road, Little River Turnpike, Route 50, Route 7, Route 123, and Lewinsville Road. It does not include a trail at every crossing. The plan also includes a trail running parallel to the Beltway between the American Legion Bridge and the Dulles Toll Road. This trail does not extend along the remainder of the Beltway; instead it connects to other trails that extend to activity centers.

Table 3-10
EXISTING RECREATIONAL TRAILS NEAR THE CAPITAL BELTWAY

Location	Trail Description
Lake Accotink Park	Large network of hiking, biking, and nature trails, including one that crosses under Braddock Road into Wakefield Park.
Flag Run Park	Recreational trail along Flag Run on the east side of the Beltway.
Canterbury Woods Park	Paved trail that runs along Long Branch.
Wakefield Park	A network of trails through natural areas in the park, used primarily for mountain biking. Connects to trails in Lake Accotink, Americana, and Accotink Steam Valley Park. Trails also connect to pedestrian overpass that connects park with neighborhoods on the east side of the Beltway.
Fitzhugh Park	Paved trail through wooded sections of park.
Annandale Community Park	Hiking and nature trail that connects to Hidden Oaks Nature Center.
Accotink Stream Valley Park	Trail along Accotink Creek that connects to trails running through Americana, Wakefield and Lake Accotink Parks.
Americana Park	Recreational trail providing connection to Wakefield Park.
Fairfax County	Cross County Trail under development. Trail will eventually extend for 40 miles from the Occoquan River near Route 123 to the Potomac River at Great Falls. The proposed route will connect three major stream valley parks including the Pohick, the Accotink, and Difficult Run. This trail crosses the Little River Turnpike within the project limits.
W&OD Railroad Regional Park	Multi-use trail that runs from Arlington County to Purcellville in Loudoun County. Includes paved path for pedestrians and bicyclists, and bridle path. Trail crosses the Beltway just north of the I-66/I-495 interchange on a dedicated overpass.
Idylwood Park	Connector trail for the W&OD Railroad Regional Park.
Scotts Run Stream Valley Park	Hiking trail along Scotts Run in section south of Chain Bridge Road; hiking trail and bridle path on section between Old Dominion Drive and Georgetown Pike.
Scotts Run Nature Preserve	Extensive network of hiking trails through the preserve.
George Washington Memorial Parkway	Potomac Heritage Trail extends along the Potomac River from the Beltway to Roslyn.

Source: Fairfax County Park Authority, 2001.

3.4.7 Other Recreational Resources

In addition to the public parks and recreation areas described above, there are also a number of private recreational facilities within the project area. These facilities include: community swim and tennis clubs; outdoor pools, playgrounds, basketball courts, volleyball courts, and picnic areas at apartment, condominium, and townhouse complexes; swimming pools and tennis courts at private residences; and common lands owned by community associations. These recreational facilities are located on private property and are not open to the public for general use.

3.5 HAZARDOUS MATERIALS

Available federal, state, and local agency databases were reviewed to determine whether hazardous materials-related activities occurring within or near the current right-of-way could impair the environmental quality of the right-of-way and adjacent properties. These databases track information about underground and aboveground storage tanks; hazardous materials users; hazardous waste generators; hazardous waste treatment, storage, and disposal sites; water pollution incidents; and landfills.

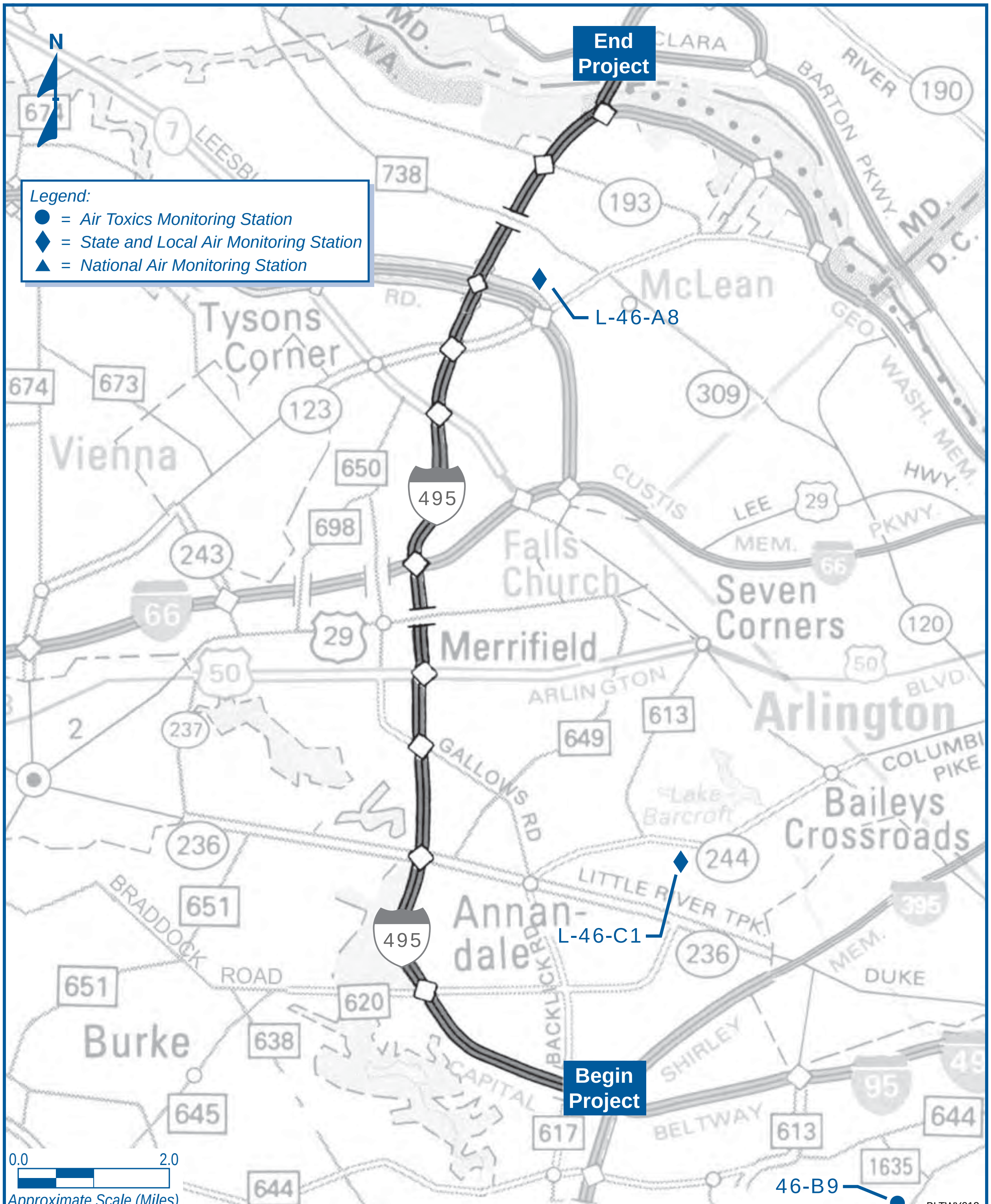
After sites were identified by the database searches, field investigations were conducted to confirm their existence and to identify additional sites that could be of concern. A total of 122 potential hazardous materials sites were identified and confirmed within the project area. Most of the sites consist of underground storage tanks or locations of previous hazardous material spills. None of the sites were identified on the EPA's national priority list (the superfund program). One site, the northern Virginia steel corporation, was identified in EPA's comprehensive environmental response, compensation, and liability information system (CERCLIS), although further investigation found that a preliminary assessment was conducted at the site and concluded that further studies were not warranted. Eighteen sites were listed in the resource conservation and recovery information system (RCRIS) as small quantity generators and one site was listed as a large quantity generator. Detailed information about the sites, databases searched, and agency coordination is presented in the *hazardous materials technical report.*

3.6 AIR QUALITY

3.6.1 Criteria Pollutants

Pursuant to the Clean Air Act of 1970, as amended, the U.S. EPA established National Ambient Air Quality Standards (NAAQS) for six air pollutants associated with vehicular emissions: carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), ozone (O_3), particulate matter ($PM_{2.5}$ and PM_{10}), and sulfur dioxide (SO_2). These NAAQS were set at levels protective of human health and welfare and are reviewed every five years to ensure that they are based on the best available science. The NAAQS include both primary and secondary standards. Primary standards protect against adverse health effects; secondary standards protect against welfare effects such as decreased visibility and damage to crops, ecosystems, vegetation, and buildings.

The Virginia Department of Environmental Quality (VDEQ) and the Fairfax County Health Department operate air quality monitoring stations near the project area at three locations: Station Number L-46-Z - Doctor's Exchange at 6120 Brandon Avenue, Springfield; Station Number L-46-C1 – Mason Government Center at 6507 Columbia Pike; Annandale and Station Number L-46-A8 - McLean Government Center at 1437 Balls Hill Road, McLean. The locations of these three sites are shown in **Figure 3-9**. **Table 3-11** shows monitoring data collected at the stations, along with applicable NAAQS for comparison.



AIR QUALITY MONITORING STATIONS Figure 3-9

CAPITAL BELTWAY STUDY

Table 3-11
EXISTING AMBIENT AIR QUALITY

		MEASURED CONCENTRATION			
Criteria Pollutant	**Criteria Type**	**McLean Govt. Ctr. (L-46-A8)**	**Mason Govt. Ctr. (L-46-C1)**	**Doctor's Exchange (L-46-Z)**	**Applicable NAAQS**
Carbon Monoxide (CO)	1-Hour Concentration[a]	3.6 ppm	2.4 ppm	n/a	35 ppm
	8-Hour Concentration[a]	2.8 ppm	1.8 ppm	n/a	9 ppm
Lead (Pb)[b]	Quarterly Average	n/a	n/a	0.01 ug/m^3	1.5 ug/m^3
Nitrogen Dioxide (NO_2)	Annual Arithmetic Mean	0.023* ppm	0.018 ppm	n/a	0.053 ppm
Ozone (O_3)	8-Hour Concentration[f]	0.088 ppm	n/a	n/a	0.08 ppm
Particulate Matter (PM_{10})	Annual Arithmetic Mean[c]	n/a	n/a	20 ug/m^3	50 ug/m^3
	24-Hour Concentration[a]	n/a	n/a	61 ug/m^3	150 ug/m^3
Particulate Matter ($PM_{2.5}$)[f]	Annual Arithmetic Mean[d]	13.6 ug/m^3	13.2 ug/m^3	n/a	15 ug/m^3
	24-Hour Concentration[e]	32.9 ug/m^3	36.7 ug/m^3	n/a	65 ug/m^3
Sulfur Dioxide (SO_2)	Annual Arithmetic Mean	0.005 ppm	0.006 ppm	n/a	0.03 ppm
	24-Hour Concentration[a]	0.023 ppm	0.020 ppm	n/a	0.14 ppm

Notes: ppm = parts per million, ug/m^3 = micrograms per meter cubed, n/a = data not available. * Did not meet EPA's minimum requirements for data capture.

a. Not to be exceeded more than once per year. b. Lead is not monitored because the measurements fall at or below the detectable level. c. To attain this standard, the expected annual arithmetic mean PM_{10} concentration at each monitor within an area must not exceed 50 ug/m^3. d. To attain this standard, the 3-year average of the annual arithmetic mean $PM_{2.5}$ concentration from single or multiple community oriented monitors must not exceed 15.0 ug/m^3. e. To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 65 ug/m^3. f. To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm

Sources: USEPA website; Virginia Ambient Air Monitoring Data Report, 2003.

Since publication of the Draft EIS, the U.S. EPA has resolved the court challenges associated with the new 8-hour standard for ozone and the $PM_{2.5}$ standard. In April 2004, U.S. EPA designated the Washington, DC-MD-VA region as a "Moderate" nonattainment area for the 8-hour ozone standard. The Region is required to submit a new air quality plan (called a State Implementation Plan or SIP) to the U.S. EPA in 2007 and meet the new standard by 2010. In early January this year, the U.S. EPA published the final designations for fine particulates or $PM_{2.5}$ and designated the Washington, DC-MD-VA region as a nonattainment area. The U.S. EPA expects to issue guidance for implementing the new standard later this year. Ambient concentrations of Pb, CO, NO_2, SO_2, PM_{10}, and total suspended particulates were well within the NAAQS for the region. Data for the monitoring sites show that the 8-hour ozone standard was violated at the McLean monitoring site.

In February 2004, Virginia submitted data to the EPA showing that no areas of the state were in violation of the NAAQS for $PM_{2.5}$ in 2001, 2002, and 2003 and recommended that the state be designated in attainment with particulate matter standards. In June, the U.S. EPA responded with a letter announcing its intention to include the Northern Virginia, which is part of the Washington, DC-MD-VA air quality region, as a nonattainment area. In January of this year, the U.S. EPA formally designated the Washington, DC-MD-VA region as nonattainment for $PM_{2.5}$.

3.6.2 Regional Attainment and Conformity Status

Nationwide, atmospheric levels of all four pollutants to which motor vehicles contribute significantly—O_3, CO, airborne Pb, and NO—have declined consistently for almost two decades, and violations of the NAAQS for airborne Pb, CO, and NO_2 have been virtually eliminated. Controlling ground-level ozone has proven more challenging, but violations of the federal ozone standard have also been sharply reduced. Most of the reduction in atmospheric concentrations of these pollutants in the region can be attributed to tighter emissions standards for cars and trucks, point source controls, federal programs to reduce pollution such as Tier I and II controls, the use of reformulated gasoline and other cleaner burning fuels, etc. These lower concentrations have occurred despite the increasing population, gross domestic product, and vehicle miles traveled.

A similar trend has occurred within the Washington metropolitan region. Air quality is improving for each of the criteria pollutants listed above and today the region is meeting most of the six standards with ample margins. Ground-level ozone and $PM_{2.5}$ are the two pollutants for which the Washington, DC-MD-VA region has not attained. However, as discussed above, none of the monitoring data from Virginia show violation of the NAAQS for $PM_{2.5}$.

3.6.3 Air Toxics

Toxic air pollutants include a number of substances that are known or suspected to cause cancer or other serious health effects in humans (e.g., respiratory problems, neurological problems, and reproductive problems) when they are exposed to certain levels of the pollutants. The federal Clean Air Act authorizes the EPA to characterize, prioritize, and control emissions of these pollutants. The sources of these substances can be broadly divided into stationary sources (e.g., power, manufacturing, and processing plants) and mobile sources (on-road and off-road motor vehicles).

Mobile sources emit toxic air pollutants in three ways: exhaust emissions of uncombusted or incompletely combusted fuels and fuel byproducts, evaporative emissions from fuels, and particle emissions from vehicle wear and tear. The EPA developed a list of mobile source air toxics known to have, or suspected of having adverse health effects. The list was generated by intersecting a list of known motor vehicle emissions (from available databases and studies) with a list of compounds characterized as having potential serious adverse health effects resulting from lifetime exposures. **Table 3-12** lists the substances, ranked by relative percentage of total national emissions attributable to on-highway mobile sources. The EPA's final rule for the Control of Emissions of Hazardous Air Pollutants from Mobile Sources (40 CFR Parts 80 and 86) states: "It is important to note that inclusion on the list is not itself a determination by EPA that emissions of the compound in fact present a risk to public health or welfare, or that it is appropriate to adopt controls to limit the emissions of such a compound from motor vehicles or their fuels."

Table 3-12
EPA'S LIST OF MOBILE SOURCE AIR TOXICS

Substance[1]	General Description	Health Effects	On-highway Mobile Source Contribution to Total National Emissions[1]: Short Tons	On-highway Mobile Source Contribution to Total National Emissions[1]: % of Total National Emissions
Toluene	colorless, flammable, liquid hydrocarbon used as gasoline octane enhancer, as a solvent in many commercial products, & for production of polymers used in numerous consumer products (including paints, polyurethanes, plastics, dyes, & adhesives); emitted from motor vehicles in exhaust and through evaporation	nonclassifiable[2] as human carcinogen, neurotoxicity, narcosis, cardiac arrhythmia, & respiratory system irritation	549,900	51
Benzene	colorless, highly flammable, liquid hydrocarbon, a constituent of motor fuels and widely used as a solvent & manufacturing agent (e.g., in detergents, explosives, dyestuffs & pharmaceuticals); benzene in tobacco smoke accounts for nearly half the national exposure; emitted in exhaust and through evaporation	human carcinogen, blood disorders, fertility impairment, eye, skin, respiratory system irritation, drowsiness, dizziness, headaches	168,200	48
Ethylbenzene	colorless, liquid hydrocarbon, a constituent of motor fuels and asphalt, used to manufacture styrene & as a solvent; present in both exhaust and evaporative emissions.	nonclassifiable as human carcinogen, respiratory irritant, neurotoxicity	80,800	47
Methyl Tertiary-Butyl Ether (MTBE)	colorless, liquid hydrocarbon used as a gasoline additive to increase octane and reduce carbon monoxide emissions	nonclassifiable as human carcinogen, neurotoxicity, respiratory irritant	65,100	47
Xylene	colorless, liquid hydrocarbon, a constituent of gasoline and diesel fuel, used in manufacture of ethylbenzene & as solvent in paints & coatings; present in both exhaust and evaporative emissions	nonclassifiable as human carcinogen, respiratory and gastrointestinal irritant, neurotoxicity, impaired pulmonary function, heart palpitation & chest pain	311,000	43
1,3-Butadiene	colorless, gas hydrocarbon used in manufacturing chemicals, rubber, & plastics; released through combustion of wood and tobacco; found in motor vehicle exhaust because of incomplete combustion of gasoline and diesel fuel	probable human carcinogen, respiratory irritant, neurotoxicity, cardiovascular disease	23,500	42
Styrene	colorless, liquid hydrocarbon used to manufacture polystyrene plastics & resins; constituent of gasoline & diesel fuels, emitted in exhaust	possible human carcinogen, respiratory and gastrointestinal irritant, central nervous system dysfunction, blood & liver effects	16,300	33

Table 3-12
EPA'S LIST OF MOBILE SOURCE AIR TOXICS

Substance[1]	General Description	Health Effects	On-highway Mobile Source Contribution to Total National Emissions[1]: Short Tons	On-highway Mobile Source Contribution to Total National Emissions[1]: % of Total National Emissions
Acetaldehyde	colorless, liquid hydrocarbon used in manufacturing a variety of chemicals, perfumes, polyester resins, & dyes; also used as fruit & fish preservative, a flavoring agent; as a solvent in the rubber, tanning, and paper industries; an intermediate product of higher plant respiration; also formed in combustion of wood (residential fireplaces) & tobacco & in coffee roasting; also formed in the body from breakdown of ethanol (alcoholic beverages); found in motor vehicle exhaust because of incomplete combustion of gasoline and diesel fuel.	probable human carcinogen, respiratory & skin irritant,	28,700	29
n-Hexane	colorless, liquid hydrocarbon used to extract edible oils from seeds & vegetables, as a solvent, & as a cleaning agent; a constituent of gasoline, it is emitted through exhaust and evaporation	nonclassifiable as human carcinogen, mild neurotoxicity, respiratory & skin irritant,	63,300	26
Formaldehyde	colorless, gas hydrocarbon used in synthesis of other chemicals & in a multitude of consumer & commercial products, including many building materials & home furnishings; formed in the atmosphere by oxidation of virtually all volatile organic compounds; formed from incomplete combustion of gasoline and diesel fuel	probable human carcinogen; respiratory, skin, & gastrointestinal irritant	83,000	24
Acrolein	water-white or yellow, liquid hydrocarbon used principally in the manufacture of acrylic acid; also formed from tobacco combustion; found in motor vehicle exhaust because of incomplete combustion of gasoline and diesel fuel.	possible human carcinogen; respiratory & skin irritant	5,000	16
Polycyclic Organic Matter[3]	broad class of organic compounds; generally formed from combustion of fuels, wood, tobacco, vegetation, garbage, etc.	probable human carcinogen, skin disorders, some respiratory effects	42	4
Chromium Compounds	metal used in making steel & other alloys, automobile brake linings & catalytic converters, & wood preservatives	human carcinogen [chromium VI only (hexavalent chromium)] ; shortness of breath, coughing, wheezing; neurological & gastrointestinal effects	14	1.2

Table 3-12
EPA'S LIST OF MOBILE SOURCE AIR TOXICS

Substance[1]	General Description	Health Effects	On-highway Mobile Source Contribution to Total National Emissions[1]	
			Short Tons	% of Total National Emissions
Nickel Compounds	metal used in alloys, electroplating, batteries, coins, plumbing, machinery parts, & catalysts; present in trace quantities in exhaust emissions from gasoline and diesel engines	human carcinogen (nickel refinery dust & nickel subsulfide); dermatitis and respiratory effects from chronic exposures	10.7	0.9
Lead Compounds[4]	metal used in manufacture of batteries & various metal products; no longer used as fuel additive, which had been major source of emissions	probable human carcinogen; brain & kidney damage; gastrointestinal symptoms; anemia; reproductive system effects	19	0.8
Manganese Compounds	metal used in manufacture of steel, batteries, fertilizer, varnishes, ceramics, & in water purification; a manganese compound is used in some motor fuels as an octane enhancer	nonclassifiable as human carcinogen; neurotoxicity; respiratory effects; impotence	5.8	0.2
Dioxin/Furans	Derived primarily from solid/medical waste combustion, forest fires, pulp & paper production; dietary intake is the primary route for human exposures; formed by and emitted from heavy-duty diesel trucks	probable human carcinogen	0.0001	0.2
Arsenic Compounds	naturally occurring element in the earth's crust, combines readily with many other elements; used in wood preservation, pesticides, & microelectronics manufacture; food ingestion is largest source of human exposure; found in motor vehicle exhaust due to impurities in fuel or fuel additives.	human carcinogen; nervous system, gastrointestinal, & respiratory effects; kidney damage	0.25	0.06
Mercury Compounds	metal used in batteries, lamps, industrial processes, refining, lubricants, & thermometers; emissions from motor vehicles are negligible	possible human carcinogen or nonclassifiable (depending on the form); neurotoxicity; kidney damage; gastrointestinal & respiratory effects	0.2	0.1
Naphthalene	white solid or powder hydrocarbon used as insecticide, moth repellant (moth balls), & in miscellaneous organic chemicals; also released to the air from burning of wood, coal, & oil; present in small quantities in gasoline and diesel fuels, it is emitted in exhaust and by evaporation	possible human carcinogen, anemia, liver & neurological damage, cataracts & retina damage	N.A.	N.A.

Table 3-12
EPA'S LIST OF MOBILE SOURCE AIR TOXICS

Substance[1]	General Description	Health Effects	On-highway Mobile Source Contribution to Total National Emissions[1]: Short Tons	On-highway Mobile Source Contribution to Total National Emissions[1]: % of Total National Emissions
Diesel Particulate Matter & Diesel Exhaust Organic Gases	particle (primarily polycyclic organic matter, metals, and dioxin) and gaseous (including benzene, formaldehyde, acetaldehyde, acrolein, & 1,3-butadiene) emissions	probable carcinogen; respiratory irritant		

Notes: 1. Source: EPA. 2001. Control of emissions of hazardous air pollutants from mobile sources; final rule. Federal Register 66:61 p17238, table III-2 listing emission inventories from 1996 National Toxics Inventory. 2. "Nonclassifiable" generally means that EPA has insufficient data upon which to base a classification of human carcinogenicity. The substance may or may not be a carcinogen; there simply is not enough relevant data to make a conclusion. 3. Includes organic compounds with more than one benzene ring and with a boiling point 100 degrees centigrade or higher; within this group, EPA has identified seven polynuclear aromatic hydrocarbons (PAH) as probable human carcinogens: benz(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, chrysene, 7,12-dimethylbenz(a)anthracene, and indeno(1,2,3-cd)pyrene. 4. Lead is a criteria pollutant for which a National Ambient Air Quality Standard was established in 1978. Lead as a gasoline additive was completely phased out in January 1996. Consequently, lead emissions from motor vehicles now are minimal and the Virginia Department of Environmental Quality discontinued monitoring atmospheric concentrations of lead in 1998.

It is also important to note that EPA determined that additional controls for these substances are not needed at present because existing and already-proposed control programs for volatile organic compounds (VOCs) and diesel particulate emissions are expected to achieve the maximum feasible reductions in emissions of these other substances as well. Thus EPA is not proposing to address air toxics on a project-by-project basis when it comes to mobile source air toxics. Accordingly, there are no National Ambient Air Quality Standards for any of these substances, with the exception of lead, which prior to its outlawing as a fuel additive had been a constituent of gasoline to boost octane. Notwithstanding, EPA has agreed under a consent degree to establish hazardous air pollutant emissions limits for motor vehicles by February 2007.

The majority of mobile source toxic emissions are hydrocarbons, which result from evaporation or incomplete combustion of petroleum fuels. Increasingly stringent emission standards over the last 35 years have dramatically lowered emissions of hydrocarbons. Prior to regulation, the typical emission rate for light-duty vehicles was 9 grams/mile, compared to the current standard of 0.09 grams/mile, a reduction of 99%. The EPA estimates that controls already in place will reduce on-highway emissions of benzene, formaldehyde, 1,3-butadiene, and acetaldehyde by 67-76% and diesel particulate emissions by 90% between 1990 and 2020.

In 2002, DEQ established an Air Toxic Monitoring Station in northern Virginia (in Lee Regional District Park at Telegraph Road and Rose Hill Drive, DEQ Site Code 46-B9, AIRS# 51-059-0030, approximately 5.5 miles southeast of the Capital Beltway Project). Data collected from the station will be used to characterize urban air toxic concentrations and to assess the reasonableness of the National Air Toxics Assessment (NATA) inventory/modeling that EPA conducted in 1999. The NATA estimates emissions and health risk information on 32-air toxics pollutants and diesel particulate matter (diesel PM). As shown in **Table 3-13**, the air samples collected at the site were analyzed for a number of target pollutants.

Table 3-13
DEQ TOXICS MONITORING DATA FROM NORTHERN VIRGINIA SITE

Substance	Concentrations (ppbV)[1]		
	Average	Minimum	Maximum
Toluene	0.324	0.07	1.08
Benzene	0.237	0.11	0.45
Ethylbenzene	0.046	0.01	0.12
m/p Xylene	0.116	0.02	0.39
1,3-Butadiene	0.057	0.01	0.23
Styrene	0.028	0.01	0.08
Acetaldehyde	0.901	0.388	1.820
Formaldehyde	2.24	0.378	9.900
Acrolein	0.053	0.010	0.172

Source: VDEQ Virginia Ambient Air Monitoring 2003 Data Report
Notes: 1. parts per billion of carbon

3.7 NOISE

3.7.1 Noise Terminology and Criteria

The potential noise impact of the proposed alternatives was assessed in accordance with Federal Highway Administration (FHWA) and Virginia Department of Transportation (VDOT) noise assessment guidelines. The FHWA guidelines are set forth in 23 CFR Part 772[1]. VDOT's regulations are contained within the State Noise Abatement Policy[2], and are consistent with the FHWA guidelines.

To determine the degree of impact of highway traffic noise on human activity, the Noise Abatement Criteria (NAC) established by the FHWA regulation were used in this study (see **Table 3-14**).

The NAC are given in terms of the hourly, A-weighted, equivalent sound level in decibels (dBA). The A-weighted sound level is a single number measure of sound intensity with weighted frequency characteristics that corresponds to human subjective response to noise. Most environmental noise (and the A-weighted sound level) fluctuates from moment to moment, and it is common practice to characterize the fluctuating level by a single number called the equivalent sound level (L_{eq}). The L_{eq} is the value or level of a steady, non-fluctuating sound that represents the same sound energy as the actual time-varying sound evaluated over the same time period. For traffic noise assessment, L_{eq} is typically evaluated over a one-hour period, and may be denoted as $L_{eq}(h)$.

Noise-sensitive land uses potentially affected by this project are in Category B and consist of residences, schools, places of worship, and parks and recreational areas where outdoor activity occurs. Per FHWA, noise impact occurs when the predicted design-year Build Alternative noise levels in the project area "approach or exceed" the NAC during the loudest

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[1] Federal Highway Administration, "23 CFR Part 772: Procedures for Abatement of Highway Traffic Noise and Construction Noise B Final Rule." Federal Register, Vol. 47, No. 131, 8 July 1982.

[2] Virginia Department of Transportation, "State Noise Abatement Policy," adopted pursuant to the authority of Section 33.1-12 of the Code of Virginia, January 1997.

hour of the day. As shown in Table 3-14 above, the applicable NAC for exterior activities in Category B is 67 dBA L_{eq}(h). VDOT defines the word "approach" to mean when the loudest-hour L_{eq} equals 1 dB less than the NAC. Therefore, noise impact is assessed when future Build noise levels equal or exceed 66 dBA L_{eq}, for Activity Category B.

Table 3-14
FHWA NOISE ABATEMENT CRITERIA

Activity Category	L_{eq}(h) (dBA)*	Description of Activity Category
A	57 (Exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67 (Exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries and hospitals
C	72 (Exterior)	Developed lands, properties, or activities not included in Categories A or B above.
D	--	Undeveloped lands.
E	52 (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals and auditoriums.

*Hourly Equivalent A-weighted Sound Level

In situations where there are no exterior activities that would be affected by traffic noise (such as may occur at places of worship or schools), noise impact is assessed with respect to the FHWA NAC for Activity Category E. The applicable NAC for interior activities is 52 dBA L_{eq}(h). Based on VDOT's definition of "approach," noise impact also occurs if interior noise levels with the future Build Alternative equal or exceed 51 dBA L_{eq}(h).

Noise impact also occurs when predicted project noise levels substantially exceed existing noise levels. An increase of 10 decibels or more is considered "substantial" by VDOT.

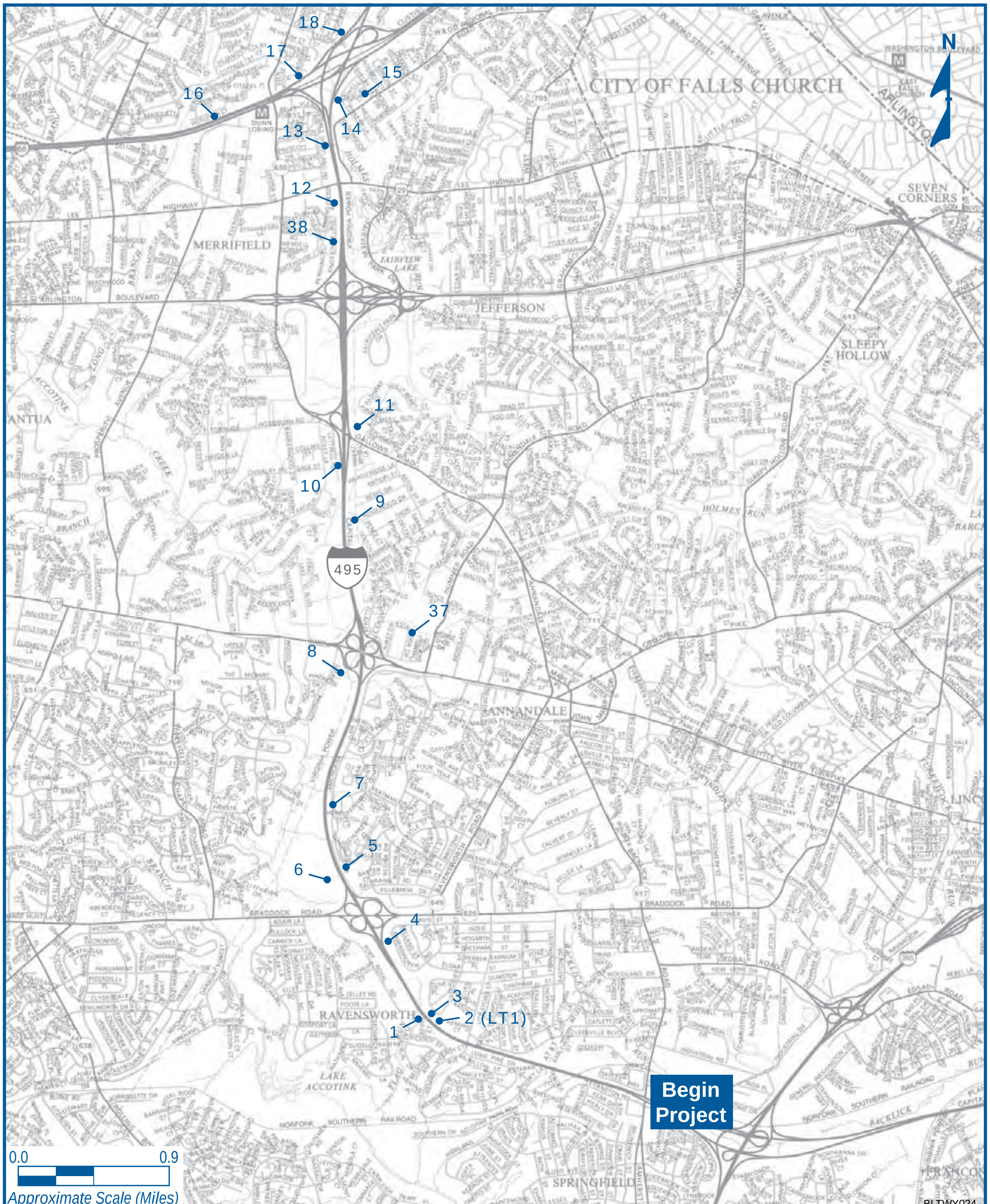
In short, for Category B land uses, wherever the predicted design-year Build Alternative noise levels during the loudest hour of the day either (1) equal or exceed 66 dBA Leq, or (2) exceed existing noise levels by 10 decibels or more, noise impact occurs. Likewise for Category E land uses, wherever the predicted design-year Build Alternative noise levels during the loudest hour of the day either (1) equal or exceed 51 dBA Leq, or (2) exceed existing noise levels by 10 decibels or more, noise impact is assessed.

If traffic noise impacts are identified as a result of the project, then noise abatement measures must be considered for feasibility and reasonableness.

Noise levels in the project study area were determined for the existing conditions, and the design-year No-Build and build conditions.

3.7.2 Existing Noise Conditions

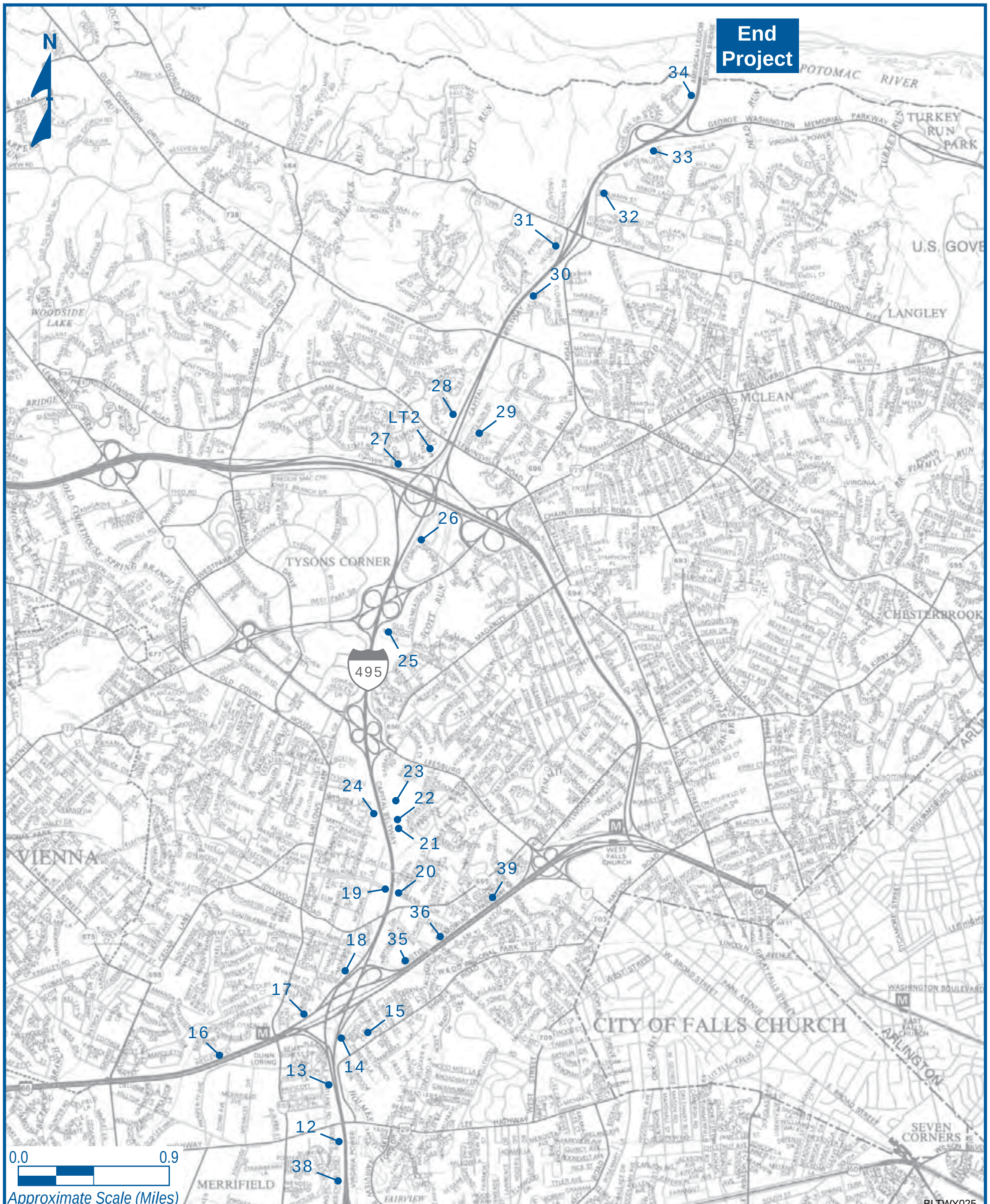
Existing noise levels were measured at noise-sensitive sites along the Beltway, as shown in **Figure 3-10**. Noise levels, shown in **Table 3-15**, are expressed as equivalent sound levels (L_{eq}) in A-weighted decibels (the A-weighting represents frequency characteristics that correspond to human subjective response to noise). The noise measurements provided valuable information on current noise conditions and the effects of terrain and shielding on sound propagation from the roadway to the nearby noise-sensitive land uses.



NOISE MEASUREMENT LOCATIONS
I-95/I-395/I-495 Interchange to I-66

Figure 3-10a
(1 of 2)

CAPITAL BELTWAY STUDY



NOISE MEASUREMENT LOCATIONS
I-66 to American Legion Memorial Bridge

CAPITAL BELTWAY STUDY

Figure 3-10b
(2 of 2)

Table 3-15
MEASURED SHORT-TERM NOISE LEVELS

		Measured L_{eq} (dBA)		
Site No.	**Location**	**Total**	**Traffic Only***	**Dominant Sources of Noise**
1	Cul-de-sac 5500 block Flag Run Drive	66	66	Beltway traffic, aircraft overflights, insects
2	Residence 7535 Axton Street	68	68	Beltway traffic, aircraft overflights,
3	Residence 7533 Axton Street	68	68	Beltway traffic, aircraft overflights, lawn mower
4	Residence 5338 Ravensworth Road	65	65	Beltway traffic, aircraft overflights, birds
5	Fitzhugh Park Basketball Court 4966 Americana Drive	69	69	Beltway traffic, local traffic
6	Wakefield Park Hiking Trail (near picnic area) 8100 Braddock Road	61	61	Beltway traffic, aircraft overflights, local traffic, siren
7	Bristow Village Townhomes 4900 block Americana Drive	67	67	Beltway traffic, local traffic
8	Americana Park Baseball Field 4301 Accotink Parkway	58	58	Beltway traffic, local traffic, aircraft overflights
9	Residence 3475-3476 Pence Court	70	70	Beltway traffic, aircraft overflights
10	Residence 3450 Luttrell Avenue	65	65	Beltway traffic, aircraft overflights
11	Residence 7916 Sycamore Drive	60	59	Beltway traffic, aircraft overflights
12B	Yorktowne Square Condominiums Kings Chapel Road	68	68	Beltway traffic, local traffic
13	Residence 2725 Pleasantdale Road	72	72	Beltway traffic, aircraft overflights, local traffic
14	Residence 2622 Pioneer Lane	62	62	Beltway traffic, local traffic
15	Residence 2620 Shelby Court	56	56	Distant Beltway and I-66 traffic, birds, aircraft overflights, local traffic
16	Residence 8331 Wesleyan Street	68	68	I-66 traffic
17	Residence 8101 Cottage Street	65	65	Beltway and I-66 traffic, aircraft overflights
18	Iliff Rehabilitation Center 8000 Illiff Drive	66	66	Beltway traffic, aircraft overflights, car door
19	Vacant Land 7800 block Railroad Street (at Beltway)	66	66	Beltway traffic, aircraft overflights, siren
20	Residence 7810 Helena Drive	67	65	Beltway traffic, aircraft overflights, wind

Table 3-15
MEASURED SHORT-TERM NOISE LEVELS

		Measured L_{eq} (dBA)		
Site No.	**Location**	**Total**	**Traffic Only***	**Dominant Sources of Noise**
21	Renaissance Apartments Balcony (1st Floor) 2230 George C. Marshall Drive	69	69	Beltway traffic, parking lot traffic, aircraft overflights, a/c units
22	Renaissance Apartments Tennis Courts 2230 George C. Marshall Drive	63	63	Beltway traffic, fan noise
23	Marshall High School 7731 Leesburg Pike	62	62	Beltway traffic, aircraft overflights
24	Residence 2121 Tyson Executive Village	60	60	Beltway traffic, local traffic, aircraft overflights, construction equipment
25	Residence 1808 Old Meadow Road, Apartment 605	66	66	Beltway traffic, aircraft overflights
26	Gates of McLean Apartments 1500 block Spring Gate Drive	63	62	Beltway traffic, aircraft overflights
27A	Residence (patio) 7733 Falstaff Road	58	57	Beltway traffic, aircraft overflights, birds, insects
27B	Residence (deck) 7733 Falstaff Road	59	58	Beltway traffic, aircraft overflights, birds, insects
28	Residence 7600 Timberly Court	65	65	Beltway traffic, aircraft overflights
29	Residence 7506 Box Elder Court	60	59	Beltway traffic, aircraft overflights , lawn mowers
30	Residence 1038 Delf Drive	71	71	Beltway traffic, aircraft overflights
31	Residence 906 Helga Place	61	61	Beltway traffic, aircraft overflights
32	Residence 7112 Benjamin Street	60	59	Beltway traffic, aircraft overflights, local traffic
33	Residence 720 Lawton Street	59	59	Beltway and G.W. Parkway traffic, aircraft overflights, barking dog
34	Residence 611 Live Oak Drive	74	74	Beltway traffic, aircraft overflights
35	Idylwood Park Athletic Field 7800 Virginia Lane	61	61	I-66 traffic, Metrorail trains
36	Residence Opposite 2430 Center Street	57	57	I-66 traffic, Metrorail trains, birds
37	Residence 4034 Estabrook Drive	60	57	Little River Turnpike and Lafayette Village Drive traffic
38	Yorktowne Square Condominiums 2902/2904/2906 Kings Chapel Road	68	68	Beltway traffic
39	Residence 7424 Leighton Drive West	59	59	I-66 traffic, Metrorail trains, aircraft overflights

* The “Traffic-Only” noise measurement represents the equivalent sound level excluding those 1-minute periods dominated by noise events that were not traffic-related.

Short-Term Measurements. The measured noise levels (L_{eq}) along the Beltway ranged from a low of 56 dBA in front of 2620 Shelby Court (Site 15) to a high of 74 dBA at the north end of Live Oaks Drive (Site 34). At almost every site, the dominant noise sources included traffic on the Beltway, traffic on local roads, and aircraft flying overhead. These noise sources are typical in the project area and are included in the *total* noise levels shown in Table 3-14. At measurement sites nearest the Beltway, the *total* and *traffic-only* noise levels were very close, indicating that traffic is the dominant noise source at those locations. At measurement sites in quieter locations farther from the roadway, the contributions from aircraft and other noise sources were more important, resulting in a greater difference between the *total* and the *traffic-only* noise levels.

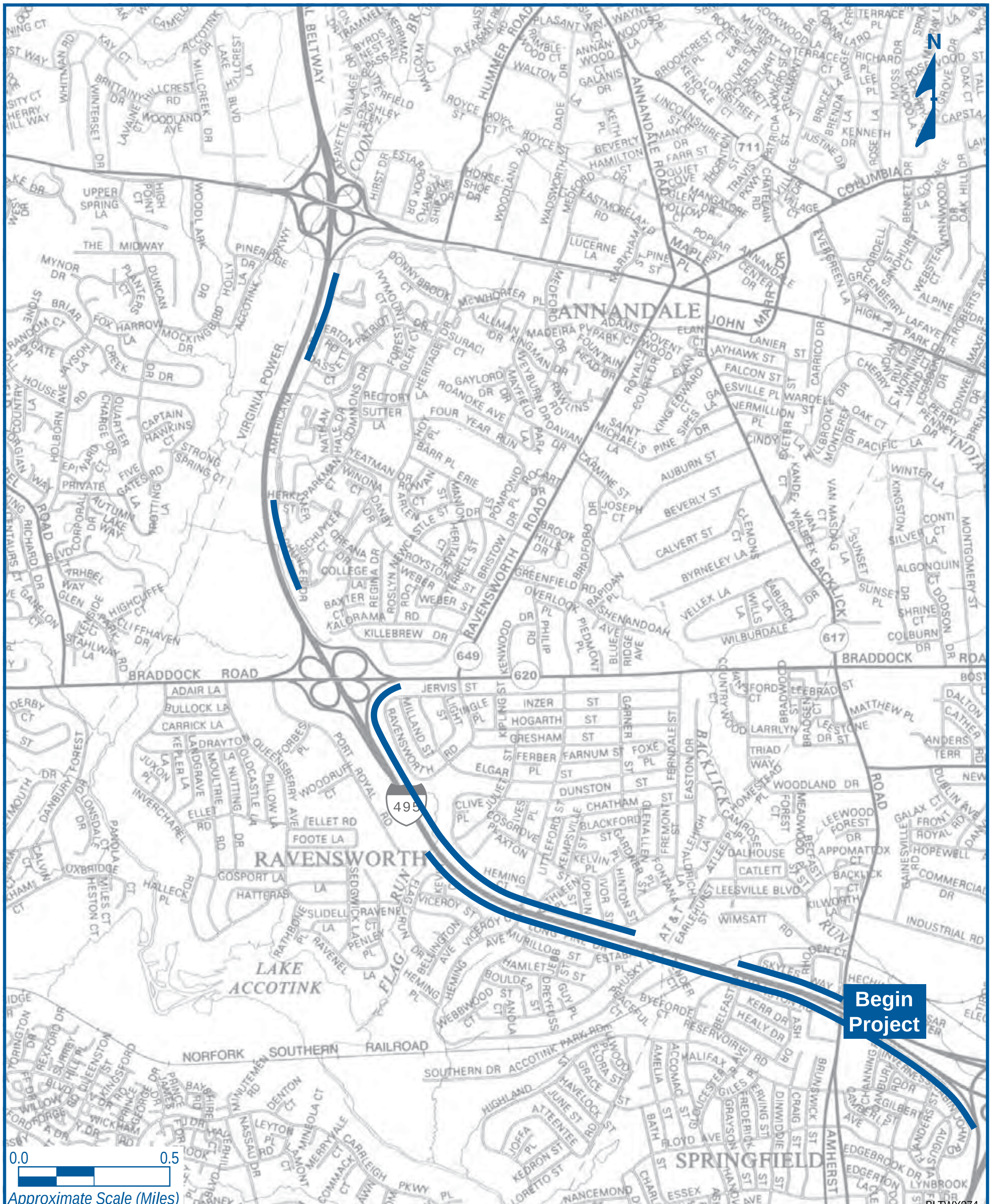
Long-Term Measurements. Measurements over a period of 24 hours were conducted at two sites in the project area to determine the daily cycle of fluctuations in noise levels and the loudest hour of the day. Both sites were adjacent to the Beltway where the noise environment was dominated by Beltway traffic. The hourly L_{eq} varied by up to 9 dBA over a 24-hour period. At Site LT1 on Axton Street in North Springfield, the loudest hourly noise level approached 69 dBA (L_{eq}) for the hour starting at 3 p.m. The loudest hourly noise levels approached 67 dBA (L_{eq}) for the hours starting at 1 p.m. and 2 p.m. at Site LT2 on Snow Meadow Lane in McLean.

Existing Sound Barriers. Several existing noise barriers within the project area would be removed due to the widening of the highway. The noise reductions provided by existing sound barriers were included in the estimates of existing loudest-hour noise levels. It has been VDOT's practice to replace any existing noise barriers that are removed as the result of a widening project. **Figure 3-11** shows the locations of existing barriers throughout the project area.

3.8 VISUAL AND AESTHETIC CONDITIONS

The visual characteristics of the Beltway are typical of interstate highways surrounding major metropolitan areas, except that trees, shrubs, and herbaceous plants growing on some unused portions of VDOT's right-of-way often provide a buffer for adjacent development (see **Figure 3-12**). The most dominant features are the roadway itself, nearby vegetation, and roadway-related appurtenances, such as interchanges, overpasses, retaining or noise walls, and signs. Several parks and private lands that abut the Beltway encompass higher-quality forests and natural areas.

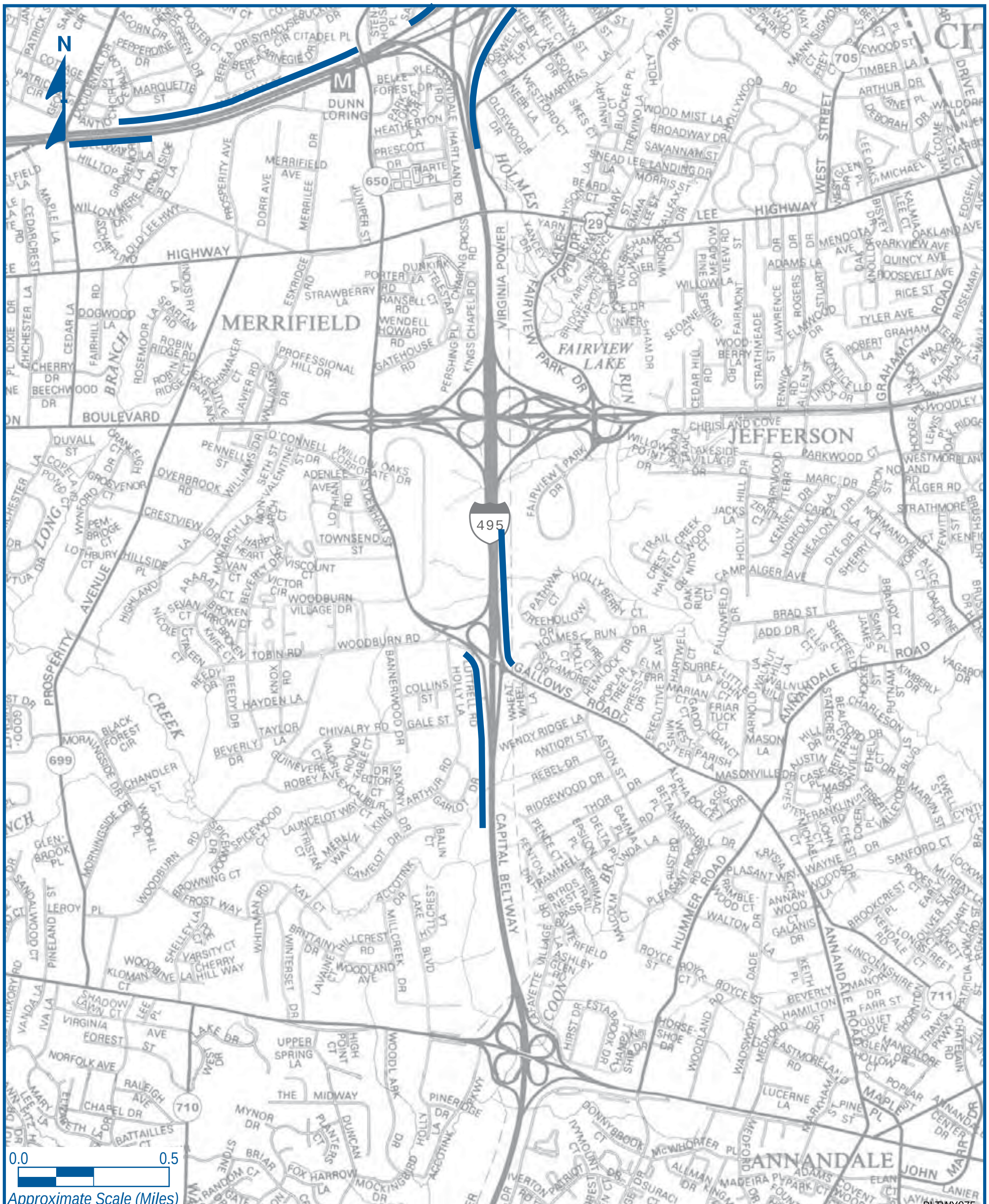
From the driver's perspective, the Beltway is an interstate facility, generally 8 lanes in width separated by concrete barriers. Most of the roadway is located below the grade of adjoining development, with most interchanges crossing over the Beltway. The Beltway is primarily bordered on both sides by trees, grassy knolls, and other vegetation. This vegetation includes low-quality forest growth, dense scrub, and invasive species that often occupy open or disturbed ground adjacent to highways and other developed areas. In most cases, these trees are planted on and around a berm, which provides a buffer between the Beltway and nearby communities. This vegetation is broken intermittently by noise barriers, overpasses, and interchanges. Noise barriers (of varying design) are also visible along portions of the Beltway. They are more prevalent in areas near interchanges where homes and other buildings are located closer to the roadway than on most mainline sections. In many cases, they have been placed away from the edge of the pavement, and are obscured by shrubs and trees planted between the wall and the roadway.



LOCATIONS OF EXISTING NOISE BARRIERS
I-95/I-395/I-495 Interchange to Little River Turnpike

Figure 3-11a
(1 of 4)

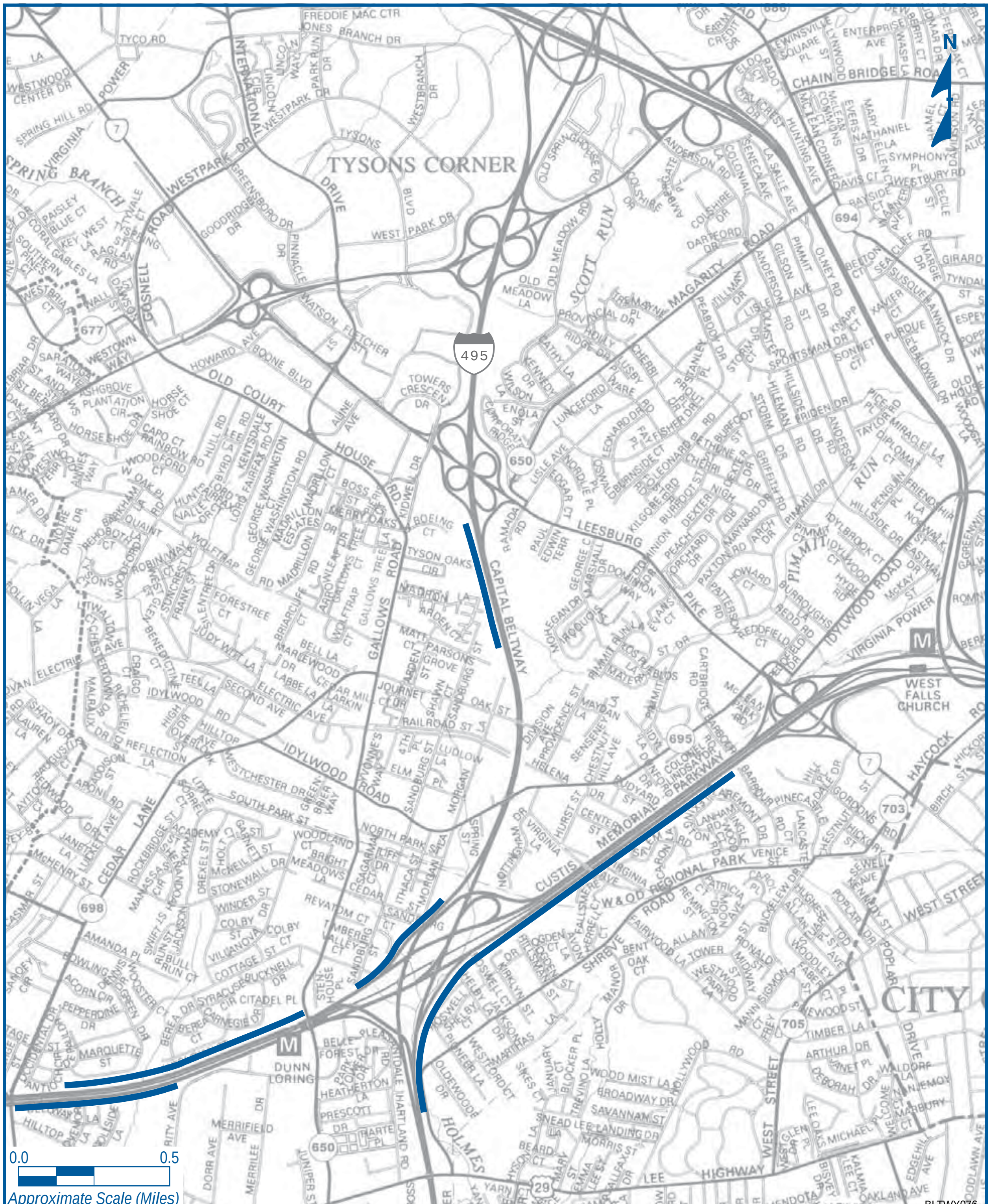
CAPITAL BELTWAY STUDY



LOCATIONS OF EXISTING NOISE BARRIERS
Little River Turnpike to I-66

Figure 3-11b
(2 of 4)

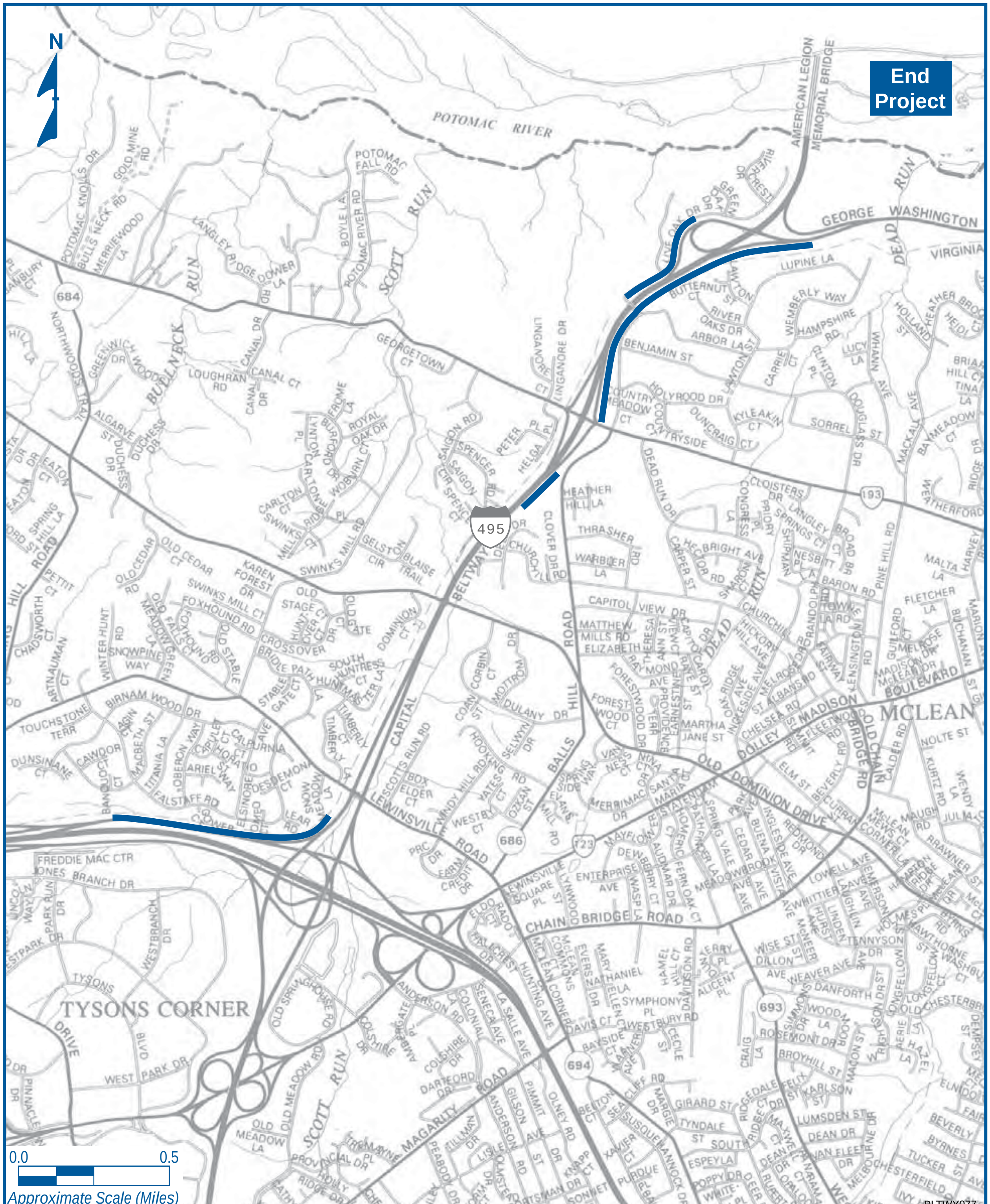
CAPITAL BELTWAY STUDY



LOCATIONS OF EXISTING NOISE BARRIERS
I-66 to Dulles Access/Toll Road

Figure 3-11c
(3 of 4)

CAPITAL BELTWAY STUDY



LOCATIONS OF EXISTING NOISE BARRIERS
Dulles Access/Toll Road to American Legion Memorial Bridge

Figure 3-11d
(4 of 4)

CAPITAL BELTWAY STUDY

Typical Beltway section characterized by overhead signs, low-level overpasses, and tree buffer.

Standard noise barriers south of the Braddock Road interchange.

Electrical transmission lines adjacent the Beltway north of Gallows Road.

Multi-story buildings at Tysons Corner.

BLTWY107

VISUAL SETTING Figure 3-12

CAPITAL BELTWAY STUDY

Along other sections of the Beltway, wooden fences screen the roadway or interchange from adjacent neighborhoods. Also visible are power and telephone transmission lines, electrical transformers and substations, radio towers, and communication towers. There are no particularly striking natural features that provide scenic views along the Beltway. In Tysons Corner, several buildings, particularly Tycon Tower, near the Leesburg Pike (Route 7) interchange and the recently completed Gannett/USA Today building at the Dulles Access/Toll Road interchange, serve as gateways into Tysons Corner and are prominent in the driver's viewshed.

From a relational aesthetics perspective (that of non-drivers with a view of the road), the topography, noise walls and vegetation obscure most highway facilities from view. While adjacent neighborhoods are generally buffered from direct views of the highway, there are locations where the differences in elevation between the roadway and nearby development prevent complete obstruction (particularly during the winter). People using the several parks that abut the Beltway may also see views of the Beltway. However, in most cases, park facilities (playgrounds, ball fields, trails, etc.) are located away from the Beltway and are generally screened with vegetation and/or noise walls. In the case of the W&OD Railroad Regional Park, users cross the Beltway immediately north of the I-66 interchange and are given a bird's eye view of the highway.

3.9 NATURAL ENVIRONMENT

3.9.1 Geology, Soils, and Groundwater

The project area lies within the inner Piedmont physiographic province, which is characterized by gently rolling topography and deeply weathered crystalline rocks that range in age from Precambrian to Paleozoic. Average elevations range from 250 feet above mean sea level (msl) to 350 feet above msl, except near the American Legion Bridge, where elevations rapidly decline along steep slopes to an elevation of about 50 feet above msl near the edge of the Potomac River. The highest elevations (450 to 500 feet above msl) occur near Tysons Corner and Dunn Loring.

In the vicinity of the Beltway, the ground surface is underlain primarily by metamorphosed sedimentary rock (metasandstones and schist) and transported igneous rock. Soils in stream valleys consist of alluvial sands and gravels formed by fluvial erosion and episodic deposition from overbank flooding. The recent alluvial deposits consist of micaceous silt and sands as well as quartz and crystalline pebbles, cobbles, and boulders. In the southern end of the project area, terrace deposits are present above the modern floodplains and include well-bedded, gently sloping graded deposits of gravel, sand, silt, and clay. Because of urbanization, no farms and no prime or unique farmland soils under the purview of the Farmland Protection Policy Act of 1981 are found in the project area.

The Fairfax County soils maps indicate three soil types within the project area that have potential engineering constraints: marine clay (Patapsco clay) and soils from the Orange and Iredell series. Geotechnical analyses can be performed to avoid or manage any potential problems encountered with these soil types. Rocks and soils associated with radon gas emissions have been studied in detail within Fairfax County, but most areas in Northern Virginia with a high likelihood for these formations lie west of the project area.

According to the Fairfax County Water Authority (FCWA), the Occoquan Reservoir and Potomac River account for approximately 99 percent of the county's water supply (Fairfax County, 1995).

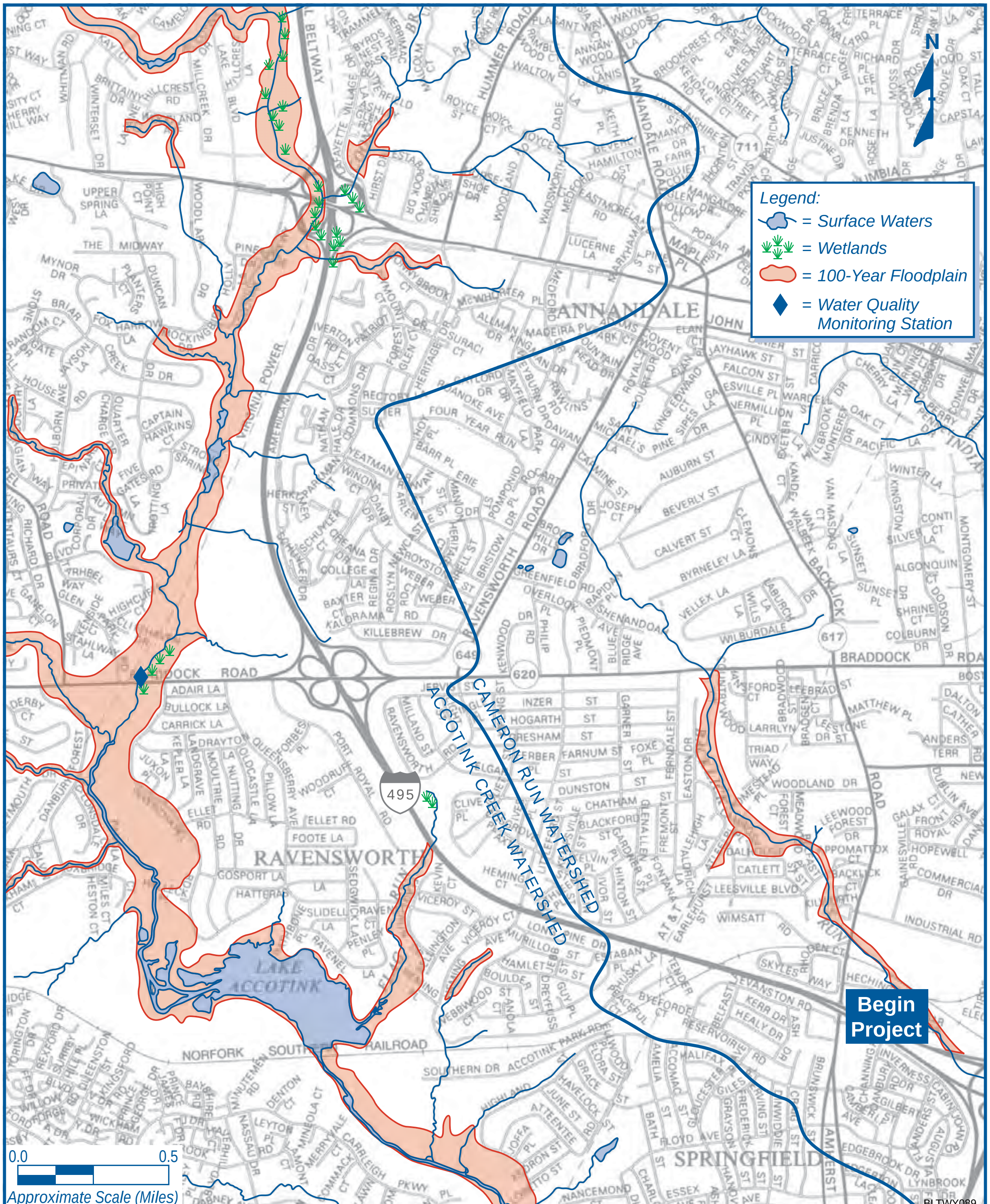
The FCWA projects that surface water withdrawals from these sources will continue to increase through 2005, with groundwater assuming less of a role in the future water supply for the county. Most businesses and residences in the vicinity of the Beltway are served by public water supply systems that use surface water from the Potomac River. However, some homeowners rely on wells for their water, especially north of I-66, where the project area is underlain by a lower Paleozoic/Precambrian schist aquifer. This aquifer provides yields that are adequate for residential use and the quality of the water is considered to be excellent. Lands south of I-66 are underlain by bedrock aquifers that consist of Paleozoic/Precambrian metamorphic and igneous rocks. Wells in the bedrock aquifers provide very low yields, less than 50 gallons per minute. None of the aquifers located in the vicinity of the Beltway have been designated sole-source aquifers by EPA.

3.9.2 Surface Waters

The project area is located entirely within the Potomac River watershed. Several perennial watercourses traverse the project area, including Backlick Run, Accotink Creek, Flag Run, Scotts Run, Holmes Run, Coon Branch, and the Potomac River, as shown in **Figure 3-13**. Contributing sub-basins include Cameron Run, Accotink Creek, Pimmit Run, Dead Run, and Scotts Run (Fairfax County, 1994). All of these waters have existing sediment, water quality, and water quantity problems (Hoffman, 1998).

Surface water quality varies with land cover. At the southern end of the project area, the Holmes Run portion of the Cameron Run watershed is urbanized, with impervious surfaces occupying nearly 30 percent of the area in the vicinity of the Beltway. Water quality and site conditions are comparably poor. The Accotink Creek watershed is developed throughout, with highly urbanized areas in its upper portion. Downstream of the Beltway, Accotink Creek has degraded site conditions, including poor biotic integrity, habitat, and fish taxa richness. Impervious surfaces occupy nearly 30 percent of the area, and eroded stream banks and unstable habitat are characteristic of the upper watershed. Watersheds in the northern end are less developed. Nearly 50 percent of the Scotts Run and Dead Run watersheds are forested, but the headwaters of both streams begin in or near Tysons Corner. Impervious surfaces in the Scotts Run watershed occupy as much as 40 percent of the land area, and they occupy more than 20 percent in the Dead Run watershed. Both streams have poor biotic integrity, low fish taxa richness, and poor to very poor ratings for overall site conditions (Fairfax County, 2001). Low-intensity residential land use occupies almost half of the Pimmit Run watershed, contributing to the more than 25 percent impervious surfaces in the watershed. Site conditions and biotic integrity in the watershed are poor, also due to the development between Tysons Corner and Falls Church. The degradation of water quality in these watersheds is attributed not only to the level of development, but also to the historic approach to stormwater management that encouraged runoff to enter streams as quickly as possible (Fairfax County, 2001).

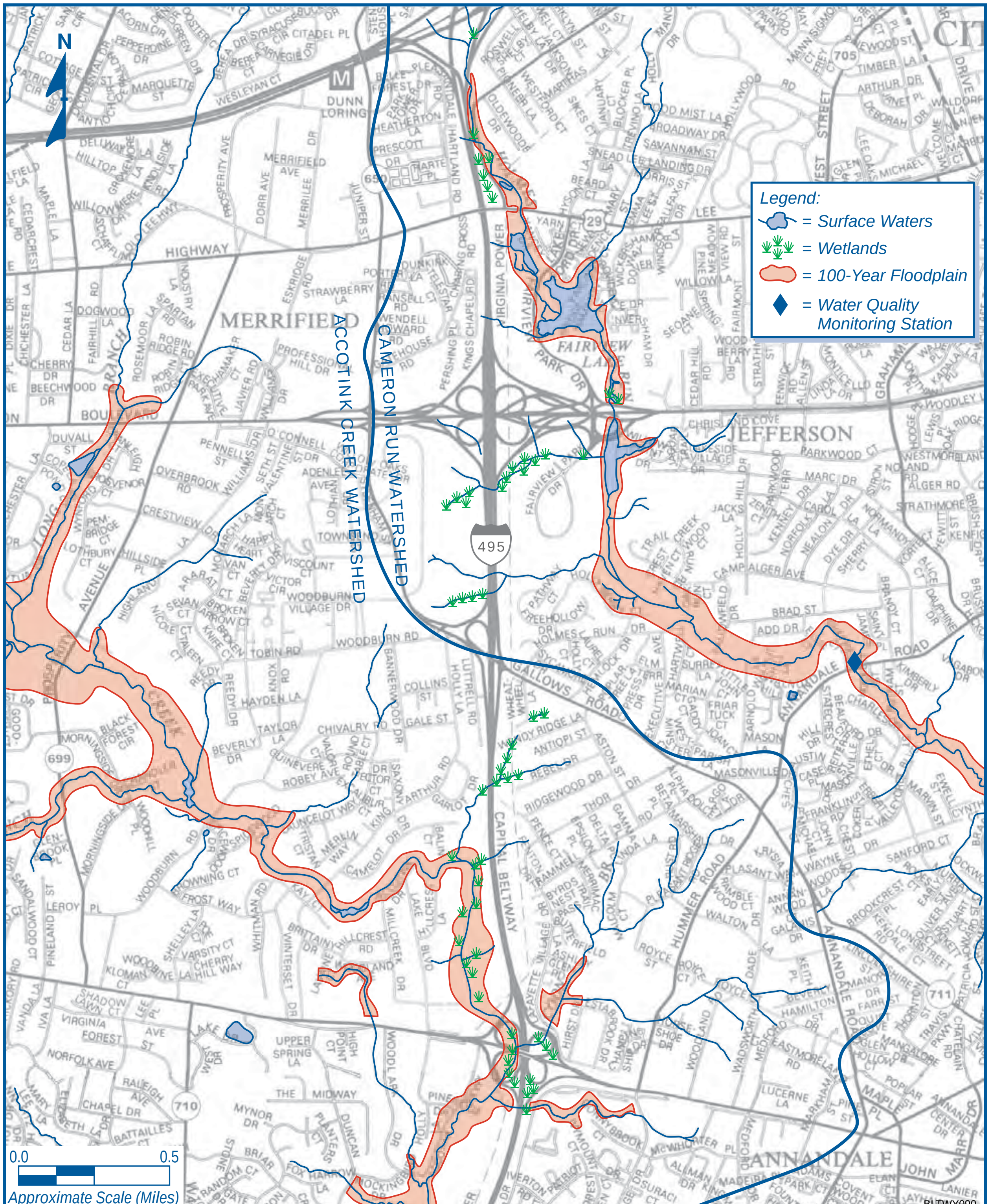
VDEQ has designated surface waters in the project area as Class III waters: non-tidal waters of the Coastal and Piedmont Zones. **Table 3-16** summarizes Virginia water quality standards for these surface waters. Certification of compliance with state water quality standards is required for discharges to surface waters regulated under Section 401 of the Clean Water Act. VDEQ retains Section 401 certification authority for all surface waters in the state. Water quality in Accotink Creek is monitored at a station near Braddock Road (see Figure 3-13). The station is operated as part of both the National Water Quality Assessment.



WATER RESOURCES
I-95/I-395/I-495 Interchange to Little River Turnpike

Figure 3-13a
(1 of 4)

CAPITAL BELTWAY STUDY



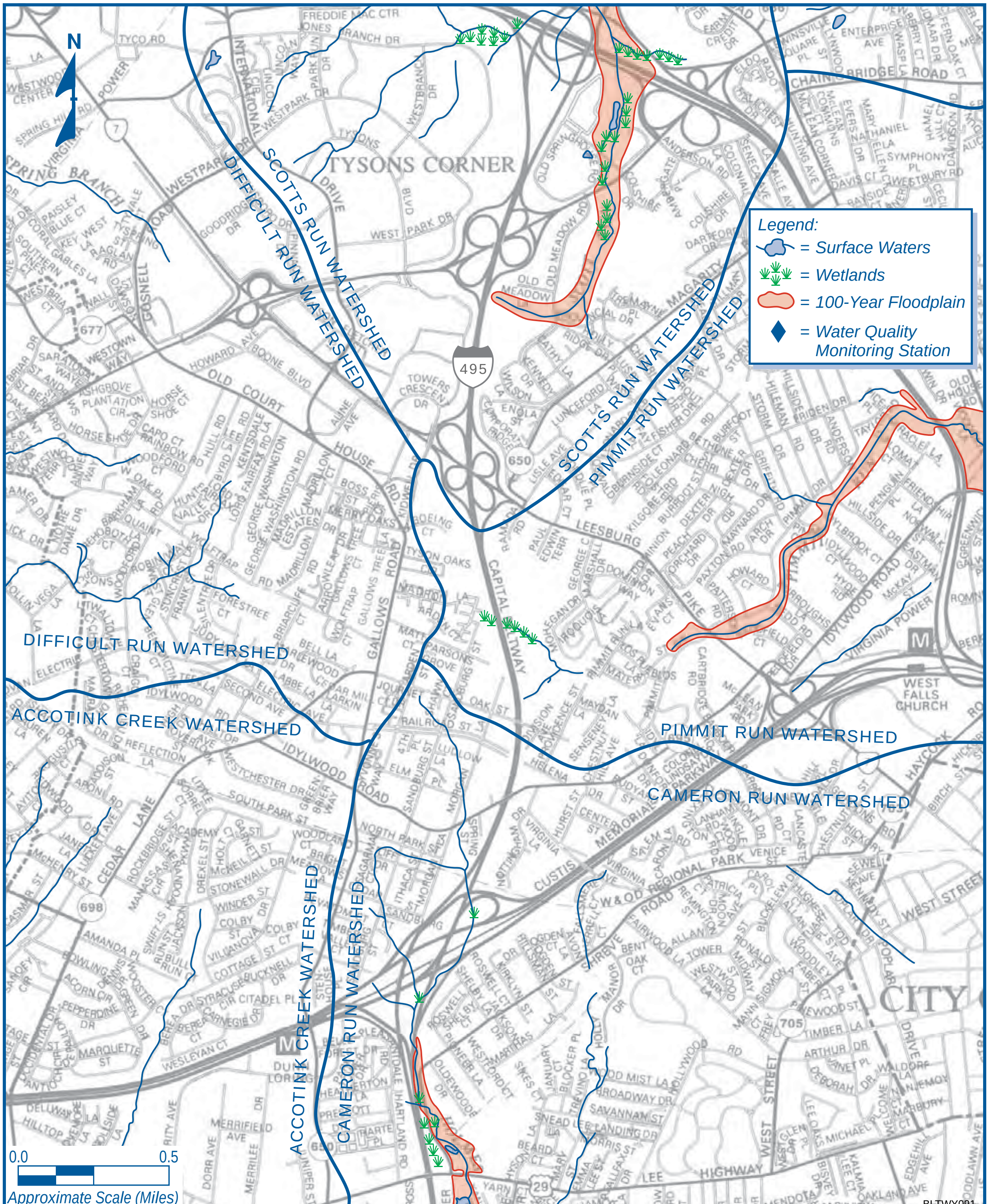
WATERSHED RESOURCES

Figure 3-13b

Little River Turnpike to I-66

(2 of 4)

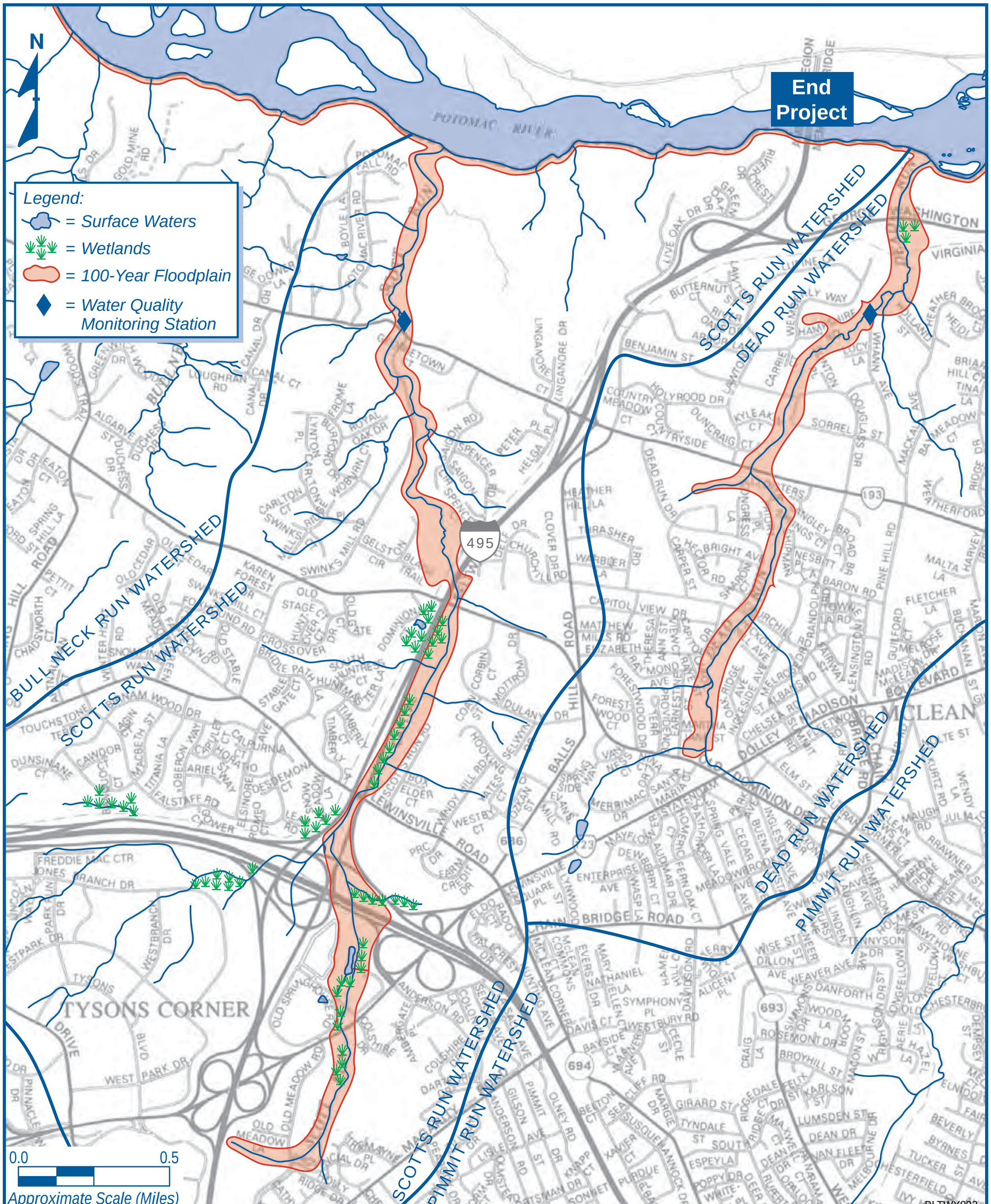
CAPITAL BELTWAY STUDY



WATER RESOURCES
I-66 to Dulles Access/Toll Road

Figure 3-13c
(3 of 4)

CAPITAL BELTWAY STUDY



WATER RESOURCES
Dulles Access/Toll Road to American Legion Memorial Bridge

CAPITAL BELTWAY STUDY

Figure 3-13d
(4 of 4)

TABLE 3-16
VIRGINIA WATER QUALITY STANDARDS FOR CLASS III NON-TIDAL WATERS

Criteria	Dissolved Oxygen (mg/L)		pH Range	Maximum Temperature	Fecal Coliform	
	Minimum	Daily Average			30-Day[1]	Max.[2]
Standard	4.0	5.0	6.0-9.0	32°C	200	1,000

1. Geometric mean of 200 fecal coliform bacteria per 100 ml of water for two or more samples over a 30-day period.
2. 1,000 fecal coliform bacteria per 100 ml at any time.

Source: Virginia Water Quality Standards (9 VAC 25-260-5)

Program for the United States Geological Survey (USGS) and the Ambient Water Quality Monitoring Program for VDEQ. Normal flows range from less than 10 cubic feet per second (cfs) in late summer to storm flows of 50 cfs, and, occasionally, to more than 1,200 cfs. Available data from monthly samples collected at this station between April 1993 and June 1998 show no violations of the state water quality standards for dissolved oxygen, pH, or temperature. However, sections of Accotink Creek (miles 4.5 and 10.18) are now considered impaired waters due to general standards for benthic and fecal coliform contamination (Friends of the Rivers of Virginia, 2001). This includes the region around the I-95 and I-495 crossings of Accotink Creek.

The Fairfax County Health Department (FCHD) also monitors water quality in the project area, including monitoring stations in Accotink Creek, Holmes Run, Scotts Run, Pimmit Run, and Dead Run (see Figure 3-13). Samples of fecal coliform bacteria collected in streams throughout the county revealed that 13 percent of the streams were in the "good water quality" range, based on the standard of having a geometric mean of less than 200 fecal coliform bacteria per 100 ml of water for two or more samples over a 30-day period. Similarly, 14 percent of samples from the Scotts Run monitoring station were in the "good water quality" range. Only 5 percent of samples from the Dead Run and Accotink Creek monitoring stations were within the standard. The Pimmit Run and Cameron Run watersheds had slightly better water quality for fecal coliform, with 10 and 15 percent of samples in the acceptable range, respectively.

Overall, these results indicate that water quality is fair for fecal coliform (FCHD, 2000). However, water quality for the chemical and physical parameters of the streams was good. For instance, average dissolved oxygen concentrations for all samples in the vicinity of the Beltway were well above the minimum standard of 4.0 mg/l. Average pH readings at these monitoring stations were above the 6.0 pH minimum, ranging from 7.2 to 7.7 (FCHD, 2000).

3.9.3 Wetlands

The U.S. Army Corps of Engineers (COE) administers regulations for activities affecting waters of the U.S. and navigable waters pursuant to Section 404 of the Clean Water Act of 1977, as amended, and Section 10 of the Rivers and Harbors Act of 1899. Waters of the U.S. include special aquatic sites, such as sanctuaries and refuges, wetlands, mud flats, vegetated shallows, coral reefs, and riffle and pool complexes, as defined by EPA's 404 (b)(1) guidelines. There are no navigable waters in the project area that are subject to jurisdiction under the Rivers and Harbors Act.

All wetlands within 165 feet (50 meters) of the edge of existing pavement were identified. Preliminary information was gathered from National Wetland Inventory Maps, USDA/NRCS soil maps and reports, 1990 Fairfax County Soil Science Office mapping, COE Jurisdictional Determinations issued for Accotink Stream Valley Park, aerial photography, and planimetric and topographic maps. Subsequently, field delineations were conducted based on a synthesis of this information. Field investigations were conducted between September and November 1997, May and August 1999, and September and October 2000. The 1987 COE *Wetlands Delineation Manual* and other applicable federal guidance (1992 and 1999) were applied in making wetland determinations and identifying jurisdictional and non-jurisdictional areas. The COE issued a written Jurisdictional Determination verifying all wetlands as accurate in March 2001, and on May 2, 2001. Verified wetlands located within the project area are shown in Figure 3-13 and are summarized by type and area in **Table 3-17**. The *Natural Resources Technical Report* provides detailed supplemental data relative to the location and nature of these wetlands.

Table 3-17
SUMMARY OF WETLANDS WITHIN 165 FEET (50 METERS) OF THE BELTWAY

Cowardin Class*	Description	Area (acres)	Area (hectares)
PEM1A	Palustrine, Emergent, Persistent, Temporarily Flooded	1.37	0.555
PEM1C	Palustrine, Emergent, Persistent, Seasonally Flooded	0.84	0.340
PFO1A	Palustrine, Forested, Broad-leaved Deciduous, Temporarily Flooded	9.86	3.988
PFO1C	Palustrine, Forested, Broad-leaved Deciduous, Seasonally Flooded	9.21	3.726
PSS1A	Palustrine, Scrub-Shrub, Broad-leaved Deciduous, Temporarily Flooded	0.40	0.161
PSS1C	Palustrine, Scrub-Shrub, Broad-leaved Deciduous, Seasonally Flooded	0.18	0.074
Various	Isolated, Non-jurisdictional Wetlands	0.67	0.271
	Total Wetland Area	22.52	9.11

* Cowardin Class refers to the common method of describing wetland types, according to Cowardin et al. 1979.

The functions and values for wetlands along the Beltway were identified according to best professional experience and judgment, with the aid of specific supporting methodology and other considerations relative to each function and value. Function-value evaluation forms were used to record information about the general physical wetland setting (size, wetland type, location in the watershed, and ecological/physical characteristics). Descriptive comments were added for more specific qualitative characterization of each wetland relative to its various functions. These forms are provided in the *Natural Resources Technical Report*. In general, wetlands along the Beltway provide floodflow attenuation, sediment and shoreline stabilization, nutrient removal, and wildlife habitat. Larger wetlands tend to retain stormwater, dissipate erosive energy, protect waterway banks, and treat and process pollutants and excessive nutrients generated from highway and developed area runoff. Project-area wetlands also serve as important habitats for wildlife living within an urban landscape.

3.9.4 Floodplains

Executive Order 11988 requires avoidance of long- and short-term effects associated with the modification of and development in floodplains whenever there is a practicable alternative. Practicable alternatives could include bridging floodplains versus the placement of fills, shifting alignments to minimize impacts, or other measures that reduce or minimize significant encroachments where such encroachments occur.

The Federal Emergency Management Agency (FEMA) delineates 100-year (Zone A) and 500-year (Zone B) floodplains on flood boundary maps as part of the National Flood Insurance Program. The 100-year floodplain refers to the area along or adjacent to a stream or body of water that is capable of storing or conveying floodwaters during a 100-year frequency storm. Figure 3-13 illustrates the extent of designated 100-year floodplains in the project area.

3.9.5 Special Jurisdictions

Chesapeake Bay Protection Areas. The Chesapeake Bay Preservation Act of 1988 authorized tidewater localities to develop and adopt local programs designed to protect water quality in the Chesapeake Bay and its tributaries.

Fairfax County has established Resource Protection Areas (RPAs) and Resource Management Areas (RMAs) to deal with development activities in environmentally sensitive areas of the Chesapeake Bay watershed. RPAs are lands at or near the shoreline that have intrinsic water quality value for ecological and biological processes, or that are sensitive to significant water quality degradation impacts. The RPA designation includes tidal wetlands, tidal shores, non-tidal wetlands that are connected by surface flow and contiguous to tidal wetlands or tributary streams, and a minimum 100-foot (30-meter) buffer landward along both sides of any tributary stream. RMAs designated by Fairfax County include floodplains, highly erodible soils, steep slopes, highly permeable soils, and non-tidal wetlands not designated in RPA zones.

Public roads and associated structures are exempt from Chesapeake Bay Preservation Act regulations as long as encroachment in the RPA is minimized and approved erosion and sediment control and stormwater management plans are implemented.

Coastal Zones. The Coastal Zone Management Act of 1972, as amended, enabled the Commonwealth of Virginia to develop programs that implement the policies of the Act. The Virginia Coastal Resources Management Program (CRMP), which was established to preserve, protect, develop, and restore coastal resources, applies to all of Fairfax County. The CRMP uses existing legislation and regulations to handle land use issues in the coastal zone. Federal agencies and applicants for federal approvals and funding must consider and comply with the Virginia CRMP. This project must comply with the following core programs of the CRMP: Wetlands Management, Fisheries Management, Non-Point Source Water Pollution Control, Point Source Water Pollution Control, and Air Pollution Control. Compliance will be achieved through agency consultation during applicable permit processes.

3.9.6 Wildlife and Habitats

Wildlife in the region generally includes common species that are best able to adapt to suburban and urban areas and occupy a wide range of habitats. A relatively low number of species use the aquatic and terrestrial habitats in the vicinity of the Beltway due to their small size, disturbed nature, urbanized surroundings, and distance from larger undeveloped habitats. Samples of wildlife populations reveal low population densities, primarily owing to the patchiness and disturbed nature of habitats and the lack of contiguous habitat patches. For example, the Virginia Department of Forestry has documented the low quality of forest resources in the project area.

An exception to the low-quality habitats near the Beltway is along its northern portion, north of the Dulles Access/Toll Road. This area encompasses a relatively undeveloped portion of land along the Potomac River that is characterized by north-facing cliffs, bluffs, ravines, and a narrow and sheltered floodplain. The Virginia Division of Natural Heritage (VDNH) has documented 25 Natural Heritage Resources (NHRs) in this predominantly forested location. NHRs are defined as “rare plant and animal species, rare and exemplary natural communities, and significant geologic features”. VDNH has established protection priorities for these resources. A complete listing, along with protection rankings, is provided in the *Natural Resources Technical Report*.

Aquatic Ecology. Aquatic habitats in the vicinity of the Beltway consist of natural and manmade non-tidal palustrine systems, riparian corridors, ditches, and ponds. Dominant overstory species typically include a mixture of bottomland communities such as willow oak (*Quercus phellos*), pin oak (*Quercus palustris*), red maple (*Acer rubrum*), tulip poplar (*Liriodendron tulipifera*), box elder (*Acer negundo*), elm (*Ulmus americana*), sweetgum (*Liquidambar styraciflua*), and black gum (*Nyssa sylvatica*). Understory sapling and shrub species include arrowwood (*Viburnum dentatum*), sweet pepperbush (*Clethra alnifolia*), highbush blueberry (*Vaccinium corymbosum*), ironwood (*Carpinus caroliniana*), elderberry (*Sambucus canadensis*), spicebush (*Lindera benzoin*), and black willow (*Salix nigra*). Wet areas support distinctive herbaceous plants such as skunk cabbage (*Symplocarpus foetidus*), cardinal flower (*Lobelia cardinalis*), calico aster (*Aster lateriflorus*), rattlebox (*Ludwigia alternifolia*), cattail (*Typha latifolia*), and wood reed grass (*Cinna arundinacea*).

Wildlife resources in riparian and palustrine systems use the dense cover provided by bottomland forest, alluvial thickets, pools, and stream banks. Species that are more dependent on the proximity to water have higher population densities as a result of contiguous tracts of forested areas along streams. Regional wetlands provide habitats for many birds, including waterfowl, migratory songbirds, and a few shorebirds. Some species may populate larger, more stable wetlands year round, while most use them seasonally for breeding, feeding, resting, or overwintering. Nesting wetland birds include red-winged blackbirds, green and blue herons, bitterns, mallards, gulls, Canada geese, black and wood ducks, and rails. More stable wetland communities located along waterways contain mature living and standing dead trees suitable for cavity-nesting bird species. Several cavity-nesting species were observed in the project area. Other birds utilizing non-tidal wetlands in the project area include towhees, chickadees, titmice, warblers, tanagers, vireos, flycatchers, kingfishers, and sparrows. Raptors, including hawks, owls, and occasional ospreys or bald eagles, have been observed feeding within the project area where food sources are adequate. Mammalian species that are commonly associated with urban aquatic settings in the project area include white-tailed deer, raccoon, opossum, skunk, eastern cottontail, muskrat, and gray squirrel.

All water resources in the project area have been influenced by human activities, such as road construction, drainage system installation, utility line construction, housing/commercial development, and stormwater management/erosion control construction. Increased impervious surfaces in these highly urbanized watersheds produce erosive peak runoff conditions. As a result, larger perennial water systems, including Backlick Run, Accotink Creek, Holmes Run, and Scotts Run, have been incised and eroded from the force of surface runoff. The lack of modern best management practices and stormwater controls within these watersheds also contributes to the degradation of aquatic habitats and water quality. Stream bottoms and other wet areas that have not been severely affected by erosion and sedimentation or deforestation can support benthic organisms such as insect larvae, snails, clams, worms, and crayfish. While these organisms are important sources of food for other wildlife, they are not likely to have large, stable populations in the vicinity of the Beltway due to urbanization effects.

Terrestrial Ecology. Terrestrial habitats include a mosaic of natural and human-altered communities including forests, open fields, overgrown meadows and waysides, and landscaped and disturbed areas. Upland forest communities near the Beltway are characterized by mixed-aged second growth mixed hardwoods. Dominant species are red maple, tulip poplar, black cherry (*Prunus serotina*), northern red oak *(Quercus rubra)*, black gum, white oak *(Quercus alba)*, black oak *(Quercus velutina)*, white ash (*Fraxinus americana*), beech *(Fagus grandifolia)*, sweetgum, black locust *(Robinia pseudoacacia)*, flowering dogwood (*Cornus florida*), bitternut hickory (*Carya cordiformis*), white pine (*Pinus strobus*), and Virginia pine (*Pinus virginiana*). The largest tracts of undeveloped habitat are located along stream corridors within Fairfax County and federal parks in the county, including Wakefield Park, Accotink Stream Valley Park, Idylwood Park, Scotts Run Stream Valley Park, Dranesville District Park, and the George Washington Memorial Parkway. These forests contain important food-products (acorns, fruit, nuts) that help support local populations of deer, small mammals, and game birds, including wild turkey.

Such terrestrial communities provide habitat for a wider variety of mammals, birds, reptiles, and amphibians than the smaller palustrine and riparian communities along the Beltway. However, land near the Beltway is extensively developed, which means that small and moderate-size forested parcels are scattered throughout. This habitat fragmentation is the result of existing transportation facilities and surrounding residential and commercial development. Species use is based on habitat suitability characteristics, special habitat requirements, historical range, territory/home range size, reproductive habits, and foraging habits.

Terraced forest communities are present along stream corridors and are characterized by a soil moisture level typical of irregularly flooded bottomland habitats. Well-drained alluvial communities occur in the floodplains of Backlick Run, Accotink Creek, Scotts Run, and the Potomac River. Frequent natural disturbances in these transitional communities tend to result in greater species richness and more vegetation stratification than in contiguous closed-canopy forested wetland communities. These communities also contain mature living and standing dead trees suitable for cavity-nesting bird species. Birds identified in the field included herons, ducks, Canada geese, hawks, owls, and various common songbirds. Common mammals observed include white-tailed deer, raccoon, opossum, skunk, bats, chipmunk, eastern cottontail, groundhog, gray squirrel, and fox.

The *Natural Resources Technical Report* contains lists of vegetation, fish, amphibian, reptile, and mammalian species that have been observed or could be present in the project area.

Invasive Species. The fragmentation and disturbance of habitats within the project area increases their vulnerability to invasive species. According to Executive Order 13112, an "invasive species" is a plant, animal, or other organism (1) that is non-native (or alien) to the ecosystem under consideration and (2) whose introduction causes or is likely to cause economic or environmental harm or harm to human health. FHWA is committed to preventing the introduction of and controlling the spread of invasive plant species on highway rights-of-way (FHWA Memorandum, 1999). Due to the complexity of this effort, federally funded highway projects are directed to participate in joint efforts with agencies at all levels. The Invasive Alien Plant Species Cooperative Project, a product of the partnership between the Virginia Department of Conservation and Recreation (DCR) and the Virginia Native Plant Society, was established to combat invasive alien plant species problems in the state's natural communities. DCR has published an advisory list of plant species that are known to exhibit invasive behavior in some situations. Species have been ranked as having high, medium, or low invasiveness based on factors such as cumulative impact on natural areas, potential to disperse and invade natural landscapes, distribution and abundance, difficulty of management, and impacts on other species.

More than 75 percent (86 species) of the plant species included on the list of Invasive Alien Plant Species of Virginia compiled by DCR have been observed or could occur within the project area. Most of these species are herbaceous plants, many are shrubs or vines, and only three are trees. **Table 3-18** lists invasive plant species that have been observed in the project area, and includes the relative invasiveness of each, as determined by DCR. The presence of these species within the project area is indicative of a regional spread of invasive plants, particularly in disturbed, urban areas. While VDOT is not responsible for the encroachment of these plants into the Beltway right-of-way, the agency is responsible for discouraging their introduction and spread, particularly following new construction projects.

Table 3-18
INVASIVE PLANT SPECIES OBSERVED OR WITH THE POTENTIAL TO OCCUR WITHIN THE PROJECT AREA

Common Name	Scientific Name	Invasiveness
Tree-of-heaven	*Ailanthus altissima*	High
White mulberry	*Morus alba*	Low
Chinese wisteria	*Wisteria sinensis*	Medium
Japanese honeysuckle	*Lonicera japonica*	High
Amur honeysuckle	*Lonicera tatarica*	Medium
Bush honeysuckle	*Lonicera maackii*	Medium
Oriental bittersweet	*Celastrus orbiculatus*	High
Porcelain-berry	*Ampelopsis brevipedunculata*	High
Chinese privet	*Ligustrum sinense*	High
Multiflora rose	*Rosa multiflora*	High
Russian olive	*Elaeagnus angustifolia*	Low
Canada thistle	*Cirsium arvense*	High
Chinese lespedeza	*Lespedeza cuneata*	High
Common reed	*Phragmites australis*	High
Garlic mustard	*Alliaria petiolata*	High
Japanese knotweed	*Polygonum cuspidatum*	High
Mile-a-minute	*Polygonum perfoliatum*	High
Purple loosestrife	*Lythrum salicaria*	High

3.9.7 Threatened and Endangered Species

Consultation with federal and state agencies pursuant to Section 7 of the Endangered Species Act of 1973, as amended, has been completed with respect to the presence of rare, threatened, and endangered plant and animal species within the project area. Agencies consulted included the following:

- U.S. Fish and Wildlife Service
- National Marine Fisheries Service
- Virginia Department of Conservation and Recreation, Division of Natural Heritage
- Virginia Department of Game and Inland Fisheries
- Virginia Department of Agriculture and Consumer Services

Federally Listed Species. According to the U.S. Fish and Wildlife Service, there are no known occurrences of threatened or endangered species or their critical habitat in the project area (USFWS, 1998). No threatened or endangered species were observed during field investigations conducted in 1997 and 1999. Copies of federal agency consultation letters concurring with this assessment are provided in the *Natural Resources Technical Report.*

State-Listed Species. According to DCR, VDNH, and the Virginia Department of Agriculture and Consumer Services (VDACS), there are no known occurrences of state-listed threatened or endangered species or their habitat in the project area (Berlinghoff, 1998; Courter, 1998). The Virginia Department of Game and Inland Fisheries (VDGIF) has not provided any comments at this time. No legally protected species were observed during field investigations conducted in 1997 and 1999. Copies of state agency consultation letters concurring with this assessment are provided in the *Natural Resources Technical Report.*

3.10 CULTURAL RESOURCES

Pursuant to Section 106 of the National Historic Preservation Act, historic properties that are included in, or eligible for inclusion in, the National Register of Historic Places (NRHP), and that also are within the area of potential effect (APE) have been identified and evaluated. This was accomplished by conducting field surveys of archaeological sites and architectural resources, and consulting with the State Historic Preservation Officer (SHPO). In Virginia, the Director of the Department of Historic Resources serves as the SHPO.

The archaeological APE was defined as the footprint of the widest possible alternative under consideration (12-lane Express/Local with HOV configuration), which has a maximum cross section of 236 feet (72 meters). This archaeological APE represents approximately 997 acres, although approximately 75 percent of this area was previously disturbed by original Beltway construction. As a result, an area measuring approximately 247 acres was surveyed for archaeological resources. The architectural APE was defined as extending 500 feet from the right-of-way centerline and represents approximately 1,575 acres. Approximately 25 percent of this area was previously disturbed by original Beltway construction. The actual area surveyed for architectural resources is estimated to consist of 1,179 acres. The surveys were conducted in accordance with *Guidelines for Archaeological Investigations in Virginia* (Virginia Department of Historic Resources) and federal guidelines contained in *Secretary of the Interior's Standards and Guidelines for Archaeological and Historic Preservation* (U.S. Department of Interior, 1983). Details of the survey methodologies are described in the technical report, *A Cultural Resources Survey of Improvements to the Capital Beltway (Route 495) in Fairfax County, Virginia* (Gray & Pape, Inc., 2001).

3.10.1 Archaeological Resources

No NRHP-eligible archaeological sites were identified within the APE.

3.10.2 Architectural Resources

There are two NRHP-eligible resources within the APE: the Holmes Run Acres Historic District (VDHR #029-5183) and the Washington and Old Dominion (W&OD) Railroad Historic District (VDHR #053-0276)

Holmes Run Acres Historic District (VDHR #029-5183). Located northeast of the Gallows Road interchange, Holmes Run Acres was developed beginning in 1950 as a creative alternative to tract housing. The houses were of a modular plan and used modular components, a new method of construction in post-World War II America. The houses sit on quarter-acre lots and were built of wood and brick with brick fireplace walls, exposed beams, and extensive use of glass. The architects sited the houses to take full advantage of natural views. Holmes Run Acres has been recommended eligible for the NRHP as an historic district under Criterion C for architecture and community planning.

W&OD Railroad Historic District (VDHR #053-0276). The route for the W&OD Railroad crosses the Beltway just north of the I-66 interchange. The W&OD Railroad began in 1853 as the Alexandria, Loudoun, and Hampshire Railroad. The route started in Alexandria and traversed rural Virginia, ending in Bluemont at the foot of the Blue Ridge Mountains. Although the railroad no longer exists, the W&OD Railroad Regional Park now occupies the roadbed with a multi-use (bicycle/pedestrian/equestrian) trail. The District has been nominated to the NRHP under Criterion A for its contributions to the broad patterns of northern Virginia history in the areas of commerce and transportation from the mid-19th century through the mid-20th century.

4

ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION

The following sections discuss the direct, indirect (or secondary), and cumulative effects of the project alternatives. Direct effects occur at the same time and place as project implementation. Direct effects include displacements of features or resources within the construction "footprint" of the proposed project (e.g., displacements of homes, businesses, and wetlands) as well as off-site effects resulting from the project (e.g., changes in noise levels, air quality, visual intrusions, and water quality).

Indirect effects do not occur at the same time and place as project implementation, but remain reasonably foreseeable. Indirect effects include induced growth and changes in land use patterns and density, and related effects on air and water and other natural systems, including ecosystems. Quantifying indirect effects is often difficult due to the inability to foresee relationships between the project and future development, as well as the interplay of factors besides transportation (e.g., overall economic conditions, availability of other infrastructure such as water and sewer systems, growth policies and plans of local governments, and inclinations of individual landowners).

Cumulative effects are incremental consequences of a proposed action that, when added to the consequences of past and reasonably foreseeable actions, affect the same resources. Other actions in the project area include other highway projects and residential, commercial, and institutional development.

4.2 LAND USE

A summary of the land use effects of the Preferred Alternative and No-Build Alternative is presented in **Table 4-1**. The effects of the other alternatives considered in the preparation of the Draft Environmental Impact Statement (EIS) and Final EIS are also shown for comparison purposes. The Preferred Alternative was developed in part to address the comments made by the public and local government that the impacts to local communities from the Candidate Build Alternatives studied in the Draft EIS were too high.

4.2.1 Direct Land Use Conversions

The Preferred Alternative will require the acquisition of lands adjacent to the Beltway and the conversion of existing uses to highway use. Table 4-1 shows the acreages of direct land use conversion for the Preferred Alternative. As shown, the amount of land that will be converted to highway right-of-way would be greatly reduced as compared to what was required by the Candidate Build Alternatives studied in the Draft EIS. Displacements of homes and businesses resulting from these land use conversions are discussed in Section 4.3.1.

Table 4-1
SUMMARY OF LAND USE RELATED EFFECTS

	Final EIS Alternatives		Revised Alternative	Candidate Build Alternatives Draft EIS[1]		
Effect	**No-Build**	**Preferred Alternative 12-Lane HOT**	**10-Lane HOV**	**Concurrent HOV**	**Express/ Local with HOV**	**Barrier-Separated HOV**
Direct Land Use Conversion (acres)	0	10	5	102.7–118.5	150.5-168.3	137.5-153.4
Compatible with Existing Land Use	Yes	Yes	Yes	Yes	Yes	Yes
Consistency with Local Comprehensive Plans	No	Yes	Yes	Yes	Yes	Yes
Consistency with Long-Range Transportation Plan (at the time of EIS approval)	No	Yes	No	Yes	No	No
Compatibility with Other Planned Transportation Projects in Northern Virginia	Yes	Yes	Yes	Yes	Yes	Yes

Notes: 1. The total impact numbers for the Candidate Build Alternatives studied in the Draft EIS are provided as ranges because of the multiple interchange options available at Gallows Road, Interstate 66, and the Dulles Access/Toll Road

4.2.2 Consistency with Plans and Policies

Improvements to the Beltway are an integral part of, and are therefore consistent with, Fairfax County's 1995 Comprehensive Plan. One of the goals of the Comprehensive Plan is to provide adequate land use by type to support the population and employment forecasts. A complementary goal is to provide a transportation system that allows for efficient movement of people and goods, and that connects the various land uses in a way that promotes continued economic prosperity and quality of life. The Preferred Alternative is consistent with these goals and with the county's plans and policies for achieving them. County officials have expressed continuing support for the implementation of Beltway improvements. Technical staff from the County’s Department of Transportation have been instrumental in assisting the Study Team develop and refine the build alternatives to ensure consistency with county plans.

Improvements to the Beltway are also included in the fiscally constrained *Long Range Transportation Plan for the National Capital Region* (CLRP). The most recent regional plan incorporates all the transportation projects that the Virginia Department of Transportation

(VDOT) and local jurisdictions plan to complete by the year 2030 including the Preferred Alternative to add High Occupancy Toll (HOT) lanes to the Capital Beltway.

4.2.3 Planned and Unplanned Growth

Unplanned growth can result in haphazard land uses that may become incompatible. Planned land use allows necessary room for growth without conflict. Appropriately planned land use will provide sufficient employment within a short commute of major portions of the population.

Fairfax County's Comprehensive Plan has anticipated development growth by providing for it in the future land use and zoning plans. These land use and zoning plans include the Beltway as a principal element of community and planning area boundaries for the county. Improvements to the Beltway are included in the Comprehensive Plan and are therefore part of the planned growth of Fairfax County.

4.2.4 Potential for Induced Development

The relationship between roadway improvements and induced development has created a lot of debate and a variety of opinions regarding sprawl. While it is clear that highways may directly induce development under certain circumstances, this cause and effect relationship doesn't always transpire when a roadway improvement is made. While it is easy to assert that transportation improvements will have this effect, it is infinitely more difficult to predict with confidence when, where, and how much, especially in a dynamic urban/suburban metropolis such as the Washington, D.C. region, where factors other than transportation influence residential and business location decisions. This issue is discussed in greater depth in Section 4.16 – Secondary and Cumulative Effects.

4.2.5 Potential for Joint Development

Several other major transportation projects are currently under consideration in Northern Virginia. Two involve possible joint use of the Capital Beltway corridor: the Virginia Department of Rail and Public Transportation's (DRPT) planned extension of Metrorail to Dulles Airport and eastern Loudoun County, and their proposal for Beltway rail. Close coordination has been maintained between VDOT's Study Team and the sponsors of the other two projects.

The proposed Metrorail extension would cross the Capital Beltway at the Chain Bridge Road interchange in Tysons Corner. Collocation studies and joint plans have been developed to ensure that neither project would preclude the other. Plans for the Chain Bridge Road interchange, shown in Chapter 2 would accommodate the planned Metrorail alignment.

The Capital Beltway Rail Feasibility Study was the result of recommendations from VDOT's 1997 *MIS Results Report.* Conducted by DRPT, the study confirmed the feasibility of rail along the Beltway corridor. The study also concluded that the rail should not be placed within the Beltway right-of-way, but along a parallel corridor. Beltway plans have been developed so as not to preclude potential crossings of the highway by the rail alignment.

4.3 SOCIOECONOMICS

A summary of the socioeconomic effects of the Preferred Alternative and No-Build Alternative is presented in **Table 4-2**. The effects of the other alternatives considered in the preparation of the Draft EIS and Final EIS are also shown for comparison purposes.

Table 4-2
SUMMARY OF SOCIOECONOMIC EFFECTS

	Final EIS Alternatives		Revised Alternative	Candidate Build Alternatives Draft EIS[1]		
Effect	**No-Build**	**Preferred Alternative 12-Lane HOT**	**10-Lane HOV**	**Concurrent HOV**	**Express/ Local with HOV**	**Barrier-Separated HOV**
Number of Residential Relocations	0	3	1	206-217	258-294	219-258
Number of Commercial Relocations	0	0	0	19-31	20-32	20-32
Changes in Neighborhood and Community Cohesion	None	None	None	Effects to Merrifield Village, Shrevewood, and Dunn Loring Woods	Effects to North Springfield, Merrifield Village, Shrevewood, and Dunn Loring Woods	Effects to Merrifield Village, Shrevewood, and Dunn Loring Woods
Effects on Community Facilities	None	None	None	Stenwood Elementary School playground, Iliff Rehabilitation Center parking lot	N. Springfield Swim Club tennis courts, N. Springfield Elem. School parking lot, Stenwood Elem. School playground, Iliff Rehabilitation Center parking lot	Stenwood Elementary School playground, Iliff Rehabilitation Center parking lot
Effects on Environmental Justice Populations	None	None	None	None	None	None
Changes in Travel Patterns and Accessibility	Negative	Better Mobility, Travel Time Savings	Better Mobility, Travel Time Savings	Better Mobility, Travel Time Savings	Better Mobility, Travel Time Savings	Better Mobility, Travel Time Savings
Effects on Public Safety	Negative	Positive	Positive	Positive	Positive	Positive
Tax Revenue Loss due to Right-of-way Acquisition[2]	0	$9,202	$2,870	$1.8-$2.5 million	$2.2-$3.1 million	$2.2-$3.0 million
Number of Construction-Related Jobs Created	0	20,173	17,644	50,513	62,064	53,880

Note: 1. The total impact numbers for the Candidate Build Alternatives studied in the Draft EIS are provided as ranges because of the multiple interchange options available at Gallows Road, Interstate 66, and the Dulles Access/Toll Road. 2. Based on Year 2002 costs.

4.3.1 Relocations

Displacements of homes, businesses, and nonprofit organizations were estimated by VDOT and are reported above in Table 4-2.

Residential. The Preferred Alternative would result in a dramatic reduction in the number of residential relocations compared to the Candidate Build Alternatives studied in the Draft EIS. The Preferred Alternative was developed in part to address the concerns of the general public and local governments regarding the high number of relocations.

The displacees are assumed to represent a cross section of the diversity of minorities in Northern Virginia. Based on data from the Fairfax County Department of Systems Management for Human Resources, it was estimated that the average number of family members is three, and that annual incomes range from $40,000 to $200,000. It is likely that the displacees are owner-occupants, and the remainder are tenant-occupants. Because no individual contacts were made, it is not known if any of the displacees would have special relocation needs, such as provisions for the disabled.

Based on review of real estate advertisements, observation of for-sale signs, and the ongoing construction of new homes in the area, replacement housing is readily available. No problems are anticipated in finding suitable replacement housing for the displacees. VDOT has the ability and, if necessary, is willing to provide housing of last resort, including the purchase of land or dwellings; repair of existing dwellings to meet decent, safe, and sanitary conditions; relocation or remodeling of dwellings purchased by VDOT; or construction of new dwellings. All families and individuals displaced by the project will be relocated to suitable replacement housing. All replacement housing will be fair housing available to all persons without regard to race, color, religion, sex, or national origin and will be within the financial means of the displacees. Each person will be given sufficient time to negotiate for and obtain possession of replacement housing. No residential occupants will be required to move from property needed for the project until comparable decent, safe, and sanitary replacement dwellings have been made available to them.

Commercial. The Preferred Alternative would not result in displacement of commercial properties, a significant improvement over the Candidate Build Alternatives studied in the Draft EIS.

Non-Profit Organizations. The Preferred Alternative would not displace any non-profit organizations, schools, or churches.

Upon completion of a more in-depth design for the project, VDOT will develop a detailed relocation plan to ensure that orderly relocation of all displacees can be accomplished in a satisfactory manner. The acquisition of right-of-way and the relocation of displacees will be in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended. Assurance is given that relocation resources will be available to all residential, business, and nonprofit displacees without discrimination.

4.3.2 Changes to Neighborhoods and Community Cohesion

Effects on community cohesion can include the taking of land and homes, physical or psychological barriers dividing a community, or disruption of access within a community. The Preferred Alternative would not disrupt access to or from adjacent neighborhoods. All existing overpasses and underpasses will be maintained or replaced, and no non-motorist facilities such as pedestrian or bicycle paths will be lost. To the degree that improvements to the Capital Beltway attracts trips away from local roads, quality of life in communities will improve due to a decrease in cut-through traffic. The Preferred Alternative would result in three residential displacements from the Poplar Hills neighborhood in Annandale, a very small percentage of the homes in that area.

4.3.3 Changes in Travel Patterns and Accessibility

The Preferred Alternative would not adversely affect traffic patterns or accessibility to nearby developments, except for limited periods of temporary detours during construction. The road network would remain unchanged. Improvements to the Beltway would improve mobility within the study area and the eastern portion of Fairfax County. Travel time savings associated with an improved Beltway would likely attract trips off of local roads onto the Beltway, thereby removing unwanted traffic within neighborhoods.

The pedestrian bridge spanning the Beltway north of Braddock Road will be extended in order to span the additional lanes associated with the Preferred Alternative. New approaches and abutments for the bridge will be built to extend the length of the existing bridge. All work will be within the existing right-of-way. Access to the bridge will be closed during the short construction periods and pedestrians and cyclist will be directed to cross at either the Braddock Road or Route 236 Interchanges..

In the vicinity of I-66, accessibility between the Shrevewood neighborhood and the neighborhoods to the north and west would be improved by the construction of a new bridge for the Washington and Old Dominion (W&OD) trail over I-66. Currently, pedestrians and cyclists must cross I-66 on local streets using narrow sidewalks. Construction of the new bridge was negotiated with the Northern Virginia Regional Park Authority as part of the Section 4(f) mitigation plan discussed in Chapter 8.

4.3.4 Effects on Community Facilities

No community facilities will be affected by the Preferred Alternative. The impacts to the community facilities posed by the Candidate Build Alternatives studied in the Draft EIS were eliminated during the design of the Preferred Alternative.

4.3.5 Effects on Social Groups and Environmental Justice

As described in Section 3.3.3, several populations under the aegis of the Presidential Executive Order 12898 on environmental justice (EJ) were identified in the study area. The following factors are used in determining that project effects on these populations would not be disproportionately high and adverse: (1) whether the effects would be ***predominantly*** borne by a minority or low-income population, or (2) whether the effects to be suffered by the minority population or low-income population would be ***appreciably more severe*** or greater in magnitude than the adverse effects that would be suffered by the non-minority population or non-low income population. The categories of adverse effects include relocations of families and businesses, changes to neighborhoods and community cohesion, natural resource utilization, air quality, hazardous materials, noise, and traffic and transportation.

Although the Preferred Alternative would displace three homes, none of those homes are located in neighborhoods in block groups identified as EJ populations. No business displacements would occur. The project would not affect natural resources that EJ populations rely on for subsistence. The projected concentrations of carbon monoxide (CO) in the immediate vicinity of the project would not exceed National Ambient Air Quality Standards (NAAQS) at any of the receptor locations for any of the alternatives (see Section 4.6).

Section 4.7 and the *Noise Technical Report* detail the results of the noise analysis completed for the Capital Beltway Study. The results show that noise levels at many sites, not just those within EJ block groups, will exceed the FHWA criteria at which noise abatement measures must be considered. Where feasible and reasonable, noise abatement measures will be provided.

Easing congestion on the Beltway can reduce "cut-through" traffic on local roadways and neighborhood streets by making the Beltway a more attractive travel option. Under the No-Build Alternative, cut-through traffic is expected to increase in the future. The most common routes used to avoid the Beltway involve using Backlick Road and Annandale Road on the east, or Prosperity Avenue on the west, to connect to Gallows Road, which provides access to Merrifield and Tysons Corner. These routes run through or adjacent to seven of the identified minority or low-income block groups. The Preferred Alternative will decrease cut-through traffic on these streets and will help to reduce the negative impact this traffic has on the potentially affected EJ populations. More information on cut-through traffic is available in the *Traffic Technical Report*.

The public involvement program, which is discussed in greater detail in Section 7.2, has provided numerous opportunities for participation by EJ populations in the study process. Outreach efforts included a project hotline (phone and e-mail); a website with detailed information about the study process, progress, and alternatives under consideration; and a mailing list, consisting of over 3,500 individuals that was used to distribute newsletters and meeting announcements. Two sets of workshops, consisting of three meetings each, were held in November 1998 and June 1999. These meetings were advertised in several local papers, notices were sent to individuals on the project mailing list, and over 75,000 postcards were mailed to local residents. The meetings, which presented project process and alternatives development information, were attended by over 1,100 people and gathered comments from more than 600 citizens. Location public hearings were held after the Draft EIS was published in 2002 and additional public workshops were held in June 2004 after the Candidate Build Alternatives were modified to address public and local government concerns. More than 925 people attended the public hearings and approximately 400 attended the workshops. The hearings and workshops were advertised in a manner similar to the workshops held in 1998 and 1999. In addition to the formal public meetings, VDOT representatives met with over 40 special interest groups, civic and homeowner associations, community organizations, and individual property owners.

4.3.6 Effects on Public Safety

The Preferred Alternative would have positive effects on highway and traffic safety. Higher capacity on the Beltway would result in improved response time for emergency service providers. Section 2.5 discusses the travel time savings for the Preferred Alternative. The Candidate Build Alternatives studied in the Draft EIS and No-Build Alternative are included for comparison purposes.

4.3.7 Economics

The acquisition of private residential and commercial properties would result in loss of property tax revenue for Fairfax County. The Preferred Alternative would result in $9,202 in annual tax revenue losses. These losses would be offset to some degree by the economic benefits of reductions in congestion and travel time.

The project would provide a positive economic impact to the project area through the increase in employment and purchases of building materials during construction of a build alternative. Based on an FHWA procedure for estimating construction-related employment, each one million dollars of construction expenses would create an average of 9.75 temporary, on-site construction jobs and 12.7 temporary, off-site jobs for the duration of the project. Off-site employment would include support services to construction services (e.g., construction supplies, and food and beverage service). This procedure assumes that local workers would provide the needed labor for the project. Based on the construction cost estimates, **Table 4-3** provides estimates of the temporary employment creation due to construction requirements.

Table 4-3
ESTIMATED CONSTRUCTION EMPLOYMENT

	Final EIS Alternatives		Revised Alternative	Candidate Build Alternatives Draft EIS[1]		
Effect	**No-Build**	**Preferred Alternative 12-Lane HOT**	**10-Lane HOV**	**Concurrent HOV**	**Express/ Local with HOV**	**Barrier-Separated HOV**
Total cost (in millions)[2]	$0	$891	$783	$2,250 - $2,340	$2,720 -$2,830	$2,400 - $2,480
On-site Jobs	0	8,761	7,663	21,938	26,520	23,400
Off-site Jobs	0	11,412	9,981	28,575	34,544	30,480
Total Jobs	**0**	**20,173**	**17,644**	**50,513**	**62,064**	**53,880**

Notes: 1. The total impact numbers for the Candidate Build Alternatives studied in the Draft EIS are provided as ranges because of the multiple interchange options available at Gallows Road, Interstate 66, and the Dulles Access/Toll Road. 2. The estimated construction cost is based on preliminary design information and costs developed using Year 2002 dollars.

4.4 PARKS AND RECREATION AREAS

A summary of the effects to parks and recreation areas from the Preferred Alternative and No-Build Alternative is presented in **Table 4-4**. The effects of the other alternatives considered in the preparation of the Draft EIS and Final EIS are also shown for comparison purposes.

Parks and recreational areas located along the Beltway are potentially subject to direct and indirect impacts as well as proximity impacts from the proposed action. Public parks are afforded a high level of protection from direct use impacts (or land takings) under Section 4(f) of the Department of Transportation Act. Chapter 8 of this Final EIS addresses in detail each of the five public parks that may be directly impacted by the proposed alternatives. Those parks include, Wakefield Park, Fitzhugh Park, Accotink Stream Valley Park, Jefferson District Park, and the W&OD Railroad Regional Park.

The parks, recreational areas, and trails described in Section 3.4 were assessed for potential indirect impacts as well. These indirect effects could include increased noise levels in activity areas, as well as changes in access to parks.

Effects of increased noise levels on parks and recreation areas are presented in detail in Section 4.7. Elevated noise levels will occur in activity areas in the following parks and

Table 4-4
SUMMARY OF EFFECTS TO PARKS AND RECREATION AREAS

	Final EIS Alternatives		Revised Alternative	Candidate Build Alternatives Draft EIS		
Effect	**No-Build**	**Preferred Alternative 12-Lane HOT**	**10-Lane HOV**	**Concurrent HOV**	**Express/ Local with HOV**	**Barrier-Separated HOV**
Amount of Parkland Required (acres)	0	2.50	1.14	15.05	18.13	19.36
Number of Parks Directly Impacted	0	5	5	7	7	7
Number of Parks and Recreation Areas with Activity Areas Exposed to Noise Impacts[1]	7	7	6	9	9	9
Number of Existing or Proposed Trails Affected	0	0	0	0	0	0

Notes: 1. Noise impacts in activity areas are defined as exposure to noise levels greater than 66 dBA.

recreation areas under the No-Build Alternative as well as the Preferred Alternative: Americana Park, Fitzhugh Park, Wakefield Park, Idylwood Park, W&OD Railroad Regional Park, Stenwood Elementary School, and Marshall High School. The Candidate Build Alternatives studied in the Draft EIS resulted in noise impacts in activity areas at the following additional parks and recreation areas: Springfield Swim Club and Lisle Park. None of these proximity noise impacts would be substantial enough to impair the use of these resources. In addition, noise barriers to protect residential receptors are proposed in these locations to lower the increased noise levels. In most cases, the proposed noise barriers were found to meet VDOT's criteria for cost-effectiveness. In some cases, however, the reasonableness and cost-effectiveness of the proposed barrier system for protecting the parks depends upon the noise sensitivity of the park properties, and will be evaluated on a case-by-case basis during the project's final design. More detailed information on the specific noise barriers is provided in Section 4.7.1 and the *Noise Technical Report*.

During construction of the Preferred Alternative, a new bridge for the W&OD trail would be built. Staged construction of the bridge would ensure that pedestrian and bicycle crossings are maintained at all times. In addition, the replacement bridge will be designed to meet the Northern Virginia Regional Park Authority's current standards for bridges. None of the other existing or proposed trails described in Section 3.4 would be directly affected by the Preferred Alternative. Trail users on the W&OD trail would experience increased noise levels as they cross the Beltway on the trail. However, these levels are not anticipated to impair the use of the trail or be substantially different from what trail users experience today.

The location of future trails, planning access to those trails from surrounding developments, and assessments of how those trails would improve bicycle and pedestrian access and mobility falls under the jurisdiction of Fairfax County. The provision of protected bikeways and pedestrian paths will be addressed during the final design phase of the project. With respect to crossings of the Beltway, Fairfax County's position is that access will be provided at each location, and crossings that currently exist (including all existing free and low traffic crossings) will be maintained during and after construction.

The Preferred Alternative would improve access to the local parks and recreation areas. Improved Beltway operations would encourage more distant visitors to frequent the local park facilities and interchange improvements provide improved direct access to several facilities. Although the Preferred Alternative will displace local residents who may frequent the local parks, none of the displacements is expected to have a significant effect on park operations.

4.5 HAZARDOUS MATERIALS

The presence of soil and groundwater contamination, or the existence of hazardous materials within existing or proposed right-of-way, can have an adverse impact on the cost and schedule to complete a transportation project. Contaminated soil unearthed during construction could require special treatment and disposal and would not be usable for backfilling excavations. Contaminated groundwater drawn into a dewatering system could require special treatment and permitting prior to disposal. In addition, it could be necessary to notify contractors about contaminated sites if worker exposure to hazardous conditions is possible.

The locations of potential hazardous materials sites throughout the study area were identified early in the project process in an effort to avoid impacts. This early identification of potential contamination provides valuable information for alternatives evaluation, design, right-of-way acquisition, and construction phasing.

A summary of the effects from hazardous materials predicted to result from the Preferred Alternative and No-Build Alternative is presented in **Table 4-5**. The effects of the other alternatives considered in the preparation of the Draft EIS and Final EIS are also shown for comparison purposes.

The Preferred Alternative will not require the acquisition of any of the known sites listed in Section 3.4 of this Final EIS. Other sites of potential concern may be identified during final design and/or construction of the Preferred Alternative.

Table 4-5
IMPACTS TO POTENTIAL HAZARDOUS MATERIAL SITES

	Final EIS Alternatives		Revised Alternative	Candidate Build Alternatives Draft EIS[1]		
Effect	**No-Build**	**Preferred Alternative 12-Lane HOT**	**10-Lane HOV**	**Concurrent HOV**	**Express/ Local with HOV**	**Barrier-Separated HOV**
Right-of-Way Requirement (acres)	0	10	5	102.7–118.5	150.5-168.3	137.5-153.4
Total Sites of Potential Concern	0	0	0	7-8	8-9	8

Note: 1. The total impact numbers for the Candidate Build Alternatives studied in the Draft EIS are provided as ranges because of the multiple interchange options available at Gallows Road, Interstate 66, and the Dulles Access/Toll Road.

4.6 AIR QUALITY

4.6.1 Conformity Determination

The transportation improvements identified in the current CLRP and Transportation Improvement Program (TIP) must conform to Clean Air Act requirements and the region's State Implementation Plan (SIP). If the region's CLRP and TIP do not conform to the SIP, then federal highway funds may be withheld. Ground-level ozone and particulate matter less than 2.5 microns in size ($PM_{2.5}$) are the two pollutants for which the Washington, DC-MD-VA region is currently classified as non-attainment. However, as discussed in Section 3.6, none of the monitoring data from Virginia show violation of the NAAQS for $PM_{2.5}$.

The Preferred Alternative (the addition of two lanes in each direction on the Capital Beltway for HOT and HOV use) has been included in the current CLRP (FY 2005) and TIP (FY 2006-2011) and the Capital Region's Transportation Planning Board (the MPO for the Washington, D.C. Metropolitan Area) conducted a conformity assessment for the 8-hour ozone standard. TPB's conformity determination was reviewed by the EPA in accordance with the procedures and criteria of the Transportation Conformity Rule. Based on their review, EPA determined that TPB's 8-hour ozone conformity assessment meets the requirements of the Clean Air Act and the applicable regulations promulgated under 40 CFR Part 93. On December 21, 2005, FHWA and FTA jointly found the 2005 CLRP and FY 2006-2011 TIP for the Washington, D.C. Metropolitan Area to be in conformance with the Transportation Conformity Rule for the 8-hour ozone standard. The TPB also recently completed a conformity assessment of the 2005 CLRP and FY 2006 -2011 for fine particles ($PM_{2.5}$ direct and precursor NOx emissions). Their assessment demonstrates that the estimated levels of fine particles for the 2010, 2020, and 2030 analysis years of the CLRP and TIP will be well below the 2002 base year levels of $PM_{2.5}$ and NOx emissions. EPA has determined that TPB's $PM_{2.5}$ conformity assessment meets the requirements of the Clean Air Act and the applicable regulations promulgated under 40 CFR Part 93. On February 21, 2006, FHWA and FTA jointly found the 2005 CLRP and FY 2006-2011 TIP for the Washington, D.C. Metropolitan Area to be in conformance with the Transportation Conformity Rule for the $PM_{2.5}$ standard.

On March 10, 2006, EPA published the Final Rule on PM2.5 and PM10 Hot-Spot Analyses in Project-level Transportation Conformity Determinations for the New PM2.5 and Existing PM10 National Ambient Air Quality Standards in the Federal Register. The new rule requires a hot-spot analysis and project level conformity determination for projects in PM2.5 nonattainment areas that are "of air quality concern," effective April 5, 2006. Qualitative hot-spot analyses are required for these projects until such time as EPA releases its future quantitative modeling guidance and announces that quantitative PM2.5 hot-spot analyses are required under 40 CFR 93.123.(b)(4). On March 29, 2006, EPA and the Federal Highway Administration issued joint guidance for conducting qualitative hot-spot analyses to meet the requirements established in the March10th final Transportation Conformity Rule. Accordingly, a draft hot-spot qualitative analysis and project level conformity determination has been prepared for the Capital Beltway Improvement Project and is included in Appendix E. Based on a review of monitoring data and the regional PM2.5 conformity analysis, FHWA has concluded that the Capital Beltway Improvement Project will not cause or contribute to a new violation of the PM2.5 NAAQS, or increase the frequency or severity of a violation.

The proposed improvements are not expected to interfere with attainment or maintenance of the NAAQS. Additional details on the air quality analysis are provided in the *Air Quality Technical Report*.

4.6.2 Mobile Source Emissions Analysis

Atmospheric concentrations of carbon monoxide (CO), the predominant pollutant emitted from gasoline-powered motor vehicles, were determined for the closest worst-case roadside sites, which are shown in **Figure 4-1**. VACAL5NA, a simplified microcomputer procedure developed from FHWA's MOBILE/CALINE model was used to estimate the CO concentrations (in units of parts per million, or ppm). Worst case assumptions and inputs were used in the analysis, including peak-hour traffic volumes, an ambient temperature of 30 degrees Fahrenheit, a wind speed of 1m/s, an atmospheric stability rating of "D," and wind directions nearly parallel to the roadway. **Tables 4-6a and 4-6b** summarize analysis results for the base (existing year) conditions, the No-Build Alternative and the Preferred Alternative. For the ten analysis sites, the tables present the peak one-hour and eight-hour CO concentrations for the base year, interim year (2010), and design year (2020). All estimates are in parts per million (ppm). The results include background concentrations of 6 ppm and 3 ppm for the one-hour and eight-hour concentrations, respectively.

The estimated CO concentrations shown in Table 4-6a and 4-6b, including background, are well below the NAAQS of 35 ppm for one-hour concentrations and 9 ppm for eight-hour concentrations.

4.6.3 Air Toxics

As described in Section 3.6.3, motor vehicles emit several pollutants that the EPA classifies as probable human carcinogens. Some toxic compounds are present in gasoline and are emitted to the air when gasoline evaporates or passes through the engine unburned. Other toxic compounds are formed as a by-product of incomplete combustion or through secondary reactions in the atmosphere.

The emissions that come from mobile sources (e.g., cars, trucks, buses) are highly dependent on the fuel that powers them. Therefore, the EPA implemented regulations for mobile sources that are aimed at controlling the emissions of air toxics through changes to fuel compositions and improving vehicle technology and performance. Examples of such changes include: reformulated gasoline and anti-dumping standards; national low emission vehicle (NLEV) program; Tier 2 motor vehicle emissions and gasoline sulfur control requirements; inspection and maintenance programs, on-board diagnostics, and heavy-duty engine and vehicle standards; and on-highway diesel fuel sulfur control requirements. In developing the March 29, 2001 final rule, *Control of Emissions of Hazardous Air Pollutants from Mobile Sources*, EPA found that refineries were producing gasolines that were cleaner than required by prior gasoline toxic emissions standards (i.e., they were “overcomplying”). EPA issued new gasoline toxic emissions standards designed to perpetuate this overcompliance. Now, the annual average toxics performance level of gasoline produced or imported beginning in 2002 must be at least as clean as the average performance level of the gasoline produced during the baseline period 1998 - 2000.

AIR QUALITY ANALYSIS RECEPTOR SITES
I-95/I-395/I-495 Interchange to I-66

Figure 4-1a
(1 of 2)

CAPITAL BELTWAY STUDY

AIR QUALITY ANALYSIS RECEPTOR SITES
I-66 to American Legion Memorial Bridge

Figure 4-1b
(2 of 2)

CAPITAL BELTWAY STUDY

Table 4-6a
PROJECT CARBON MONOXIDE CONCENTRATIONS (PARTS PER MILLION)
INTERIM YEAR (2010)

Site[1]	Receptor	Time Period	Final EIS Alternatives: Existing	Final EIS Alternatives: No-Build	Final EIS Alternatives: Preferred Alternative 12-Lane HOT	Revised Alternative: 10-Lane HOV	Candidate Build Alternatives Draft EIS[2]: Concurrent HOV	Candidate Build Alternatives Draft EIS[2]: Express/ Local with HOV	Candidate Build Alternatives Draft EIS[2]: Barrier-Separated HOV
1	North Springfield Elementary School	1-Hour	7.2	6.5	6.6	6.6	6.6	6.4	7.0
		8-Hour	3.9	3.4	3.5	3.5	3.5	3.2	3.8
2	Fitzhugh Park	1-Hour	8.0	6.9	6.9	6.9	7.2	6.9	8.1
		8-Hour	4.4	3.8	3.7	3.7	4.1	3.7	4.6
3	Luttrell Road Residence	1-Hour	10.6	7.2	7.6	7.4	7.4	7.6 - 8.0	8.0
		8-Hour	6.2	4.2	4.5	4.2	4.2 - 4.3	4.5 - 4.7	4.9
4	Stenwood Elementary School	1-Hour	6.5	6.1	6.4	6.3	6.3 - 7.4	6.4 - 8.0	6.6 - 8.4
		8-Hour	3.4	3.1	3.3	3.3	3.3 - 4.3	3.3 - 4.4	3.5 - 5.3
5	Roswell Court Residence	1-Hour	6.1	5.8	6.0	5.9	6.0 - 6.1	5.9 - 6.0	6.0 - 6.1
		8-Hour	3.1	2.9	3.0	3.0	3.0 - 3.1	3.0	3.0 - 3.1
6	George C. Marshall High School	1-Hour	9.0	7.2	7.0	7.0	7.0	6.6	6.8
		8-Hour	4.9	4.0	3.8	3.8	3.8	3.5	3.6
7	Regency Condominium	1-Hour	6.4	6.0	6.4	6.4	6.5	6.4	6.3
		8-Hour	3.3	3.0	3.3	3.3	3.3	3.3	3.2
8	Lear Road Residence	1-Hour	6.6	6.0	5.9	5.8	5.8 - 6.4	5.9 - 6.5	5.9 - 6.6
		8-Hour	3.4	3.1	2.9	2.9	2.9 - 3.3	2.9 - 3.4	3.0 - 3.6
9	Beaufort Park Tennis Court	1-Hour	8.0	6.8	6.6	6.6	6.8	6.6	6.4
		8-Hour	4.3	3.8	3.5	3.5	3.6	3.5	3.3
10	Potomac Heritage Trail	1-Hour	17.9	11.9	9.2	9.2	8.8	9.2	8.9
		8-Hour	11.5	7.9	5.8	5.8	5.3	5.8	5.4

Notes: 1. See Figure 4-1 for site location
2. The total impact numbers for the Candidate Build Alternatives studied in the Draft EIS are provided as ranges because of the multiple interchange options available at Gallows Road, Interstate 66, and the Dulles Access/Toll Road.

Table 4-6b
PROJECT CARBON MONOXIDE CONCENTRATIONS (PARTS PER MILLION)
DESIGN YEAR (2020)

			Final EIS Alternatives			Revised Alternative	Candidate Build Alternatives Draft EIS[2]		
Site[1]	Receptor	Time Period	Existing	No-Build	Preferred Alternative 12-Lane HOT	10-Lane HOV	Concurrent HOV	Express/ Local with HOV	Barrier-Separated HOV
1	North Springfield Elementary School	1-Hour	7.2	6.6	6.6	6.6	6.6	6.5	7.2
		8-Hour	3.9	3.5	3.6	3.6	3.6	3.3	4.0
2	Fitzhugh Park	1-Hour	8.0	7.0	7.0	7.0	7.4	7.0	8.4
		8-Hour	4.4	3.9	3.8	3.8	4.2	3.8	4.9
3	Luttrell Road Residence	1-Hour	10.6	7.4	7.8	7.6	7.6	7.8 - 8.2	8.2
		8-Hour	6.2	4.3	4.5	4.3	4.3 - 4.4	4.5 - 4.6	5.0 - 5.4
4	Stenwood Elementary School	1-Hour	6.5	6.2	6.5	6.4	6.4 - 7.5	6.5 - 8.1	6.7 - 8.5
		8-Hour	3.4	3.2	3.4	3.4	3.4 - 4.4	3.4 - 4.5	3.6 - 5.4
5	Roswell Court Residence	1-Hour	6.1	6.0	6.1	6.1	6.1 - 6.3	6.1 - 6.2	6.2 - 6.7
		8-Hour	3.1	3.0	3.1	3.1	3.1 - 3.2	3.1	3.1 - 3.2
6	George C. Marshall High School	1-Hour	9.0	7.4	7.2	7.2	7.2	6.8	7.0
		8-Hour	4.9	4.2	4.0	4.0	4.0	3.7	3.8
7	Regency Condominium	1-Hour	6.4	6.1	6.5	6.5	6.6	6.5	6.4
		8-Hour	3.3	3.1	3.4	3.4	3.4	3.4	3.3
8	Lear Road Residence	1-Hour	6.6	6.2	6.1	6.0	6.0 - 6.6	6.1 - 6.7	6.1 - 6.8
		8-Hour	3.4	3.2	3.0	3.0	3.0 - 3.4	3.0 - 3.5	3.1 - 3.7
9	Beaufort Park Tennis Court	1-Hour	8.0	7.0	6.8	6.8	7.0	6.8	6.6
		8-Hour	4.3	4.0	3.7	3.7	3.8	3.7	3.5
10	Potomac Heritage Trail	1-Hour	17.9	12.2	9.6	9.6	9.1	9.6	9.2
		8-Hour	11.5	8.1	6.2	6.2	5.7	6.2	5.8

Notes: 1. See Figure 4-1 for site location

2. The total impact numbers for the Candidate Build Alternatives studied in the Draft EIS are provided as ranges because of the multiple interchange options available at Gallows Road, Interstate 66, and the Dulles Access/Toll Road.

Since the draft Environmental Impact Statement was approved for public availability in 2002, FHWA, through consultation with the EPA, has issued interim guidance on addressing mobile source air toxics in NEPA documents. This guidance, released on February 3, 2006, establishes a three-tiered approach to addressing mobile source air toxics in NEPA documents depending upon the scope of the project and its stage of development. In accordance with this guidance, this EIS includes a basic qualitative analysis of the likely mobile source air toxic emission impacts of the alternatives compared to the No-Build scenario. However, available technical tools do not enable us to predict the project-specific health impacts of the emissions associated with each alternative in this EIS. Although EPA has established a list of mobile source air toxics, it has not established that emissions of these compounds present health risks, nor has it established standards or measures of concentrations of these compounds such that one could conclude that a particular project will have an adverse health effect on the public. Due to these limitations, the following discussion is included in the EIS while acknowledging CEQ's regulations (40 CFR 1502.22(b)) regarding incomplete or unavailable information.

There are six air toxics that are of primary concern when it comes to mobile source air toxic emissions, and they are commonly referred to as the six priority mobile source air toxics. These six priority mobile source air toxics include acetaldehyde, acrolein, benzene, 1,3-butadiene, diesel particulate matter, and formaldehyde. Effectively evaluating the environmental and health impacts from the six priority mobile source air toxics on a highway project such that the information could be used to make an informed decision would involve several key elements, including emissions modeling, dispersion modeling in order to estimate ambient concentrations resulting from the estimated emissions, exposure modeling in order to estimate human exposure to the estimated concentrations, and then final determination of health impacts based on the estimated exposure. Each of these steps is encumbered by technical shortcomings or uncertain science that prevents a more complete determination of the mobile source air toxic health impacts of this project and in turn, prevents FHWA from considering this information with any degree of confidence when making a decision on the project.

Emissions. The EPA tools to estimate mobile source air toxic emissions from motor vehicles are not sensitive to key variables determining emissions of mobile source air toxics in the context of highway projects. While MOBILE 6.2 is used to predict emissions at a regional level, it has limited applicability at the project level. MOBILE 6.2 is a trip-based model--emission factors are projected based on a typical trip of 7.5 miles, and on average speeds for this typical trip. This means that MOBILE 6.2 does not have the ability to predict emission factors for a specific vehicle operating condition at a specific location at a specific time. For particulate matter, the model results are not sensitive to average trip speed, although the other mobile source air toxic emission rates do change with changes in trip speed. Also, the emissions rates used in MOBILE 6.2 for both particulate matter and mobile source air toxics are based on a limited number of tests of mostly older-technology vehicles. Lastly, in its discussions of particulate matter under the conformity rule, EPA has identified problems with MOBILE6.2 as an obstacle to quantitative analysis. Consequently, these deficiencies compromise the capability of MOBILE 6.2 to estimate mobile source air toxic emissions.

Dispersion. The tools to predict how mobile source air toxics disperse are also limited. The EPA's current regulatory models, CALINE3 and CAL3QHC, were developed and validated more than a decade ago for the purpose of predicting episodic concentrations of carbon monoxide to determine compliance with the NAAQS. The performance of dispersion models is more accurate for predicting maximum concentrations that can occur at some time at some location within a geographic area. This limitation makes it difficult to predict accurate exposure patterns at specific times at specific highway project locations across an urban area to assess potential health risk. The NCHRP is conducting research on best practices in applying models and other technical methods in the analysis of mobile source air toxics. This work also will focus on identifying appropriate and more effective methods of documenting and communicating mobile source air toxic impacts in the NEPA process and to the general public. Along with these general limitations of dispersion models, FHWA is also faced with a lack of monitoring data in most areas for use in establishing project-specific mobile source air toxic background concentrations.

Exposure Levels and Health Effects. Finally and probably most important, even if emission levels and concentrations of mobile source air toxics could be accurately predicted, shortcomings in current techniques for exposure assessment and risk analysis preclude us from reaching meaningful conclusions about project-specific health impacts. Exposure assessments are difficult because it is difficult to accurately calculate annual concentrations of mobile source air toxics near roadways, and to determine the portion of a year that people are actually exposed to those concentrations at a specific location. These difficulties are magnified for 70-year cancer assessments, particularly because unsupportable assumptions would have to be made regarding changes in travel patterns and vehicle technology (which affects emissions rates) over a 70-year period. There are also considerable uncertainties associated with the existing estimates of toxicity of the various mobile source air toxics, because of factors such as low-dose extrapolation and translation of occupational exposure data to the general population. Because of these shortcomings, any calculated difference in health impacts between alternatives is likely to be much smaller than the uncertainties associated with calculating the impacts. Consequently, the results of such assessments would not be useful to decision makers, who would need to weigh this information against other project impacts that are better suited for quantitative analysis.

Research into the health impacts of mobile source air toxics is ongoing. For different emission types, there are a variety of studies that show that some either are statistically associated with adverse health outcomes through epidemiological studies (frequently based on emissions levels found in occupational settings) or that animals demonstrate adverse health outcomes when exposed to large doses.

Exposure to toxics has been a focus of a number of EPA efforts. Most notably, the agency conducted the National Air Toxics Assessment (NATA) in 1999 to evaluate modeled estimates of human exposure applicable to the county level. While not intended for use as a measure of or benchmark for local exposure, the modeled estimates in the NATA database best illustrate the levels of various toxics when aggregated to a national or State level.

The EPA is in the process of assessing the risks of various kinds of exposures to these pollutants. The EPA Integrated Risk Information System (IRIS) is a database of human health effects that may result from exposure to various substances found in the environment. The IRIS database is located at http://www.epa.gov/iris. The following toxicity information for the six priority mobile source air toxics was taken from the IRIS database *Weight of Evidence Characterization* summaries. This information is taken verbatim from EPA's IRIS database and represents the Agency's most current evaluations of the potential hazards and toxicology of these chemicals or mixtures.

- **Benzene** is characterized as a known human carcinogen.
- The potential carcinogenicity of **acrolein** cannot be determined because the existing data are inadequate for an assessment of human carcinogenic potential for either the oral or inhalation route of exposure.
- **Formaldehyde** is a probable human carcinogen, based on limited evidence in humans, and sufficient evidence in animals.
- **1,3-butadiene** is characterized as carcinogenic to humans by inhalation.
- **Acetaldehyde** is a probable human carcinogen based on increased incidence of nasal tumors in male and female rats and laryngeal tumors in male and female hamsters after inhalation exposure.
- **Diesel exhaust** (DE) is likely to be carcinogenic to humans by inhalation from environmental exposures. Diesel exhaust as reviewed in this document is the combination of diesel particulate matter and diesel exhaust organic gases.
- **Diesel exhaust** also represents chronic respiratory effects, possibly the primary noncancer hazard from mobile source air toxics. Prolonged exposures may impair pulmonary function and could produce symptoms, such as cough, phlegm, and chronic bronchitis. Exposure relationships have not been developed from these studies.

There have been other studies that address mobile source air toxic health impacts in proximity to roadways. The Health Effects Institute, a non-profit organization funded by EPA, FHWA, and industry, has undertaken a major series of studies to research near-roadway mobile source air toxics hot spots, the health implications of the entire mix of mobile source pollutants, and other topics. The final summary of this series is not expected for several years and as such, will not be available for use on this project.

Some recent studies have reported that proximity to roadways is related to adverse health outcomes -- particularly respiratory problems. Much of this research is not specific to mobile source air toxics, instead surveying the full spectrum of both criteria and other pollutants. The FHWA cannot evaluate the validity of these studies, but more importantly, they do not provide information that would be useful to alleviate the uncertainties listed above and enable us to perform a more comprehensive evaluation of the health impacts specific to this project.

Because of the uncertainties outlined above, a quantitative assessment of the effects of air toxic emissions impacts on human health has not been made for the project. While available tools do allow us to reasonably predict relative emissions changes between alternatives for large projects, the amount of mobile source air toxic emissions from each of the project alternatives and mobile source air toxic concentrations or exposures created by each of the project alternatives cannot be predicted with enough accuracy to be useful in estimating health impacts. Therefore, the relevance of the unavailable or incomplete information is that it is not possible to make a determination with any certainty whether any of the alternatives would have "significant adverse impacts on the human environment." In lieu of a quantitative assessment, a qualitative assessment of mobile source air toxic emissions relative to the various alternatives has been prepared. While FHWA acknowledges that the project alternatives may result in increased exposure to mobile source air toxic emissions in certain locations, the concentrations and duration of exposures are uncertain, and because of this uncertainty, the health effects from these emissions cannot be estimated.

This qualitative mobile source air toxic analysis focuses on the differences between the two build alternatives for the Capital Beltway and the impact that these differences may have on mobile source air toxic levels in the vicinity of the Capital Beltway. The Final EIS addresses two alternatives, a 10-lane and a 12-lane alternative, which have been reduced substantially in scope in response to comments from the public and Fairfax County following the Location Public Hearings. With the exception of the number of lanes, both of these alternatives are very similar. Both involve widening the existing Capital Beltway for 14 miles in the median, are located on the same alignment, and have the same termini (Interstate I-495 between the Springfield Interchange and the American Legion Bridge). Because of these similarities, the factors that may effect mobile source air toxic emissions and allow one to differentiate between alternatives will be operational characteristics such as vehicle miles traveled (VMT), average daily traffic (ADT) and the level of service which is a reflection of the congestion that each alternative will experience.

Table 2-7, which shows the range of daily (peak) demand volumes (vehicles in one direction) in 2020, demonstrates that the daily demand volume for the 10-lane and 12-lane alternatives in the Final EIS will only be 6% and 8% higher, respectively, when compared to the No-Build Alternative while the difference in daily demand volume between the build alternatives themselves will be less than 2%. The increase in daily demand volume over the No-Build Alternative can be expected since the project would increase capacity on the Beltway and attract traffic from the adjacent and parallel arterial routes. This is also desirable since one of the components of the purpose and need for this project is to reduce congestion and increase throughput not only on the Beltway but the adjacent and parallel arterial routes as well, which are currently experiencing congestion due to cut-through traffic trying to avoid congestion on the Beltway. Therefore, to understand the total impact that the build alternatives may have on traffic and air toxics, one has to consider the adjacent road network as well as the mainline. In this case, the 12-lane alternative is the most effective at removing vehicles from the adjacent road network when compared to the 10-lane alternative. Likewise, the preferred alternative would intuitively be more effective than alternatives that would convert a general-purpose lane for use as a HOV or HOT lane. General speaking, alternatives that provide more capacity on the Beltway will be more effective at reducing congestion and increasing throughput on the Capital Beltway as well as the adjacent road network.

When it comes to vehicle throughput, the mainline throughput of the 12-lane alternative is the greatest, accommodating over 20% more when compared to the No-Build Alternative. The 10-lane alternative will have a 13% increase in throughput when compared to the No-Build Alternative. At the on-ramps as well, the 12-lane alternative will have higher throughput since the additional capacity on the mainline will allow vehicles to gain faster entry onto the Beltway and minimize the backups that will form on the ramps and the queues that will form on adjacent streets. The capacity of both the 10-lane and 12-lane alternatives can handle the forecast demand on a daily basis with congestion limited to peak periods of between two and four hours each for the AM and PM peak periods. In contrast, the No-Build Alternative is unable to handle the forecast demand with congestion being experienced throughout the day. Approximately 10,000 vehicles that desire to use the Beltway under the no-build scenario would be forced to find other routes, increasing the amount of cut-through traffic on adjacent streets. This congestion, in turn, will be reflected in the peak hour travel speeds on the Beltway. According to Figure 2-7, both the 10-lane and 12-lane alternatives will allow for better travel speeds during peak periods than the No-Build Alternative; there are limited differences in travel speeds between the build alternatives themselves.

In developing the Draft EIS, it was determined that 14 general-purpose lanes would be needed on the Beltway to reduce congestion (defined as non-free flow travel) and achieve an acceptable level of service throughout the day. However, this would have resulted in unacceptable impacts to the natural and human environment in the corridor. Therefore, it was decided that in order to achieve a tradeoff between impacts and benefits, the maximum number of lanes that would be considered for the build alternatives would be 12. Consequently, all of the alternatives that have been considered throughout the course of the EIS, including the two alternatives in the Final EIS, will experience several hours of congestion (see Figure 2-5). Compared to the No-Build Alternative, the 10-lane and 12-lane alternatives will have 3 and 5 hours of severe and moderate congestion less than the No-Build Alternative, respectively.

Both the 10-lane and 12-lane alternatives will increase VMT on the Beltway compared to the No-Build Alternative. For example, there will be an 8% and 18% increase in AM peak hour VMT compared to the No-Build Alternative if the 10-lane and 12-lane alternatives are implemented, respectively. Likewise, there will be a 17% and 22% increase in PM peak hour VMT compared to the No-Build Alternative if the 10-lane and 12-lane alternatives are implemented, respectively. In comparing the 10 lane and the 12-lane alternatives, the VMT will be 11% higher for the 12-lane alternative compared to the 10-lane alternative for AM peak hour VMT and 6% higher for PM peak hour VMT. Although the additional lanes proposed under each of the build alternatives result in an increase in VMT, this increase would be offset by the reduction in VMT on adjacent roadways (see section 2.4.3).

In determining the relevance of these operational characteristics with respect to mobile source air toxics, one must consider a few basic conclusions that a sensitivity analysis of EPA's Mobile6.2 model allows one to make. For example, the highest mobile source air toxic emission factors are associated with lower speeds while the emission factors associated with higher speeds decrease substantially, in comparison, before leveling out at 55 to 65 mph. Closely related to vehicle speed is the type of facility involved. All things being equal, higher emission factors are associated with local streets while lower emission factors are associated with arterial facilities and the lowest emission factors are associated with freeway facilities. The higher the vehicle miles traveled on a freeway, the lower the mobile source air toxic emission factors on a per vehicle mile traveled basis. When VMT is compared between a local road and an arterial facility, mobile source air toxic emission factors from local roads are significantly higher than those from an arterial facility. Finally, the further one goes into the future, the greater the reduction in mobile source air toxic levels that will be realized due to various control programs and improvements in technology. This is reflected in the fact that the highest emission factors in EPA's Mobile6.2 model are associated with the current year while the lowest emission factors are associated with years extending into the future.

Applying these concepts to the Beltway improvements, alternatives that are more effective at reducing congestion and reducing the time that vehicles sit in traffic at lower speeds will produce lower levels of mobile source air toxic emissions than those alternatives that don't. Freeway alternatives that reduce congestion better than other freeway alternatives will produce less mobile source air toxic emissions. Likewise, those alternatives that are more effective at reducing congestion on local streets and the adjacent arterial network by redirecting that traffic to the freeway will produce lower levels of mobile source air toxic emissions. Finally, a forecasted increase in VMT in the design year does not translate to an overall increase in mobile source air toxic levels in the project corridor because it is expected that substantial reductions in air toxics will be achieved over time even with increases in VMT. This is reinforced by EPA's final rule on mobile source air toxics, which concluded that on-highway emissions of benzene, formaldehyde, 1,3-butadiene, and acetaldehyde will be reduced by 67 to 76 percent and on-highway emissions of diesel particulate matter will be reduced by 90 percent between 1990 and 2020 due to existing and proposed control programs. Because EPA has regulated heavy-duty truck emission standards, emissions for heavy-duty on-road trucks are expected to be reduced dramatically between 1998 and 2010 with allowable particulate matter being reduced 98 percent and allowable nitrogen oxide emissions being reduced 97 percent. Applying these trends to the Washington, D.C. region, one could reasonably conclude that if no improvements were made to the capital Beltway and congestion was allowed to worsen while VMT increased at the rate forecasted, it is expected that the region would still realize reductions in air toxics over time.

While the potential exists for there to be localized areas where ambient concentrations of mobile source air toxics could be higher under certain conditions under the build alternatives when compared to the No-Build Alternative, this potential is considered low since the majority of the improvements will occur within the median. While the addition of two lanes in the median to the outer loop, for example, will have the effect of moving traffic closer to the receptors located adjacent to the inner loop, it will also have the converse effect of moving that same traffic further away from the receptors located along the outer loop. Therefore, the resulting effect is one where the potential for increases in mobile source air toxics is offset by potential reductions. The potential for localized impacts has also been made low by the decision to significantly reduce the scope of the project and limit the majority of construction to the existing right-of-way limits. As a result, the relocation impacts associated with the alternatives in the Draft EIS have been reduced from a maximum of 326 homes and businesses to a maximum of 3 homes and businesses for the alternatives in the Final EIS. Likewise, the amount of right-of-way needed has been reduced from a maximum 168 acres to a maximum of 10 acres.

In conclusion and summary, the mobile source air toxic issue is a continuing area of research and a developing issue which at present, is not fully understood to the point that it would allow one to quantify the health effects that the proposed project would have on the surrounding environment. As documented above, the technical capability of quantifying such effects with any degree of confidence are years off. Consequently, the mobile source air toxic issue will not inform the decision makers for this project as it relates to the significance of this issue. Likewise, there are limited differences between the build alternatives included in the Final EIS based on the operational characteristics addressed above. Since mobile source air toxic emissions are sensitive to these operational issues, this limited difference and its impact on air toxics is not expected to have any influence on the selection of an alternative by FHWA. Despite the increase in VMT associated with the preferred alternative, the preferred alternative provides greater benefits in reducing congestion, increasing travel speeds during peak periods, and removing traffic from local streets. When these benefits are taken into account with the reductions in air toxics that are expected over time due to EPA's vehicle and fuel regulations coupled with fleet turnover, the potential of the project to increase mobile source air toxic emissions is low.

4.7 NOISE

4.7.1 Methodology

Noise Prediction Model. Noise predictions for each alternative were performed with FHWA's Traffic Noise Model (TNM). The TNM incorporates algorithms for sound emissions and propagation that are based on well-established theory and accepted international standards. The acoustical algorithms contained in the TNM have been validated by carefully conducted noise measurement programs.

The TNM version 1.0b was released in September 1999 for use on federal-aid highway noise projects nationwide. In September 2000, the TNM was updated (version 1.1) with user-oriented enhancements. In February 2003, version 2.1 was released, with additional user enhancements and improved run time. While the three programs differ somewhat in appearance and functionality, their acoustical algorithms are the same. Because the analysis of the alternatives took place over a three-year period, all three versions of the model were used during this study. TNM versions 1.0b and 1.1 were used to calculate noise levels for the Candidate Build Alternatives studied in the Draft EIS, as well as for nearly all noises levels for the No-Build Alternative and existing conditions. TNM version 2.1 was used for the revised alternatives, including the Preferred Alternative, and for several locations for the No-Build Alternative and existing conditions that were added to the analysis.

Another noise prediction model, FHWA's TNM lookup program (TNMLOOK), was used to help identify the loudest hour of the day. TNMLOOK provides a quick screening tool for evaluating simple highway geometrics by accessing a database of pre-calculated TNM results for an infinitely long, straight highway with sound propagation over flat ground, and by using various combinations of vehicle types and hard-or soft-sound propagation. Throughout the study area, traffic noise levels during the loudest hour of the day were determined for the existing (1998) conditions and the design-year (2020) no-build and build conditions.

The traffic data and engineering drawings developed for the EIS were used as input to the TNM. In general, sound propagation over acoustically "soft" ground (such as lawn) was assumed throughout the study area, except where sound propagation occurred over acoustically "hard" ground such as asphalt or water. The modeling also accounted for shielding due to terrain features, the edge of road, and rows of houses and other large structures.

Existing noise barriers were identified during a field survey of the study area and were modeled for existing conditions and the future No-Build Alternative. However, existing noise barriers were not modeled for the Preferred Alternative considered in this Final EIS because they would be removed in all cases. It is important to note that it has been VDOT's practice to replace existing barriers that are removed as a result of a widening project. The impact numbers presented below reflect the removal but not the replacement of the barriers. Section 4.7.4 includes a description of the noise abatement measures proposed as part of the Preferred Alternative.

The analysis presented below provides detailed noise impact and mitigation information for the Preferred Alternative. Similar information is available for the Candidate Build Alternatives studied in the Draft EIS in the *Noise Technical Report*. The technical report also includes the complete noise analysis conducted for the Revised Alternative that was developed after the Draft EIS was published and before the Preferred Alternative was selected.

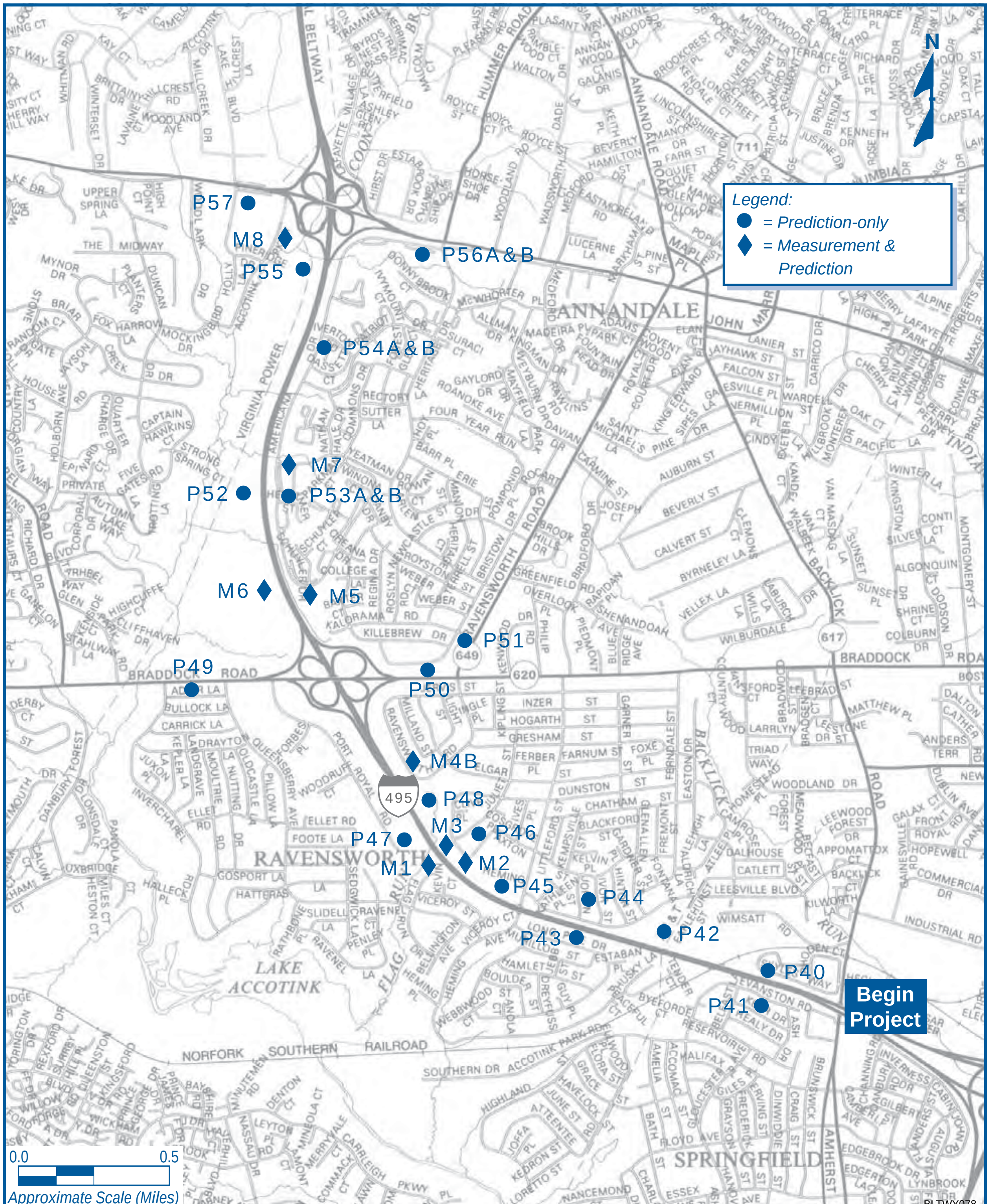
Noise Model Validation. Traffic counts and vehicle classifications obtained during the noise measurements described in Chapter 3 were used to verify model predictions. The model results were compared to measured noise levels at 26 sites to provide a basis for incorporating appropriate noise propagation effects, such as terrain and rows of buildings, into the model predictions for each site. On average, the difference between computed and measured noise levels was approximately 3 dBA (with a standard deviation of about 4 dBA), representing a conservative over-prediction of traffic noise levels along the study corridor.

Traffic Data for Noise Prediction. Traffic data for the highway noise computations included hourly volumes and speeds, broken down by automobiles and medium and heavy trucks, for existing conditions, future no-build conditions, and the Preferred Alternative. As required by FHWA and VDOT, the noise analysis was performed for the loudest hour of the day, which depends on the combination of vehicle volumes and speeds and the percentage of heavy trucks in the vehicle mix. The loudest hour of the day was found to vary from one end of the study area to the other. As a result, the study area was broken into five sections, with different loudest hours for each section.

4.7.2 Computed Existing and Future Noise Levels

Figure 4-2 shows the locations for which noise levels were determined. Many additional locations were added to the 45 measurement sites for purposes of noise prediction to provide a comprehensive basis for the comparison of noise impact among each of the design-year build alternatives. A selection of additional "Prediction Only" sites are shown along with the measurement sites; the measurement sites are shown with an "M" prefix, and the prediction-only sites are shown with a "P" prefix.

Table 4-7 shows the computed noise levels, which are A-weighted equivalent sound levels, or L_{eq}, in dBA (Section 3.7 provides a discussion of this descriptor). The sites represent areas where

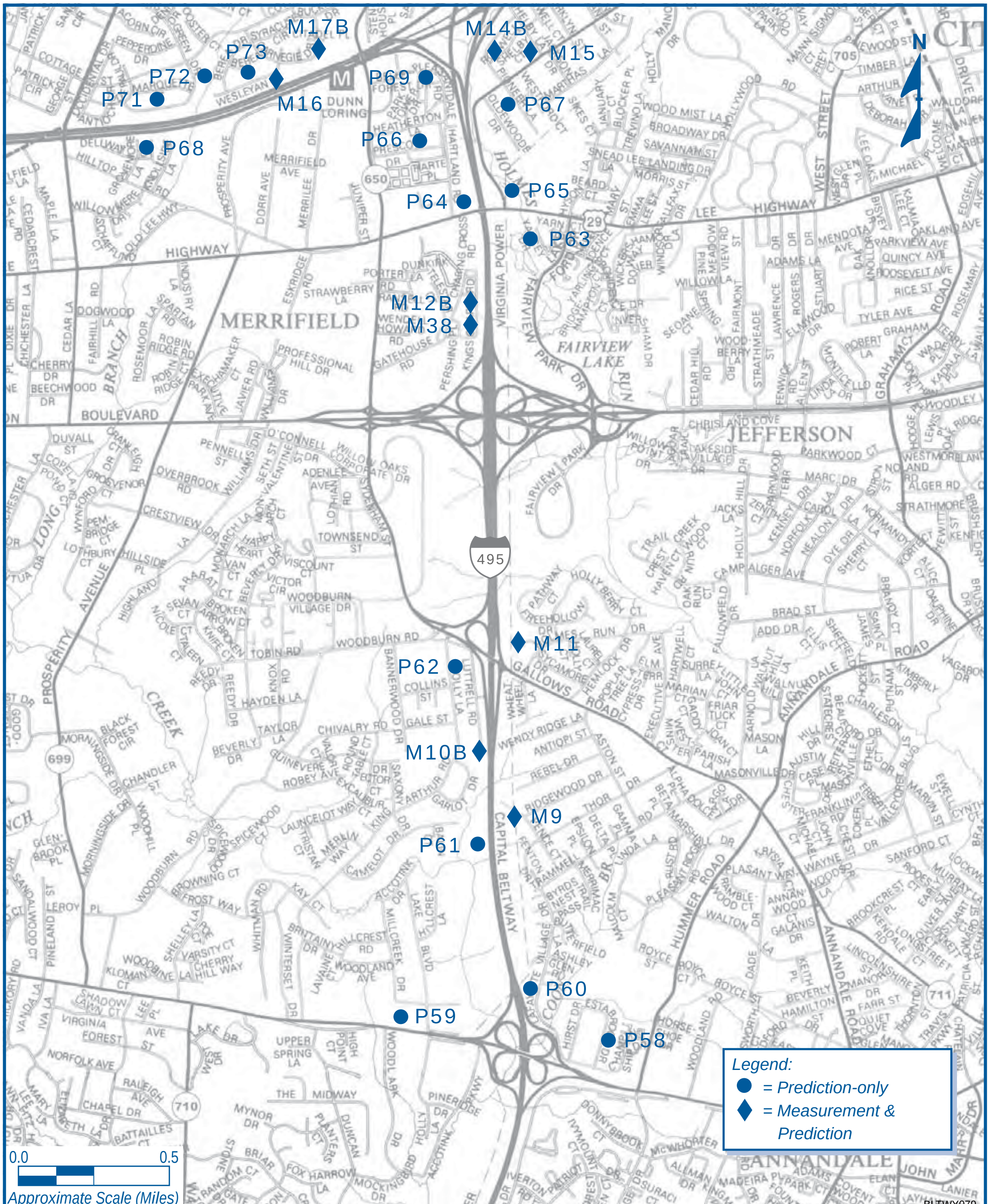


NOISE MEASUREMENT AND PREDICTION SITES

I-95/I-395/I-495 Interchange to Little River Turnpike

Figure 4-2a
(1 of 4)

CAPITAL BELTWAY STUDY

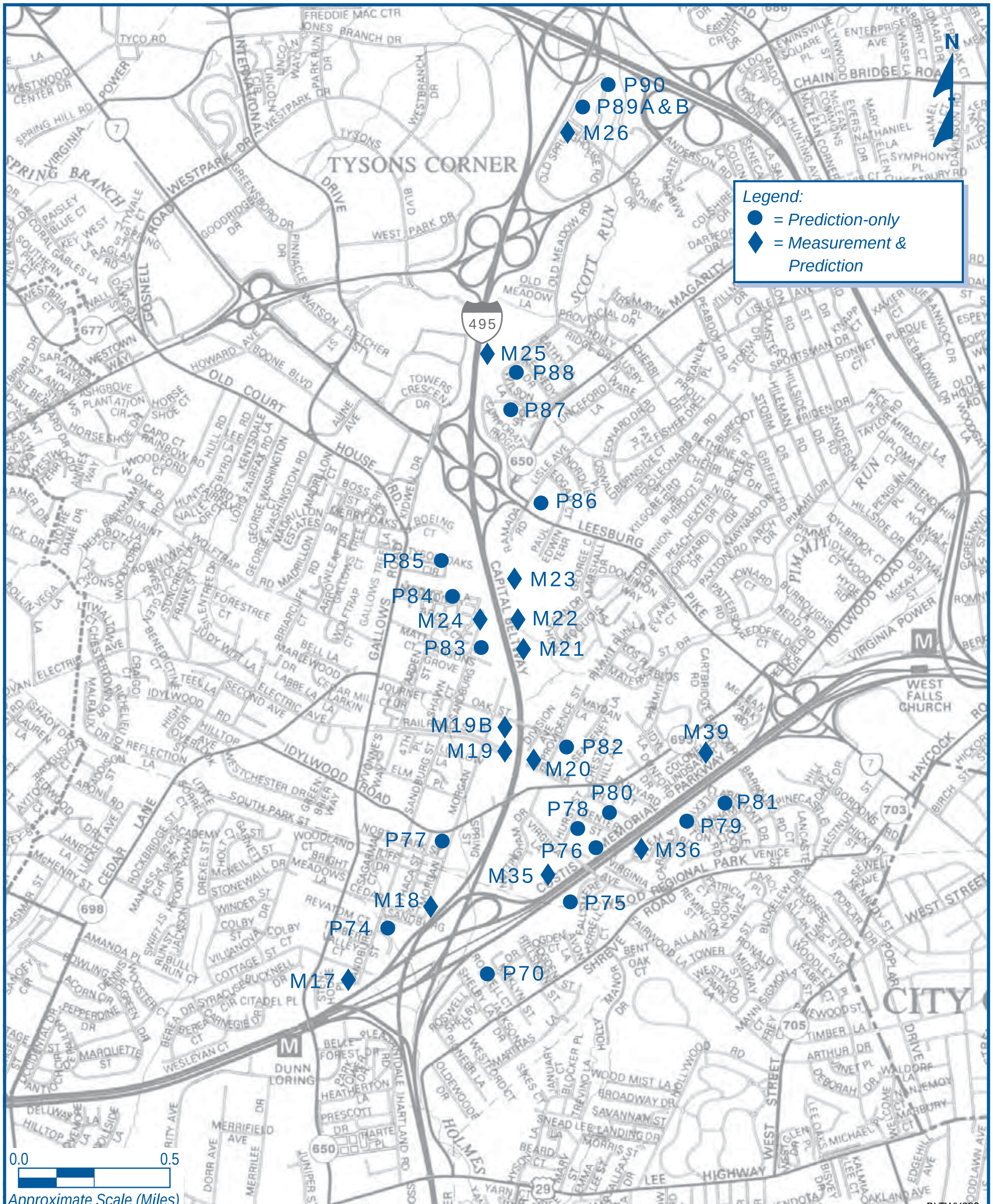


CAPITAL BELTWAY VIRGINIA

NOISE MEASUREMENT AND PREDICTION SITES
Little River Turnpike to I-66

Figure 4-2b
(2 of 4)

CAPITAL BELTWAY STUDY

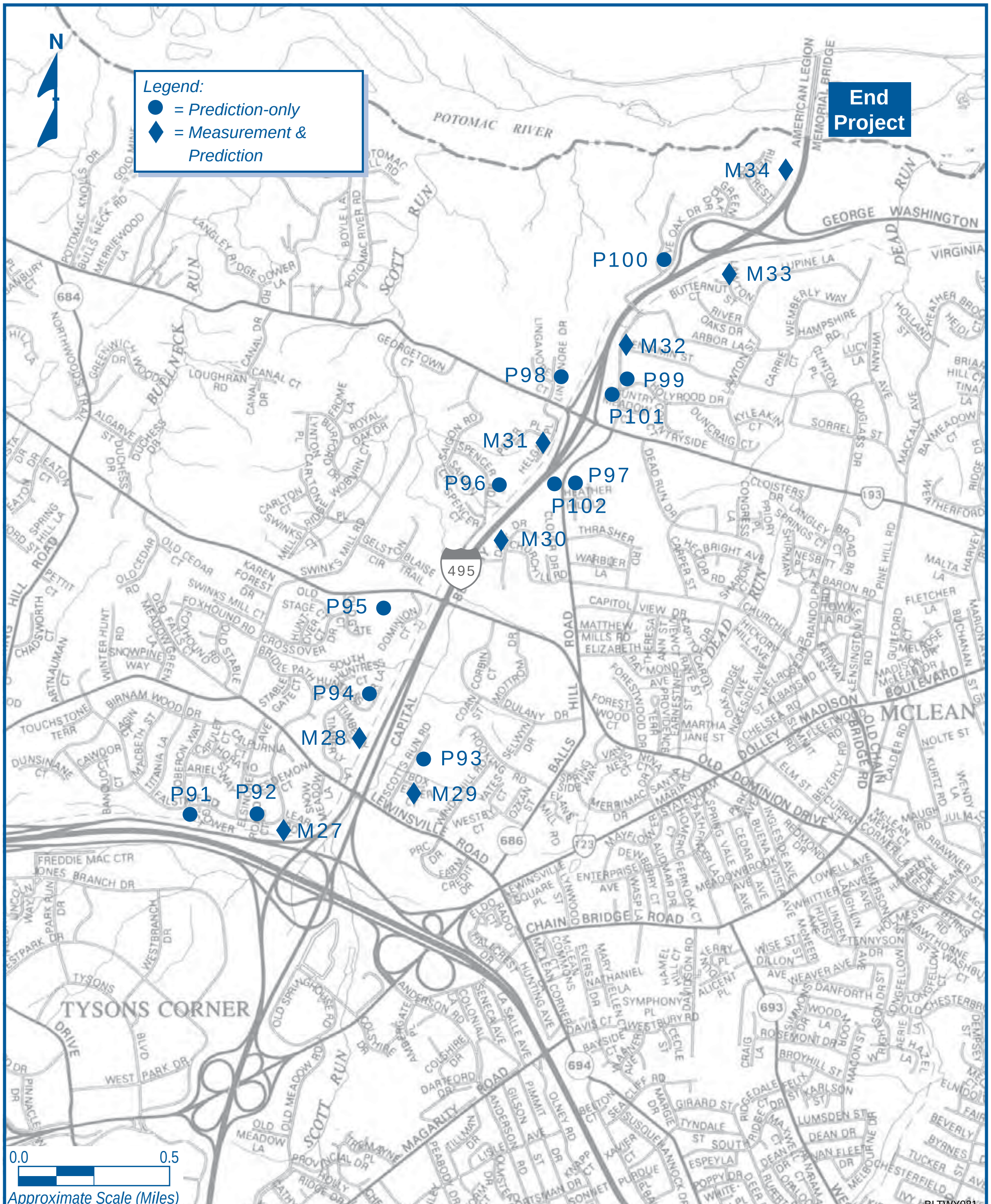


NOISE MEASUREMENT AND PREDICTION SITES

I-66 to Dulles Access/Toll Road

Figure 4-2c
(3 of 4)

CAPITAL BELTWAY STUDY



NOISE MEASUREMENT AND PREDICTION SITES
Dulles Access/Toll Road to American Legion Memorial Bridge

CAPITAL BELTWAY STUDY

Figure 4-2d
(4 of 4)

Table 4-7
COMPUTED EXISTING AND FUTURE NOISE LEVELS

					Loudest-Hour L_{eq} (dBA)							Distance to Edge of Nearest Project Road in meters[3]					
Site No.	**Description**	**Land Use[1]**	**Exterior or Interior**	**Ground or Upper floor[2]**	**Preferred Alt.**	**Rev. 10-Lane HOV**	**Existing**	**No-Build**	**Concurrent HOV**	**Express/Local**	**Barr.-Sep. HOV**	**Preferred Alt.**	**Rev. 10-Lane HOV**	**Exist./No-Build**	**Concurrent HOV**	**Express/Local**	**Barr.-Sep. HOV**
	I-95/I-395/I-495 Interchange to Little River Turnpike																
M1	Flag Run Dr. cul-de-sac	SF	Exterior	Ground	71	71	65	65	80	76	80	25	30	35	30	25	20
M2	7535 Axton St.	SF	Exterior	Ground	73	74	68	69	78	75	78	45	50	50	30	35	35
M3	7533 Axton St.	SF	Exterior	Ground	71	72	69	70	77	73	74	50	55	50	35	40	40
M4B	5313 Ravensworth Dr.	SF	Exterior	Ground	65	65	62	64	69	67	73	80	80	85	60	65	55
M5	Fitzhugh Pk	PK	Exterior	Ground	76	75	73	74	77	75	76	15	25	45	25	25	20
M6	Wakefield Pk	PK	Exterior	Ground	74	73	69	71	73	73	73	55	60	50	50	45	35
M7	Americana/Oriskany Dr.	MF	Exterior	Ground	66	66	70	72	71	69	71	65	70	80	70	65	60
M8	Americana Pk. Baseball	PK	Exterior	Ground	65	63	64	66	64	65	66	85	90	100	155	150	150
P40	Skyles Way	MF	Exterior	Ground	NA	NA	62	64	69	69	73	NA	NA	60	40	40	40
P41	Kerr Dr.	SF	Exterior	Ground	NA	NA	59	60	70	68	69	NA	NA	125	100	100	100
P42	Springfield Swim Club Pool	PK	Exterior	Ground	NA	NA	72	72	73	71	73	NA	NA	100	95	55	95
P43	Long Pine Dr.	SF	Exterior	Ground	NA	NA	61	62	76	71	74	NA	NA	55	50	30	40
P44	Ivor St.	SF	Exterior	Ground	NA	NA	67	68	70	68	71	NA	NA	130	125	95	120
P45	N Springfield Elem.	SCH	Exterior	Ground	70	69	63	64	73	72	75	65	70	65	60	55	60
			Interior	Ground	45	44	38	39	48	47	50	65	70	65	60	55	60
P46	Axton St.	SF	Exterior	Ground	63	63	61	62	65	61	64	135	140	140	120	125	130
P47	Lake Accotink Park	PK	Exterior	Ground	69	65	61	62	72	68	71	45	45	55	55	45	40
P48	Flag Run Park	PK	Exterior	Ground	67	68	65	66	70	66	69	75	70	85	65	40	60
P49	Adair Ln.	SF	Exterior	Ground	NA	NA	68	72	73	73	73	NA	NA	25	25	25	25
P50	Bristow Dr.	SF	Exterior	Ground	NA	NA	65	66	67	73	73	NA	NA	35	35	35	35
P51	Ravensworth Baptist Ch.	W	Exterior	Ground	NA	NA	59	58	62	66	66	NA	NA	135	135	135	135
			Interior	Ground	NA	NA	34	34	37	41	41	NA	NA	135	135	135	135
P52	Wakefield Pk Tennis Ct	PK	Exterior	Ground	67	67	67	69	69	66	69	70	75	75	75	70	65
P53A	Herkimer St. Apt.	MF	Exterior	Ground	73	73	70	73	72	69	70	65	70	75	70	65	60
P53B	Herkimer St. Apt.	MF	Exterior	Upper	71	71	74	75	76	72	74	65	70	75	70	65	60
P54A	Dassett Ct. Apt.	MF	Exterior	Ground	71	71	63	66	76	75	75	65	70	75	75	70	70
P54B	Dassett Ct. Apt.	MF	Exterior	Upper	75	76	71	72	78	76	76	65	70	75	75	70	70
P55	Americana Park North	PK	Exterior	Ground	71	70	70	72	72	72	73	65	65	75	65	65	55
P56A	Americana / Heritage Dr	MF	Exterior	Ground	NA	NA	64	68	67	69	70	NA	NA	60	60	60	60
P56B	Americana / Heritage Dr	MF	Exterior	Upper	NA	NA	67	70	70	72	72	NA	NA	60	60	60	60
P57	Pineridge Dr.	SF	Exterior	Ground	65	65	65	68	68	69	71	80	80	80	80	80	80

Table 4-7
COMPUTED EXISTING AND FUTURE NOISE LEVELS

					Loudest-Hour L_{eq} (dBA)							Distance to Edge of Nearest Project Road in meters[3]					
Site No.	**Description**	**Land Use[1]**	**Exterior or Interior**	**Ground or Upper floor[2]**	**Preferred Alt.**	**Rev. 10-Lane HOV**	**Existing**	**No-Build**	**Concurrent HOV**	**Express/Local**	**Barr.-Sep. HOV**	**Preferred Alt.**	**Rev. 10-Lane HOV**	**Exist./No-Build**	**Concurrent HOV**	**Express/Local**	**Barr.-Sep. HOV**
				Little River Turnpike to I-66													
M9	Pence Ct.	SF	Exterior	Ground	75	75	73	75	75	76	74	100	100	105	100	100	90
M10B	3454 Luttrell Rd.	SF	Exterior	Ground	78	78	66	68	79	80	73	45	50	60	30	30	30
M11	7916 Sycamore Dr.	SF	Exterior	Ground	70	70	61	63	68	71	68	80	80	90	75	70	70
M12B	Yorktown Sq. Apts	MF	Exterior	Ground	75	75	75	76	76	79	81	30	35	45	25	35	20
M14B	Roswell Dr.	SF	Exterior	Ground	73	71	66	68	67	67	63	70	70	90	55	40	35
M15	Shelby Ln.	SF	Exterior	Ground	66	64	62	61	66	65	64	255	255	255	205	200	220
M36	Center St.	SF	Exterior	Ground	NA	NA	60	56	69	66	66	NA	NA	25	20	15	10
M38	Yorktown Sq. Apts	MF	Exterior	Ground	78	78	77	77	78	75	78	35	35	40	30	30	20
P58	Estabrook Dr.	SF	Exterior	Ground	NA	NA	62	65	64	67	68	NA	NA	125	125	125	125
P59	Millcreek Dr.	SF	Exterior	Ground	NA	NA	71	73	73	71	76	NA	NA	25	25	25	25
P60	Annandale B-ball Ct.	PK	Exterior	Ground	64	65	63	64	62	63	63	50	50	65	55	50	45
P61	Accotink Valley Pk.	PK	Exterior	Ground	69	67	68	71	69	69	71	65	65	80	70	55	65
P62	Holly Rd.	SF	Exterior	Ground	NA	NA	61	63	65	66	67	NA	NA	95	95	95	95
P63	Yancey Dr.	MF	Exterior	Ground	67	67	64	67	65	68	65	200	205	215	140	190	185
P64	Word of Grace Fellowship Church	W	Exterior	Ground	77	76	76	78	75	77	75	50	55	65	35	45	25
			Interior	Ground	52	51	51	53	50	52	50	50	55	65	35	45	25
P65	Jefferson District Park	PK	Exterior	Ground	68	68	66	68	65	69	66	155	155	180	60	75	125
P66	Heatherton Ln	MF	Exterior	Ground	65	65	63	65	62	67	62	210	210	210	130	160	165
P67	Pioneer Ln.	SF	Exterior	Ground	69	68	65	66	67	64	64	205	215	225	75	155	140
P68	Stone Hollow Dr.	MF	Exterior	Ground	74	68	63	66	78	76	78	50	50	50	50	35	35
P69	Pleasantdale Rd.	MF	Exterior	Ground	72	70	69	71	68	70	70	55	55	60	60	40	60
P70	Roswell Ct.	SF	Exterior	Ground	65	63	60	60	65	63	62	110	110	110	60	60	60
P75	Fallsmere Ct.	SF	Exterior	Ground	61	62	59	57	66	61	65	70	75	75	60	55	40
P79	Lexington Rd.	SF	Exterior	Ground	NA	NA	54	52	61	59	59	NA	NA	90	90	85	65
P81	Claremont Dr.	SF	Exterior	Ground	NA	NA	55	51	58	57	57	NA	NA	125	125	120	90
				I-66 to Dulles Access/Toll Road													
M16	Wesleyan St.	SF	Exterior	Ground	77	71	70	73	85	79	81	40	40	40	15	5	5
M17	8101 Cottage St.	SF	Exterior	Ground	68	68	70	69	67	67	NA[4]	40	40	55	15	15	NA[4]
M17B	Stenwood Elementary	SCH	Exterior	Ground	70	66	66	68	78	74	73	55	55	55	55	50	55
			Interior	Ground	45	41	41	43	53	49	48	55	55	55	55	50	55
M18	Sandburg St.	MF	Exterior	Ground	71	73	75	73	75	NA[4]	NA[4]	25	30	45	10	NA[4]	NA[4]

Table 4-7
COMPUTED EXISTING AND FUTURE NOISE LEVELS

					Loudest-Hour L_{eq} (dBA)							Distance to Edge of Nearest Project Road in meters[3]					
Site No.	Description	Land Use[1]	Exterior or Interior	Ground or Upper floor[2]	Preferred Alt.	Rev. 10-Lane HOV	Existing	No-Build	Concurrent HOV	Express/Local	Barr.-Sep. HOV	Preferred Alt.	Rev. 10-Lane HOV	Exist./No-Build	Concurrent HOV	Express/Local	Barr.-Sep. HOV
M19	End of Railroad St.	SF	Exterior	Ground	79	79	76	77	75	76	75	50	55	70	60	40	45
M19B	Church at Dunn Loring	W	Exterior	Ground	79	78	76	76	75	76	76	60	60	75	60	40	45
			Interior	Ground	54	53	51	51	50	51	51	60	60	75	60	40	45
M20	7810 Helena Dr.	SF	Exterior	Ground	77	77	76	77	78	76	76	35	40	50	30	30	25
M21	Renaissance Apts.	MF	Exterior	Ground	73	73	73	76	74	75	72	60	60	65	50	45	50
M22	Renaissance Tennis Cts	PK	Exterior	Ground	64	61	55	59	60	62	58	30	35	40	30	30	30
M23	Marshall High School	SCH	Exterior	Ground	69	70	68	71	68	69	67	85	85	100	85	85	85
			Interior	Ground	44	45	43	46	43	44	42	85	85	100	85	85	85
M24	End of Sandburg St.	SF	Exterior	Ground	74	74	70	71	73	72	72	65	70	85	75	60	50
M25	1808 Old Meadow Rd.	MF	Exterior	Upper	78	78	77	78	80	78	79	40	40	55	25	25	15
M26	Scott's Crossing	MF	Exterior	Ground	71	69	68	68	66	67	65	60	65	65	40	30	25
M35	Idylwood Pk Ath. Field	PK	Exterior	Ground	68	69	66	66	72	71	73	60	60	65	40	35	35
M39	7424 Leighton Dr. West	SF	Exterior	Ground	NA	NA	67	64	67	66	66	NA	NA	65	70	65	50
P71	Bowling Green Dr.	SF	Exterior	Ground	71	64	64	67	77	75	77	95	95	95	80	75	55
P72	Bowling Green Ct.	SF	Exterior	Ground	65	59	55	59	70	68	69	190	190	190	170	165	125
P73	Berea Ct.	SF	Exterior	Ground	67	61	60	63	71	69	69	130	130	130	110	110	80
P74	Sandburg Ct.	SF	Exterior	Ground	63	62	60	59	66	62	67	115	120	120	80	65	100
P76	Center St.	SF	Exterior	Ground	NA	NA	70	67	75	74	75	NA	NA	45	35	30	25
P77	Lellah Ct.	SF	Exterior	Ground	69	68	67	69	68	68	68	190	195	205	170	165	145
P78	Hurst St.	SF	Exterior	Ground	NA	NA	66	64	69	66	68	NA	NA	145	130	120	90
P80	Helena Dr.	SF	Exterior	Ground	NA	NA	62	59	67	65	66	NA	NA	90	80	80	60
P82	Providence St.	SF	Exterior	Ground	69	68	65	67	67	65	67	160	160	175	160	155	150
P83	Sandburg/Kelleher Rd.	SF	Exterior	Ground	69	70	67	69	69	67	68	130	135	150	135	125	115
P84	Madron Ln.	MF	Exterior	Ground	69	70	64	65	69	69	68	155	160	170	160	145	135
P85	Tyson Oaks Cir.	MF	Exterior	Ground	63	61	60	59	62	60	60	170	175	185	165	155	135
P86	Lisle Ave./Magarity Rd.	SF	Exterior	Ground	NA	NA	64	65	66	68	70	NA	NA	80	70	65	65
P87	Enola St.	MF	Exterior	Ground	61	60	61	62	62	63	63	155	160	160	150	150	145
P88	Wilson Ln.	MF	Exterior	Ground	64	64	63	64	65	64	64	155	160	175	150	135	130
P89A	Old Springhouse Rd.	MF	Exterior	Ground	71	69	69	68	65	67	66	65	70	75	40	45	25
P89B	Old Springhouse Rd.	MF	Exterior	Upper	75	75	74	72	72	73	73	65	70	75	40	45	25
P90	Spring Gate Dr.	MF	Exterior	Ground	66	66	66	64	66	69	67	75	75	95	60	55	65

Table 4-7
COMPUTED EXISTING AND FUTURE NOISE LEVELS

					Loudest-Hour L_{eq} (dBA)							Distance to Edge of Nearest Project Road in meters[3]					
Site No.	Description	Land Use[1]	Exterior or Interior	Ground or Upper floor[2]	Preferred Alt.	Rev. 10-Lane HOV	Existing	No-Build	Concurrent HOV	Express/Local	Barr.-Sep. HOV	Preferred Alt.	Rev. 10-Lane HOV	Exist./No-Build	Concurrent HOV	Express/Local	Barr.-Sep. HOV
	Dulles Access/Toll Road to American Legion Bridge																
M27	7733 Falstaff Rd.	SF	Exterior	Ground	72	73	68	67	71	73	71	65	65	65	60	60	55
M28	7600 Timberly Ct.	SF	Exterior	Ground	72	74	76	72	75	75	76	55	65	70	65	45	50
M29	Box Elder Ct.	SF	Exterior	Ground	66	65	67	66	68	69	68	155	160	165	155	155	155
M30	1038 Delf Dr.	SF	Exterior	Ground	75	78	74	74	81	82	81	30	30	35	35	30	25
M31	Helga Pl. / Peter Pl.	SF	Exterior	Ground	64	66	63	61	64	65	68	70	70	60	65	55	65
M32	Benjamin / Balls Hill Rd.	SF	Exterior	Ground	65	67	61	60	79	80	79	60	60	60	50	70	45
M33	720 Lawton St.	SF	Exterior	Ground	NA	NA	62	61	72	72	72	NA	NA	85	80	80	75
M34	611 Live Oak Dr.	SF	Exterior	Ground	NA	NA	74	75	78	78	78	NA	NA	40	40	30	30
P91	Gower Ct.	SF	Exterior	Ground	73	73	65	68	67	70	70	60	60	60	60	60	60
P92	Romeo Ct.	SF	Exterior	Ground	65	67	62	64	65	68	67	110	110	110	110	105	105
P93	Church of LDS	W	Exterior	Ground	66	67	68	66	68	69	69	180	190	205	180	185	180
			Interior	Ground	41	42	43	41	43	44	44	180	190	205	180	185	180
P94	Huntmaster Ln.	SF	Exterior	Ground	65	65	63	64	68	68	70	100	105	105	115	100	100
P95	Dominion Ct.	SF	Exterior	Ground	69	72	67	67	71	70	70	175	180	185	185	170	130
P96	Spencer Rd.	SF	Exterior	Ground	67	69	66	65	70	69	69	120	120	115	110	105	120
P97	Salt Meadow Ln.	SF	Exterior	Ground	70	72	69	67	70	72	73	110	110	110	100	90	110
P98	Linganore Dr.	SF	Exterior	Ground	67	69	67	65	67	67	68	145	145	110	110	110	115
P99	Holyrood Dr.	SF	Exterior	Ground	62	63	54	53	63	65	63	130	130	130	120	145	115
P100	Live Oak Dr.	SF	Exterior	Ground	NA	NA	63	63	71	71	72	NA	NA	85	55	75	80
P101	McLean Bible	W	Exterior	Ground	74	76	61	60	79	80	79	35	35	40	30	50	25
			Interior	Ground	49	51	36	35	54	55	54	35	35	40	30	50	25
P102	McLean Presbyterian	W	Exterior	Ground	73	76	73	71	76	78	77	55	55	63	60	60	60
			Interior	Ground	48	51	48	46	51	53	52	55	55	63	60	60	60

Notes:

1. Types of land use: SF = Single-family residence; MF = Multi-family residence; SCH = School; W = Place of worship; and PK = Parks and recreation

2. Traffic noise levels were computed at the balcony locations of large, multi-story multi-family buildings; "Ground" indicates a noise level prediction at a ground floor exterior location, while "Upper" indicates a noise level prediction at a balcony location. In general, projected noise levels are greater at the balcony locations due to the loss of excess attenuation provided by ("acoustically") soft ground.

3. In some cases, the nearest Project road may not be a mainline section of the Beltway, but a ramp or a local cross street. To convert from meters to feet, multiply by 3.28.

4. The indicated receptor(s) would be acquired by the Project, and so would be not applicable (N/A) for certain build alternatives.

outdoor activity occurs. For multi-story apartment buildings that have balconies, traffic noise levels were computed and noise impact was assessed at balcony locations as well as at ground floor locations. In addition to residences, noise-sensitive land uses include churches, schools, and parks and recreational areas. If there were no exterior activities associated with such land uses, noise impact was evaluated with respect to the FHWA Noise Abatement Criteria (NAC) for interior activities, Category E. Following FHWA guidelines, interior noise levels are computed by subtracting the noise reduction factor of the building structure from the predicted exterior noise level. Based on typical wood frame construction with closed windows, an exterior-to-interior noise reduction of 25 dBA was assumed for churches and schools.

The Preferred Alternative is somewhat smaller in scale than the Candidate Build Alternatives studied in the Draft EIS. Project improvements do not extend as far along the Beltway at the northern and southern termini or away from the Beltway on intersecting roadways as do the improvements associated with the other alternatives. As a result, many of the measurement and prediction sites needed for the Draft EIS are outside of the study areas of the Preferred Alternative. The letters "NA" are given in Table 4-7 for the sound levels and distances at sites that are not adjacent to roadway improvements for the Preferred Alternative.

Computed Noise Levels: Existing and Future No-Build. In some areas, design-year noise levels for the No-Build Alternative are expected to increase over existing noise levels by 1 to 4 dB during the loudest hour of the day. In other areas, future no-build noise levels would remain the same or decrease by up to 3 dB. On average, design-year no-build noise levels are expected to increase by approximately 1 dB. This increase would be caused by an increase in projected traffic volumes and the mix of heavy trucks during the loudest hour.

Computed Noise Levels: 2020 Build Alternatives. In some areas, future build noise levels are expected to increase by up to 19 decibels over existing noise levels during the loudest hour of the day, while in other areas, levels are expected to decrease. The average increase over existing noise levels is expected to be approximately 4 decibels, averaged over all sites and all build alternatives. The largest increases over existing noise levels would occur at sites that are currently located behind existing noise barriers; these sites would experience an average increase of 10 decibels when the existing noise barriers are removed. Some locations would experience a decrease from existing levels, primarily where the near travel lanes would be elevated on fill, thereby shielding the noise from the far lanes. In the paragraphs that follow, the average increase over existing noise levels is reported for all applicable sites (both with and without existing barriers) by section of the project.

From the I-95/I-395/I-495 Interchange to Little River Turnpike, future noise levels are expected to increase by 3 decibels (on average) over existing noise levels with the Preferred Alternative. This average is based on about one-third fewer sites than documented in the Draft EIS because the southern terminus of the project for the Preferred Alternative is near Heming Avenue, north of the I-95/I-395/I-495 Interchange. Future build noise levels would range from 63 to 76 dBA with the Preferred Alternative.

From Little River Turnpike to I-66, future noise levels generated by traffic on the Preferred Alternative would be similar to all alternatives studied. The average increase of build noise levels over existing levels would be approximately 3 decibels. Future build noise levels are expected to range from 61 to 78 dBA with the Preferred Alternative.

From I-66 to the Dulles Access/Toll Road, the future noise levels generated by traffic on the Preferred Alternative would be similar to all alternatives studied. The increase of build noise levels over existing levels would average approximately 3 decibels. Future build noise levels would range from 61 to 79 dBA with the Preferred Alternative.

From the Dulles Access/Toll Road to the American Legion Memorial Bridge, future traffic noise levels would increase to 62 to 75 dBA with the Preferred Alternative.

4.7.3 Impact Assessment

Under FHWA and VDOT guidelines and criteria, a noise impact occurs when projected noise levels approach or exceed FHWA's noise abatement criteria or substantially exceed existing noise levels.

Residences. The number of residences exposed to noise impact would be greater with the Preferred Alternative than under existing conditions or the future No-Build Alternative. As shown in **Table 4-8**, noise impacts have been substantially reduced in the Preferred Alternative compared to the Candidate Build Alternatives studied in the Draft EIS.

Table 4-8
TOTAL AND NET RESIDENTIAL NOISE IMPACTS BY ALTERNATIVE

	Number of Dwelling Units with Noise Impact						
			Build (2020)				
Section	**Existing (1998)**	**No-Build (2020)**	**Preferred Alt. 12-Lane HOT**	**Revised Alt. 10-Lane HOV**	**Concurrent HOV**	**Express / Local**	**Barrier-Separated HOV**
I-95/I-395/I-495 Interchange to Little River Turnpike	552	905	787[1] (T)	702[1] (T)	1,743 (T)	1,260 (T)	1,647 (T)
			740[1] (N)	655[1] (N)	1,482 (N)	999 (N)	1,386 (N)
Little River Turnpike to I-66	591	808	953 (T)	833 (T)	898 (T)	1,101 (T)	839 (T)
			930 (N)	810 (N)	866 (N)	1,069 (N)	807 (N)
I-66 to Dulles Access/Toll Road	1,235	1,227	1,359 (T)	1,369 (T)	1,375 (T)	1,439 (T)	1,280 (T)
			1,330 (N)	1,340 (N)	1,346 (N)	1,410 (N)	1,251 (N)
Dulles Access/Toll Road to American Legion Memorial Bridge	124	114	134[2] (T)	165[2] (T)	222 (T)	276 (T)	265 (T)
			113[2] (N)	144[2] (N)	185 (N)	239 (N)	228 (N)
TOTAL	**2,502**	**3,054**	**3,233[1,2]**	**3,069[1,2]**	**4,238**	**4,076**	**4,031**
NET	**2,502**	**3,054**	**3,113[1,2]**	**2,949[1,2]**	**3,879**	**3,717**	**3,672**

Note: The Total (T) number of impacts reflects the removal but not the replacement of existing noise barriers. Because it has been VDOT's practice to replace existing barriers that are removed as the result of a widening project, replacement of existing barriers is expected. The Net (N) number of impacts does not include those residences that are protected by existing noise barriers for design-year no-build conditions, and thus reflects the net effect of the project.

[1] Counts for this alternative exclude the section of the Beltway between Backlick Road and the I-95/I-395/I-495 Interchange; no roadway improvements are planned for this area.

[2] Counts for this alternative exclude the area from the Live Oak Drive overpass to American Legion Bridge.

Table 4-8 provides a comparison of the total and net residential impacts by section of the corridor for existing conditions, the No-Build Alternative, the Candidate Build Alternatives studied in the Draft EIS, the revised 10-Lane (Concurrent) HOV Alternative, and the Preferred Alternative. The total impact reflects the removal but not the replacement of existing noise barriers. Because it has been VDOT's practice to replace existing barriers that are removed as the result of a widening project, replacement of existing barriers is expected. The net impact excludes those residences that are protected by existing noise barriers for design-year no-build conditions, and thus reflects the net effect of the project.

The majority of impacted residences would be exposed to design-year (2020) traffic noise levels that approach or exceed 67 dBA L_{eq} (equal or exceed 66 dBA L_{eq}) during the loudest hour of the day; a small portion of the noise impact is due to substantial increases in existing noise of 10 decibels or more. For residences, noise impact was assessed at areas where outdoor activity occurs. While these exterior areas are commonly the yards, decks, or patios of single-family homes and townhouses, in the case of large multi-story apartment buildings, these exterior areas are balconies. For each of the large multi-story apartment buildings in the study area, noise impact was assessed at balcony locations.

Throughout the study area, a number of noise-sensitive land uses would be exposed to project noise levels that would be 10 dB or more above existing levels. Substantial increases of project noise over existing noise is due to several factors, including:

- the increase in projected (total) traffic volumes for each of the build alternatives;
- the loss of the acoustical shielding provided by rows of buildings that would be acquired by the Project; and
- the increase in projected heavy truck volumes along certain sections of the improved Beltway.

A total of 2,502 dwelling units would be exposed to impact noise levels under existing (1998) conditions, while a total of 3,054 dwelling units would be impacted under the future No-Build Alternative. This increase in the number of impacted dwelling units is primarily due to the projected increase in heavy truck volumes that are expected to occur during the loudest hour of the day with the future No-Build Alternative (see Section 3.7). For each of the build alternatives, the number of residences exposed to future noise levels that equal or exceed 66 dBA L_{eq} is expected to increase compared to the number of homes exposed to these levels under existing conditions.

Table 4-8 shows that significantly less noise impact would occur with the Preferred Alternative compared to the Candidate Build Alternatives studied in the Draft EIS. This difference is primarily because the improvements proposed under the Preferred Alternative are less extensive than those proposed for the Candidate Build Alternatives studied in the Draft EIS. The section where this effect is most pronounced is at the southern terminus. Smaller differences in noise impact due to the extent of the project improvements are observed at the northern terminus, where the improvements proposed as part of the Preferred Alternative end at the Live Oak Drive overpass, instead of extending to the American Legion Bridge. Existing and no-build impacts are tabulated for the full study corridor.

Table 4-9 provides a breakdown of the Net residential noise impact by section of corridor and by type of impact for the Preferred Alternative. In this table, the number of dwelling units exposed to noise impact for existing conditions and the future No-Build Alternative represent the number of homes where traffic noise levels equal or exceed 66 dBA L_{eq}. Impact for existing conditions and the No-Build Alternative are repeated in each of the following tables to make comparison more convenient.

Table 4-9
BREAKDOWN OF NET RESIDENTIAL NOISE IMPACT FOR THE PREFERRED ALTERNATIVE

	Net Number of Dwelling Units with Noise Impact				
			Build (2020)		
Section	**Existing (1998)**	**No-Build (2020)**	**Approach or Exceed NAC Only**	**Substantial Increase Only**	**Both *Approach or Exceed* and *Substantial Increase***
I-95/I-395/I-495 Interchange to Braddock Road	87	197	71[1]	0[1]	0[1]
Braddock Road to Little River Turnpike	465	708	652	0	17
Little River Turnpike to Gallows Road	154	254	244	0	0
Gallows Road to Arlington Boulevard	0	0	0	0	0
Arlington Boulevard to I-66	437	554	586	0	100
I-66 to Leesburg Pike	432	473	479	0	0
Leesburg Pike to Route 123	408	451	456	0	0
Route 123 to Dulles Access/Toll Road	395	303	395	0	0
Dulles Access/Toll Road to Georgetown Pike	107	99	107	0	0
Georgetown Pike to American Legion Memorial Bridge	17	15	1[2]	5[2]	0[2]
Subtotals	**2,502**	**3,054**	**2,991**	**5**	**117**
Grand Totals	**2,502**	**3,054**			**3,113**

Note: The Net number of impacts does not include those residences that are protected by existing noise barriers for design-year no-build conditions, and thus reflects the net effect of the project. The replacement of existing barriers that are removed as a result of the Project is expected.

[1] Counts for this alternative exclude the section of the Beltway between Heming Ave and the I-95/I-395/I-495 Interchange; no roadway improvements are planned for this area.

[2] Counts for this alternative exclude the area from the Live Oak Drive overpass to American Legion Bridge.

The net number of dwelling units exposed to noise impact was tabulated for three separate categories, or types of noise impact. The first type of noise impact occurs wherever project noise levels would equal or exceed 66 dBA L_{eq}, but the increase above existing levels would be less than 10 dB (as shown in the fourth column of Table 4-9). The second type of noise impact occurs wherever the project alternative would cause a substantial increase in the existing noise level (10 dB or more), but the design-year noise level would be less than 66 dBA L_{eq} (as shown in the fifth column). Finally, the third type of impact occurs where both conditions exist, i.e., where project noise levels would equal or exceed 66 dBA L_{eq} *and* the project alternative would cause a substantial increase over existing levels (as shown in the sixth column). For each section of the project corridor, the net noise impact is the sum of the number of dwelling units across the three types of impact.

With the Preferred Alternative (Table 4-9), the net noise impact would total 3,113 dwelling units. Of these dwelling units, 2,991 would be exposed to build noise levels that equal or exceed 66 dBA L_{eq}, but would be less than 10 dB above existing levels. In comparison, only 5 residences would experience project noise levels that would be 10 dB or more above existing levels, but less than 66 dBA L_{eq}, and 117 homes would experience both increases in project noise levels of 10 dB or more and project noise levels that equal or exceed 66 dBA L_{eq}.

Non-residential Noise-sensitive Land Uses. The potential noise impacts due to the proposed improvements were also assessed at non-residential noise-sensitive land uses including places of worship, schools, and parks and recreation areas.

Places of Worship

Ravensworth Baptist Church is located east of the Beltway along Ravensworth Road, and is represented by Site P51 in Table 4-7 and Figure 4-2. The Ravensworth Baptist Church is outside of the project study area because no project improvements are planned in the vicinity.

The Word of Grace Fellowship Church on Hartland Road (Site P64 in Table 4-7 and Figure 4-2) would be exposed to future exterior noise levels of up to 77 dBA with the Preferred Alternative. Because the church does not have any designated outdoor activity areas and is air-conditioned, noise impacts were assessed with respect to the interior NAC of 52 dBA. Based on an exterior-to-interior noise reduction of 25 dBA, noise impact would occur at the church under the Preferred Alternative. The existing interior noise level is 51 dBA, and the future no-build level would be up to 53 dBA; both represent impact noise levels.

The Church at Dunn Loring is located west of the Beltway on Morgan Lane, and is represented by Site M19B in Table 4-7 and Figure 4-2. Future exterior noise levels at the church would be up to 79 dBA with the Preferred Alternative. Because the church does not have any designated outdoor activity areas and is air-conditioned, noise impacts were assessed with respect to the interior NAC of 52 dBA. Based on an exterior-to-interior noise reduction of 25 dBA, future noise impact is expected with the Preferred Alternative. Existing and no-build levels are 51 dBA, representing impact sound levels.

The Church of Latter Day Saints on Scotts Run Road east of the Beltway (Site P93 in Table 4-7 and Figure 4-2) would be exposed to future traffic (exterior) noise levels of 66 dBA under the Preferred Alternative. Because the church does not have any designated outdoor activity areas facing the Beltway and is air-conditioned, noise impacts were assessed with respect to the interior NAC of 52 dBA. Future interior noise levels are not expected to exceed 44 dBA during the loudest hour of the day; therefore, noise impact is not expected to occur at this church. Existing and no-build noise levels are similar.

The McLean Presbyterian Church (Site P102 in Table 4-7 and Figure 4-2) would experience future exterior noise levels of 73 dBA with the Preferred Alternative. The playground on the north side of the building would be impacted under the Preferred Alternative. Noise impacts at the church also were assessed with respect to the interior NAC of 52 dBA. Interior noise impacts are not expected to occur at the church under the Preferred Alternative which would have an interior noise level would be 48 dBA. Existing and no-build interior levels are 48 dBA and 46 dBA, respectively.

The McLean Bible Church (Site P101 in Table 4-7 and Figure 4-2) is located in a neighborhood that has an existing noise barrier that would be removed as a result of the project. Even if the existing barrier were removed but not replaced, interior noise impact would not occur at this church under the Preferred Alternative. Because it has been

VDOT's practice to replace such barriers in similar situations, replacement of the noise barrier for the Balmacra/River Oaks (east) community is expected.

Schools

Exterior activity areas at the North Springfield Elementary School (Site P45 in Table 4-7 and Figure 4-2) include a playground and courts on the north side of the west wing of the school building. The west wing of the school building shields these outside activity areas from Beltway traffic noise. Consequently, noise impacts at the North Springfield Elementary School were assessed with respect to the FHWA NAC for Activity Category E, which is based on an interior noise level of 52 dBA. Because the school is air-conditioned, a closed-window outdoor-to-indoor noise reduction of 25 dBA was assumed. Future interior noise levels are not expected to exceed 50 dBA during the loudest hour of the day with the Preferred Alternative; therefore, noise impact at the school is not expected.

The Stenwood Elementary School (Site M17B in Table 4-7 and Figure 4-2) is located in the Dunn Loring Woods neighborhood, which has an existing noise barrier. If the existing barrier were removed but not replaced, noise impact would occur in the exterior activity areas at the school. Because it has been VDOT's practice to replace such barriers in similar situations, replacement of the noise barrier for Dunn Loring Woods is expected, which would mitigate the noise impact at the school.

The athletic fields at Marshall High School (Site M23 in Table 4-7 and Figure 4-2) would be exposed to future noise levels of 69 dBA with the Preferred Alternative. Therefore, these outdoor activity areas would be exposed to noise impacts with the Preferred Alternative. However, interior noise levels are not expected to exceed 45 dBA; therefore, project noise would not impact interior activities at the school.

Parks and Recreation Areas

Table 4-10 provides a summary of the parks and recreation areas affected by project noise. This table provides the average distance at which project noise levels would approach or exceed the FHWA NAC for Activity Category B (exterior) as measured from the edge of the nearest project road, and a summary of the projected noise impact. The distances shown in Table 4-10 reflect the removal but not the replacement of existing barriers. Because it has been VDOT's practice to replace barriers that are removed as the result of a widening project, replacement of existing barriers is expected. The result would be the elimination of noise impacts in those parks and recreation areas that are behind existing barriers.

The FHWA NAC are based upon noise levels associated with human speech interference. The FHWA NAC represent a "compromise between noise levels that are desirable and those that are achievable." For these reasons, although project noise levels may approach or exceed the FHWA NAC in certain portions of a park or recreation area, unless those portions of the noise-sensitive areas receive frequent human use, noise impact would not occur. That is, for a park or recreation area (or some portion of such a land use) to be exposed to noise impact, it must experience frequent human use. Therefore, Table 4-10 lists noise impacts for park and recreation activity areas where project noise levels approach or exceed the NAC, and not for areas with infrequent use.

4.7.4 Noise Abatement

FHWA has identified certain noise abatement measures that may be incorporated in projects to reduce traffic noise impact. Abatement measures that have been considered for this project include traffic management, alteration of horizontal and vertical alignment, and construction of noise barriers. Traffic management measures that have been considered for noise abatement include reduced speeds and truck restrictions for the design-year build alternatives. Reduced speeds are not an effective noise mitigation measure because a substantial decrease in speed is necessary to provide a meaningful noise reduction. A 10 mph (16 kph) reduction in speed will result in only a 2-dBA decrease in noise level. Truck restrictions would not be considered a feasible noise abatement measure because the very purpose of the existing interstate facility is to move large volumes of traffic including trucks.

Table 4-10
PARKS AND RECREATION AREAS: AVERAGE DISTANCE AT WHICH PROJECT NOISE LEVELS APPROACH OR EXCEED FHWA NAC AND IMPACT SUMMARY

	Average Distance at which Project Noise Levels Equal or Exceed 66 dBA (in meters)[1]							Activity Areas Exposed to Noise Impact? (Yes or No)						
Park Name	**Preferred Alt.**	**Rev. 10-Lane HOV**	**Existing**	**Future No- Build**	**Concurrent HOV**	**Express/ Local**	**Barrier-Separated HOV**	**Preferred Alt.**	**Rev. 10-Lane HOV**	**Existing**	**Future No- Build**	**Concurrent HOV**	**Express/ Local**	**Barrier-Separated HOV**
I-95/I-395/I-495 Interchange to Little River Turnpike														
Springfield Swim Club	NA[2]	NA[2]	70	90	100	70	100	NA[2]	NA[2]	No	Yes	Yes	Yes	Yes
Americana Park	55	60	80	100	100	100	110	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fitzhugh Park	110	100	90	90	110	100	110	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Flag Run Park	90	95	70	80	100	80	100	No	No	No	No	No	No	No
Lake Accotink Park	70	40	---	---	110	80	110	No	No	No	No	No	No	No
Wakefield Park	90	90	50	60	70	70	70	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Wakefield Park Tennis Courts	90	80	80	90	90	70	90	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Little River Turnpike to I-66														
Accotink Stream Valley Park	105	105	110	120	120	120	120	No	No	No	No	No	No	No
Annandale Community	130	130	130	130	130	130	130	No	No	No	No	No	No	No
Jefferson District Park	210	210	180	210	140	230	120	No	No	No	No	No	No	No
I-66 to Dulles Access/Toll Road														
Idylwood Park	110	110	90	110	110	110	130	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lisle Park	NA[2]	NA[2]	70	80	90	100	110	NA[2]	NA[2]	Yes	Yes	Yes	Yes	Yes
Washington and Old Dominion Railroad Regional Park	190	170	150	180	210	170	190	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Dulles Access/Toll Road to American Legion Memorial Bridge														
McLean Hamlet Park	NA[2]	NA[2]	70	140	120	150	140	NA[2]	NA[2]	No	No	No	No	No
Scott's Run Nature Preserve	150	140	120	130	170	230	220	No	No	No	No	No	No	No
Scott's Run Stream Valley Park	160	140	200	170	180	160	140	No	No	No	No	No	No	No
Timberly Park	230	210	210	200	280	270	240	No	No	No	No	No	No	No

[1.] "Distance" is given in meters as measured from edge of Project road, and reflects the removal but not the replacement of existing barriers; to convert from meters to feet multiply by 3.28.

[2.] Park is outside of the study area for this alternative; no project roadway improvements are proposed in the immediate vicinity.

The alteration of horizontal alignment is limited by the extensive existing development along the project corridors. Meaningful noise reduction at noise-sensitive locations would require large alignment shifts, which would necessitate huge additional property takings and could expose additional sites to project noise. The alteration of vertical alignment is not feasible because depressing the roadway would require taking of additional property for the sloped embankments, or excessive costs for the construction of sound-absorptive retaining walls.

Noise Barriers. The only remaining abatement alternative investigated was the construction of noise barriers. The feasibility and reasonableness of noise barriers was studied at all locations where build alternatives would cause noise impacts within 1,000 feet (300 meters) of the road. At distances greater than 1,000 feet, the noise prediction model is not considered especially reliable, and the influence of the Beltway on ambient noise levels would be substantially diminished. Where the construction of noise barriers was found to be feasible, barrier noise reduction was estimated based on roadway, barrier, and receiver geometry, as described below.

Table 4-11 summarizes the noise barriers evaluated and the number of dwelling units protected by the barriers for the Preferred Alternative. A dwelling unit is "protected" if it is exposed to future noise impact (without a barrier) and would receive at least 5 decibels of noise reduction from a barrier. By comparison, a dwelling unit is "benefited" if it is not exposed to future noise impact, but still receives at least 5 decibels of noise reduction from a barrier designed to protect other homes.

The reasonableness of noise barriers for non-residential noise-sensitive land uses (including churches, schools, and parks and recreation areas) is determined during final design on a case-by-case basis with respect to the type and duration of activity, size of the affected area, severity of impact, total cost, and the amount of noise reduction.

Table 4-11
SUMMARY OF EVALUATED NOISE BARRIERS BY ALTERNATIVE

	Build Alternative				
	Preferred Alt. 12-Lane HOT	**Revised 10-Lane HOV**	**Concurrent HOV**	**Express-Local**	**Barrier-Separated HOV**
Total Homes Impacted	3,233	3,069	4,238	4,076	4,031
Total Homes Protected	2,943	2,902	3,900	3,616	3,875
Total Homes Protected (including Benefited)	4,198	4,237	5,213	5,289	5,219
Total Homes Protected by Cost-Effective Barriers	2,888	2,839	3,823	3,537	3,793
Total Homes Protected (including Benefited) by Cost-Effective Barriers	4,122	4,166	5,123	5,199	5,129
Total Cost of all Barriers (including Barriers with 3rd Party Funding)	$31,650,000	$32,240,000	$43,010,000	$43,160,000	$42,440,000
Total Cost of all Barriers that meet VDOT's cost-effectiveness criteria	$25,470,000	$26,180,000	$35,680,000	$35,830,000	$35,110,000

Feasibility and Reasonableness. Total barrier costs were calculated assuming a unit cost of $16 per square foot ($172 per square meter), per the VDOT guidelines in force when the Draft EIS was issued. Where noise barriers would be physically feasible and could provide at least 5 decibels of noise reduction, barrier reasonableness was then based on VDOT's cost-effectiveness criterion: a maximum of $30,000 per protected or benefited dwelling unit. It is expected that the traffic projections will be revisited during final design which could affect the conclusions regarding noise barriers.

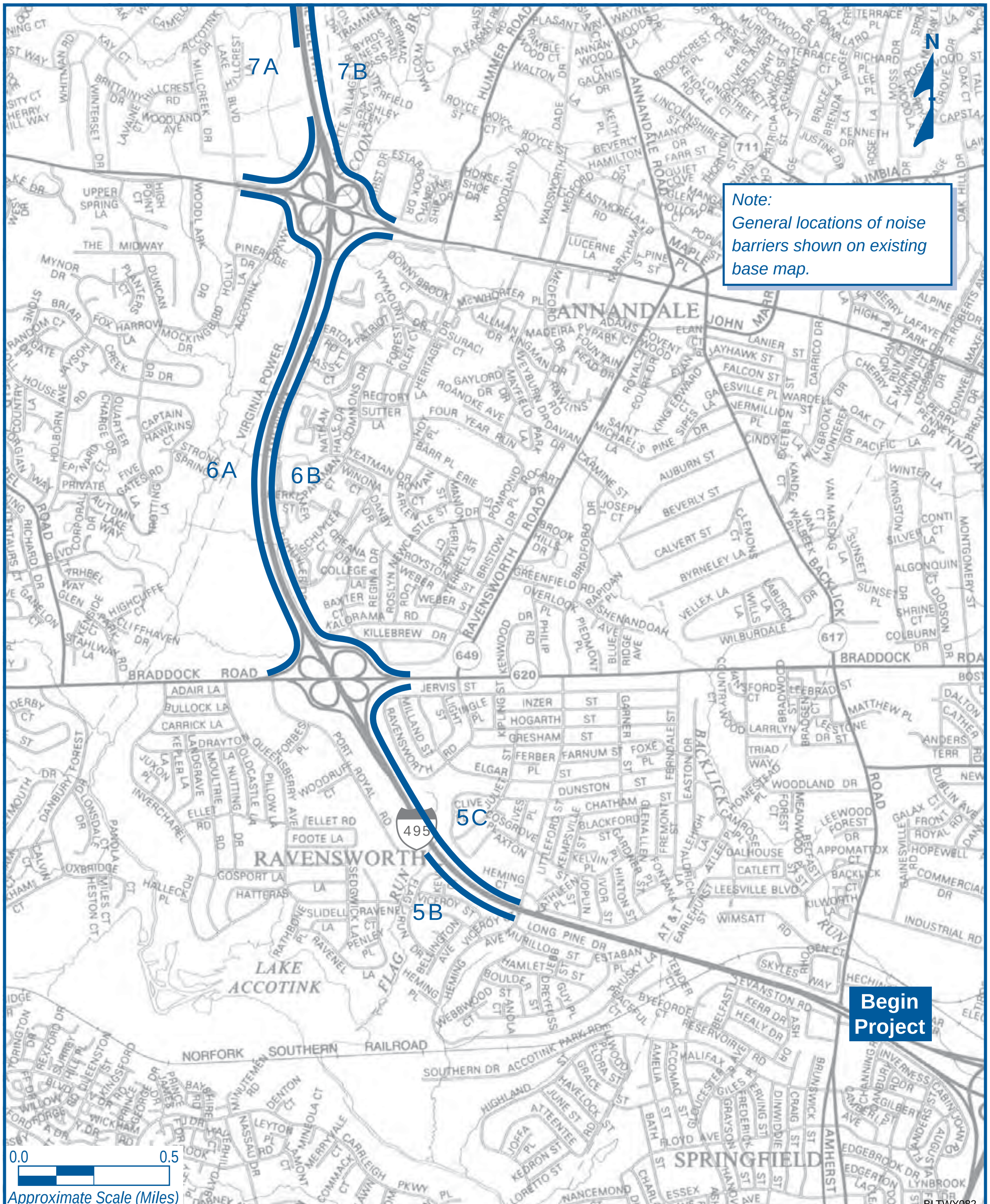
***Third Party Funding of Noise Barriers*.** Upon completion of the final noise barrier design, should a barrier cost exceed the criterion of $30,000 per protected or benefited home, additional funding must be secured before the barrier will receive further consideration. Third-party funding must come from any source other than VDOT or FHWA and must be committed in writing to VDOT within 90 days following public notification. Without the written commitments by the specified deadline, a third-party-funded barrier will not receive further consideration.

***Existing Noise Barriers*.** Several existing noise barriers in the study area would have to be removed to widen the Beltway with the Preferred Alternative. Any existing barriers that would be removed would then be replaced by barriers built as part of the project. It has been VDOT's practice to replace any barriers removed because of widening projects. To compute the cost-effectiveness for the replacement barriers, existing-barrier costs were subtracted from replacement-barrier costs then divided by the number of residences (dwelling units) protected/benefited. In Table 4-12 and corresponding discussion, this cost per home is labeled "Net." In all cost-effectiveness computations, barrier costs assume unit costs of $172 per square meter ($16 per square foot), per VDOT guidelines. Figure 3-11 shows the locations of existing noise barriers in the study area (see Chapter 3).

Barrier Descriptions. The following sections provide detailed descriptions about each of the potential noise barriers for the Preferred Alternative. **Figure 4-3** shows the locations of all feasible noise barriers for the Preferred Alternative. Some of the barriers are broken into separate segments to accommodate cross streets. **Table 4-12** describes each potential noise barrier, including total length, range of heights, the number of protected homes, the number of benefited homes, types of noise-sensitive land use protected and/or benefited, the estimated cost, and the cost per home. Where both Total and Net costs and protection are shown, the difference is the cost and protection of an existing barrier that would be removed by the project. The *Noise Technical Report* provides further detail about each of the potential barriers for all of the build alternatives.

Noise Barrier 5B. This barrier, which would replace an existing barrier, extends from the southwest quadrant of the Braddock Road/I-495 interchange to the southern terminus of the project near Backlick Road. The project southern terminus is near Heming Avenue. With the Preferred Alternative, a barrier 768 meters (2,519 feet) long and ranging in height from 2 to 7 meters (7 to 23 feet) would protect a total of 19 homes, benefit 8 additional homes, and protect portions of Lake Accotink Park. The total barrier cost would be $590,000, and the net cost per home would be $18,800. This barrier is cost effective without including the benefit provided to portions of the park.

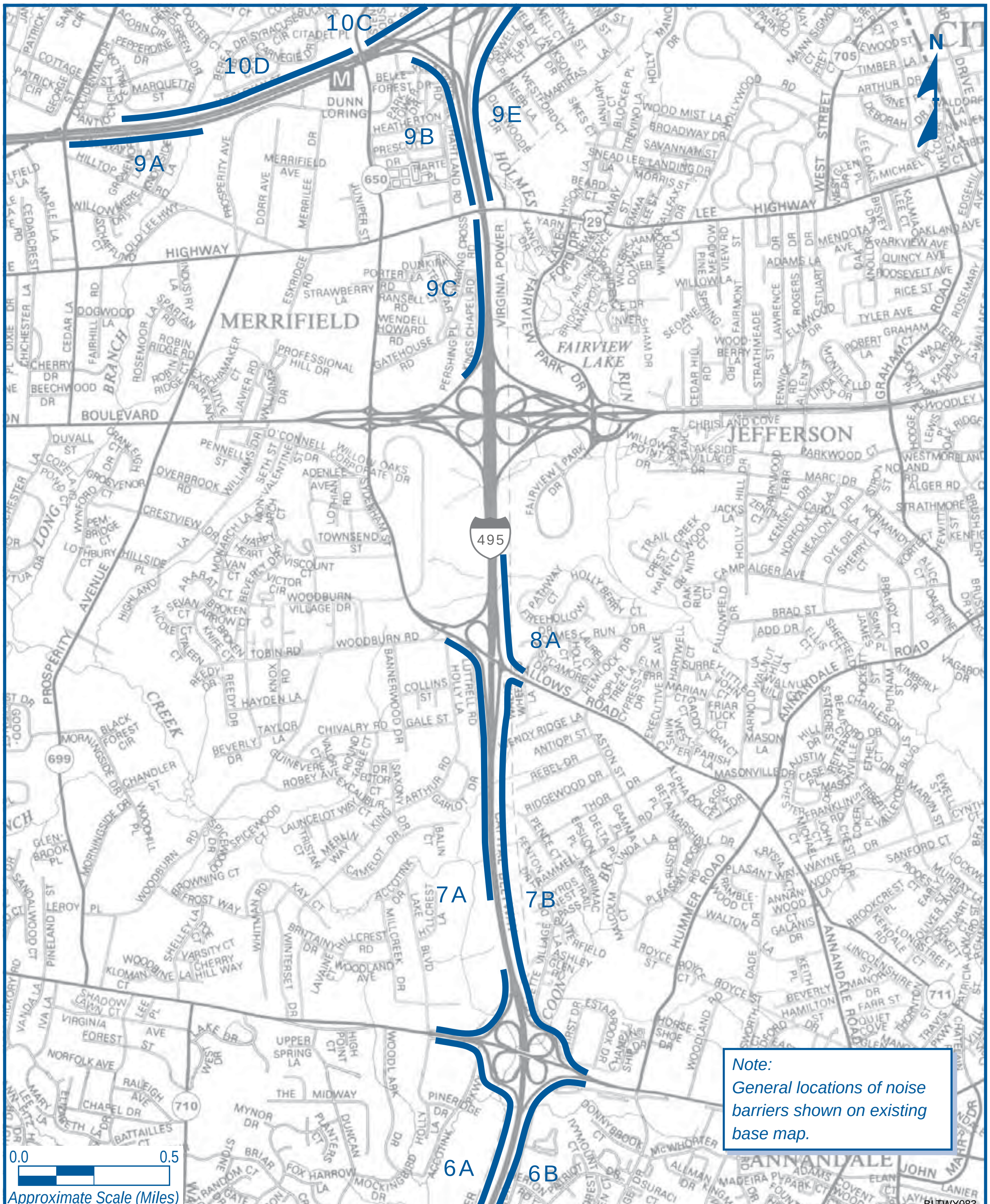
Noise Barrier 5C. This barrier would replace the existing barrier that extends from the project's southern terminus to the southeast quadrant of the Braddock Road/I-495 interchange. With the Preferred Alternative, Barrier 5C would have a length of 1,675 meters (5,494 feet), range in height from 2 to 7 meters (7 to 23 feet) and have a total cost of approximately $1.1 million. The barrier would protect a total of 55 homes (including those homes protected by the existing barrier) as well as the North Springfield Elementary School and portions of Flag Run Park. The barrier would benefit 36 additional homes, and have a net cost per home of $10,130. This barrier would meet VDOT's cost-effectiveness criterion.



LOCATIONS OF POTENTIAL NOISE BARRIER AREAS
I-95/I-395/I-495 Interchange to Little River Turnpike

Figure 4-3a
(1 of 4)

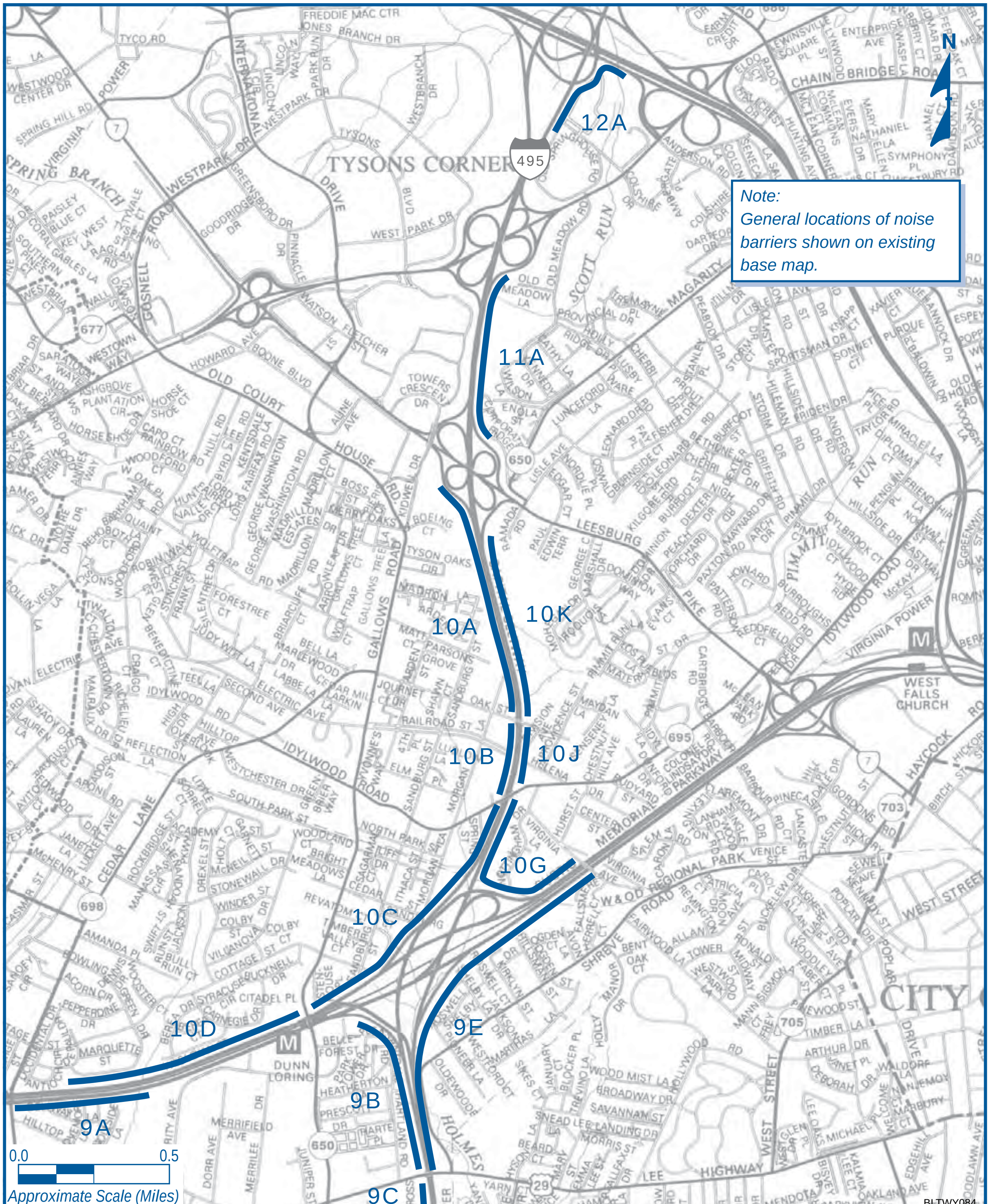
CAPITAL BELTWAY STUDY



LOCATIONS OF POTENTIAL NOISE BARRIER AREAS
Little River Turnpike to I-66

Figure 4-3b
(2 of 4)

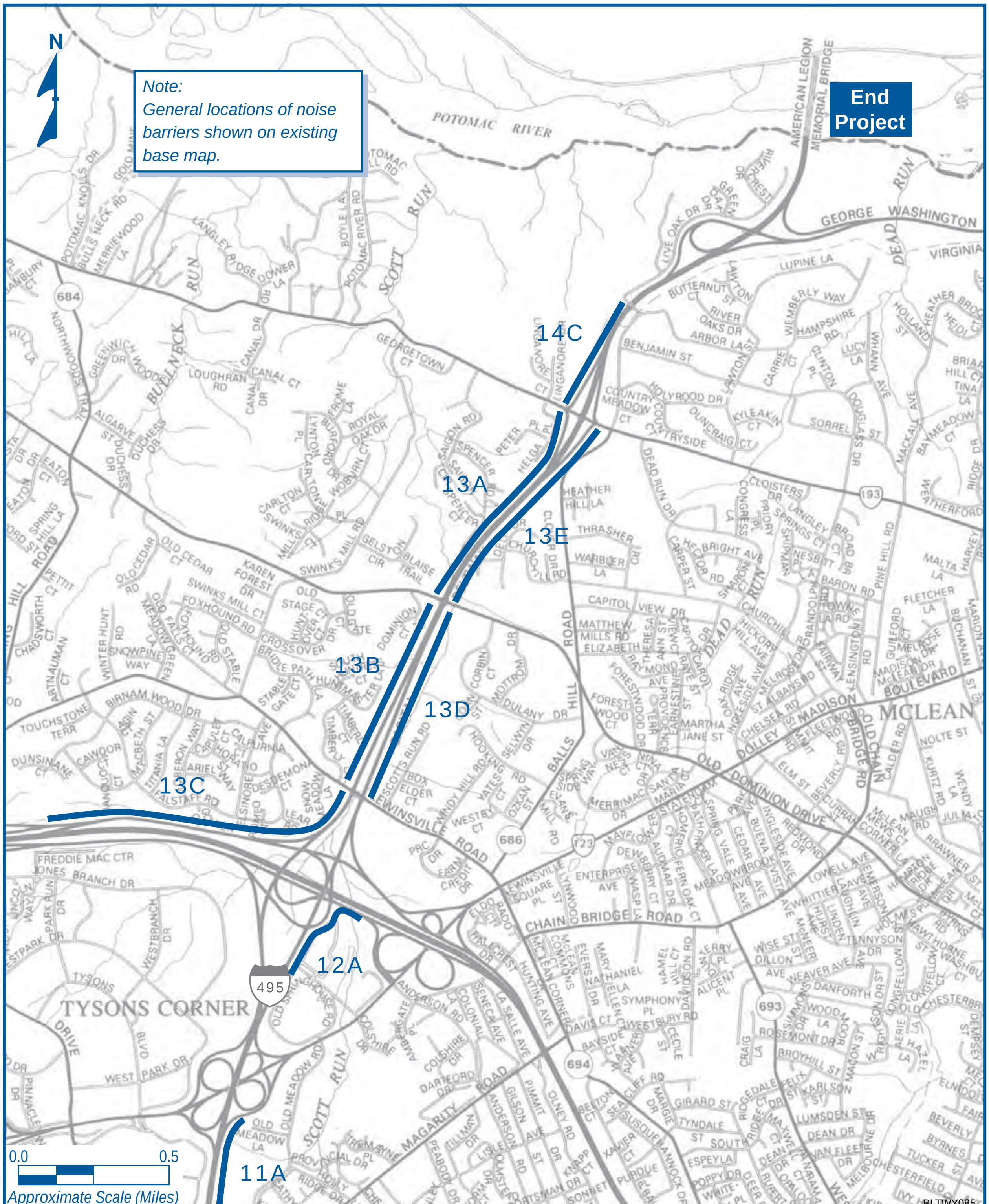
CAPITAL BELTWAY STUDY



LOCATIONS OF POTENTIAL NOISE BARRIER AREAS
I-66 to Dulles Access/Toll Road

Figure 4-3c
(3 of 4)

CAPITAL BELTWAY STUDY



LOCATIONS OF POTENTIAL NOISE BARRIER AREAS
Dulles Access/Toll Road to American Legion Memorial Bridge
Figure 4-3d (4 of 4)
CAPITAL BELTWAY STUDY

Table 4-12
DESCRIPTIONS OF NOISE BARRIERS EVALUATED FOR THE PREFERRED ALTERNATIVE

Barrier No.	Length (meters) (note 1)	Range of Heights (meters) (note 1)	Cost (note 2)	Noise-sensitive Land Use (note 3)		Cost per Home (note 6)
				Protected (note 4)	Benefited (note 5)	
5B	768	2 to 7	$590,000 (Total)	19 res. (Total), park	8 res.	$21,850 (Total)
			$150,000 (Net)	0 res. (Net)		$18,800 (Net)
5C	1,675	2 to 7	$1,080,000 (Total)	55 res. (Total), park, school	36 res.	$11,870 (Total)
			$790,000 (Net)	42 res. (Net)		$10,130 (Net)
6A	3,233	3 to 9	$2,870,000	Park	3 res.	N/A
6B	3,492	2 to 9	$3,420,000 (Total)	663 res. (Total), park	120 res.	$4,370 (Total)
			$3,210,000 (Net)	653 res. (Net)		$4,150 (Net)
7A	2,181	5 to 8	$2,420,000 (Total)	73 res. (Total), park	24 res. (Total)	$24,900 (Total)
			$1,990,000 (Net)	55 res. (Net)		$25,200 (Net)
7B	2,335	2 to 7	$2,320,000	148 res.	85 res., rec. area	$9,960
8A	690	7 to 11	$1,030,000 (Total)	5 res. (Total)	50 res.	$18,700 (Total)
			$480,000 (Net)	0 res. (Net)		$9,600 (Net)
9A	712	3	$370,000	116 res.	---	$3,200
9B	945	4 to 5	$790,000	265 res., ch.	79 res.	$2,300
9C	850	3 to 6	$690,000	174 res.	18 res.	$3,600
9E	1,660	3 to 8	$1,530,000 (Total)	98 res. (Total)	75 res., park	$8,800 (Total)
			$910,000 (Net)	98 res. (Net)		$5,300 (Net)
10A	1,063	3 to 5	$710,000 (Total)	68 res. (Total)	85 res.	$4,600 (Total)
			$580,000 (Net)	58 res. (Net)		$4,100 (Net)
10B	349	3 to 5	$280,000	20 res., ch.	---	$14,000
10C	1,562	3 to 5	$1,090,000 (Total)	48 res. (Total)	---	$22,700 (Total)
			$420,000 (Net)	29 res. (Net)		$14,500 (Net)
10D	1,367	3 to 6	$1,150,000	113 res., sch.	31 res.	$8,000
10G	685	3 to 8	$640,000	24 res.	---	$26,700
10J	311	5 to 7	$330,000	20 res.	---	$17,000
10K	1,082	4 to 8	$1,240,000	179 res., sch.	146 res.	$3,800
11A	1,215	9	$1,880,000	353 res., park	379 res.	$2,600
12A	719	5 to 12	$1,040,000	379 res.	47 res.	$2,400
13A	1,007	3 to 5	$610,000	14 res.	5 res., park	$32,000
13B	1,143	5 to 8	$1,250,000	24 res.	13 res., park	$33,800
13C	1,596	4 to 9	$1,710,000 (Total)	33 res. (Total)	43 res., park	$22,500 (Total)
			$990,000 (Net)	25 res. (Net)		$14,600 (Net)
13D	1,132	4 to 9	$1,200,000	11 res., ch.	---	$109,100

Table 4-12
DESCRIPTIONS OF NOISE BARRIERS EVALUATED FOR THE PREFERRED ALTERNATIVE

Barrier No.	Length (meters) (note 1)	Range of Heights (meters) (note 1)	Cost (note 2)	Noise-sensitive Land Use (note 3)		Cost per Home (note 6)
				Protected (note 4)	Benefited (note 5)	
13E	1,226	3 to 8	$1,170,000	35 res., ch.	8 res.	$27,200
14C	488	3	$250,000	6 res.	park	$41,700

Notes:

1.) To convert from meters to feet, multiply by 3.28.

2.) Costs are based on a statewide average unit cost of $172 per square meter ($16 per square foot) intended only for cost-effectiveness calculations, and should not be used as an engineers' estimate for construction costs.
(Total) = the total cost of a replacement noise barrier (where a noise barrier now exists but must be replaced).

(Net) = the cost of the replacement barrier *minus* the cost of the existing barrier that would be replaced.

3.) Land Use : res. = residence (single-family, townhouse, or individual unit in multi-family building); park = parks and recreational land use; sch. = school; ch. = church/place of worship.

4.) A noise-sensitive land use is *protected* if (1) it receives at least 5 dB of noise reduction *and* (2) it is exposed to future noise impact. Total = total number of dwelling units protected by the replacement barrier (including those homes protected by the existing barrier); Net = the total number of dwelling units protected by the replacement barrier *minus* the number of dwelling units protected by the existing barrier.

5.) A noise-sensitive land use is *benefited* if (1) it receives at least 5 dB of noise reduction but *is not* exposed to future noise impact.

6.) Cost divided by the sum of all protected and all benefited dwelling units – that is, by all dwelling units that receive at least 5 dB of noise reduction, whether impacted or not. The cost per home is *not applicable* for barriers that are designed to protect parks and other non-residential noise-sensitive land use; the reasonableness of such barriers is determined on a case-by-case basis taking into account the total cost of the barrier, the severity of impact, the amount of noise reduction, the type and duration of activity, and the size of the affected area.

Noise Barrier 6A. This barrier is designed primarily for the protection of Wakefield Park and Americana Park, and extends along the length of I-495 southbound between Little River Turnpike and Braddock Road. To benefit residential properties along the southwestern quadrant of the Little River Turnpike interchange, the barrier could extend to the west along Little River Turnpike. Although access issues would likely prohibit barriers from being built along Little River Turnpike, barrier designs were evaluated for this area. For the Preferred Alternative, Barrier 6A would be 3,233 meters (10,604 feet) long, range in height from 3 to 9 meters (10 to 30 feet), and cost about $2.9 million. The reasonableness and cost-effectiveness of this barrier depends upon the noise sensitivity of the park properties, and would be evaluated on a case-by-case basis.

Noise Barrier 6B. This barrier would replace two existing barriers and protect residences and Fitzhugh Park, extending from the northeast quadrant of the Braddock Road interchange to the southeast quadrant of the Little River Turnpike interchange. For the Preferred Alternative, Barrier 6B would be 3,492 meters (11,454 feet) long, range in height from 2 to 9 meters (7 to 30 feet), and have a total cost of about $3.4 million. Under the Preferred Alternative, 663 homes would be protected, 120 would be benefited, and the barrier's net cost per home would be $4,150. Fitzhugh Park also would be protected with the barrier. Noise Barrier 6B is cost-effective without including the benefit provided to Fitzhugh Park.

Noise Barrier 7A. This barrier would replace an existing barrier and protect residences and the Accotink Stream Valley Park, extending from the Gallows Road interchange to the Little River Turnpike interchange along the west side of I-495. The total cost of the barrier that would replace the existing barriers would be approximately $2.4 million. For the Preferred Alternative, the barrier would be 2,181 meters (7,154 feet) long and range in height from 5 to 8 meters (16 to 26 feet). Barrier 7A would protect 73 homes and portions of the park, and benefit 24 additional homes. The barrier's net cost per home would be $25,200. Barrier 7A meets VDOT's cost-effectiveness criterion for both alternatives, without including the benefit provided to Accotink Stream Valley Park.

Noise Barrier 7B. This barrier would protect a residential area, and extend along the east side of I-495 from the Little River Turnpike interchange to the Gallows Road interchange. For the Preferred Alternative, Barrier 7B would be 2,335 meters (7,659 feet) long, range in height from 2 to 7 meters (7 to 23 feet), and have a total cost of about $2.3 million. The barrier would protect 148 homes, and benefit another 85 homes and the Annandale basketball court. The cost per home is $9,960, meeting VDOT's cost-effectiveness criterion.

Noise Barrier 8A. This barrier would replace the existing barrier that extends from the northeast quadrant of the Gallows Road interchange to midway between the Gallows Road and Route 50 interchanges. Barrier 8A would be 690 meters (2,263 feet) long, range in height from 7 to 11 meters (23 to 36 feet), and have a Total cost of about $1.0 million. Five homes are protected and 50 benefited with this barrier, and the net cost per home is approximately $10,000. Barrier 8A would meet VDOT's cost-effectiveness criterion.

Noise Barrier 9A. This barrier would protect the townhouses adjacent to Dellway Lane and Knollside Lane, west of the I-66 / I-495 interchange, near the project terminus on I-66 west. For the Preferred Alternative, this barrier would have a length of 712 meters (2335 feet), and a uniform height of 3 meters (10 feet). The total cost of this barrier is $370,000. The barrier would protect 116 homes impacted under the Preferred Alternative, at a cost of $3,200 per home. Barrier 9A meets VDOT's cost-effectiveness criterion.

Noise Barrier 9B. This potential barrier is designed to protect the Merrifield Village Apartments adjacent to Hartland Road and Pleasantdale Road, and the Word of Grace Fellowship Church on Hartland Road. The barrier for the Preferred Alternative would be 945 meters (3106 feet) in length, and would have a height range of 4 to 5 meters (13 to 16 feet). This barrier would protect all 265 homes and the church, and benefit an additional 79 homes. This barrier design would cost $790,000, or $2,300 per home, meeting the VDOT cost-effectiveness criterion.

Noise Barrier 9C. This barrier is designed to protect the Yorktown Square Condominiums along Charing Cross Road and Kings Chapel Road. For the Preferred Alternative, Barrier 9C would be 850 meters (2790 feet) long, and have a height range of 3 to 6 meters (10 to 20 feet). The barrier would protect all 174 homes, and benefit an additional 18 homes. The barrier would cost $690,000, or $3,600 per home, thereby meeting VDOT's cost-effectiveness criterion.

Noise Barrier 9E. This barrier is designed to protect single-family homes in the southeast quadrant of the I-66 interchange and would replace an existing barrier. With the Preferred Alternative, more first-row impacts are expected than for the Candidate Build Alternatives studied in the Draft EIS, because the existing first row of homes in this area has a higher building density, and would not be excluded as "takes" for the Preferred Alternative, as they previously were.

For the Preferred Alternative the barrier would be 1,660 meters (5,445 feet) long, range in height from 3 to 8 meters (10 to 26 feet) and would have a total cost of just over $1.5 million. This barrier would protect the 98 homes impacted with this alternative, and benefit an additional 75 homes and Jefferson District Park. The net cost of this barrier would be $5,300 per home, meeting VDOT's cost-effectiveness criterion.

Noise Barrier 10A. Barrier 10A would extend from the southwest quadrant of the Rt.7/I-495 interchange to the Oak Street overpass replacing an existing barrier. For the Preferred Alternative, Barrier 10A would have a length of 1063 meters (3490 feet), and a height range of 3 to 5 meters (10 to 16 feet). The barrier would protect all 68 impacted homes, and benefit another 85 homes. The barrier would cost $710,000 and have a net cost of $4,100 per home, thus meeting VDOT's cost-effectiveness criterion.

Noise Barrier 10B. This barrier was evaluated for the residential properties between the Oak Street overpass and the Idylwood Lane overpass on the west side of I-495. Noise impact is also predicted for the Church at Dunn Loring. For the Preferred Alternative, a barrier could protect all 20 impacted residences and the church. The barrier would have a length of 349 meters (1150 feet), and a height range of 3 to 5 meters (10 to 16 feet). The barrier would have a total cost of $280,000, or $14,000 per home, thereby meeting VDOT's cost-effectiveness criterion.

Noise Barrier 10C. This barrier would extend from Idylwood Road to Gallows Road on the west side of I-495, and is designed to protect the Washington & Old Dominion trail, the Iliff Nursing & Rehabilitation Center, and single family homes adjacent to Woodcroft Court, Sandburg Street, and Stenhouse Place. The barrier would replace the existing barrier, which runs from Gallows Road to the vicinity of Sandburg Court.

With the Preferred Alternative, Barrier 10C would have a length of 1,562 meters (5,120 feet), and a height range of 3 to 5 meters (10 to 16 feet). The barrier would protect 48 homes for both of these alternatives. The barrier would have a total cost of about $1 million, with a net cost of $14,500 per home. The barrier meets VDOT's cost-effectiveness criterion. In addition to the residential protection provided, the barrier would protect the Iliff Nursing and Rehabilitation Center, the W&O Dominion Trail, and the parkland adjacent to it.

Noise Barrier 10D. This barrier would extend from Gallows Road to the project's western terminus along I-66. For the Preferred Alternative, the barrier would range from 3 to 6 meters (10 to 20 feet) in height, and have a length of 1,367 meters (4,490 feet). The barrier would protect 113 homes and Stenwood Elementary School, and benefit another 31 homes, at a total cost of about $1.2 million, or $8,000 per home. Noise Barrier 10D would meet VDOT's cost-effectiveness criterion.

Noise Barrier 10G. This barrier would protect homes along Nottingham Drive, and, in three of the alternatives, Idylwood Park. The barrier would extend along the northeast quadrant of the I-66/I-495 interchange from Virginia Lane to Idylwood Road. The barrier for the Preferred Alternative would be 685 meters (2,247 feet) in length, and would range in height from 3 to 8 meters (10 to 26 feet). The barrier would protect 24 homes impacted and cost $640,000, or $26,700 per home. Barrier 10G would meet the VDOT cost-effectiveness criterion.

However, the barrier could not be extended to protect the park as well, and remain cost-effective. The reasonableness and cost-effectiveness of extending this barrier to protect the park depends upon the noise sensitivity of the park, and would be evaluated on a case-by-case basis.

Noise Barrier 10J. This barrier would extend from Idylwood Road to Oak Street, and would protect homes in this area along Helena Drive, Providence Street, and Division Avenue. Barrier 10J would range in height from 5 to 7 meters (16 to 23 feet) and would have a length of 311 meters (1,020 feet). A total of 20 homes would be protected, at a total barrier cost of $330,000, or $17,000 per home. This barrier meets VDOT's cost-effectiveness criterion.

Noise Barrier 10K. This barrier would be designed to protect the athletic fields at George C. Marshall High School and the Renaissance Apartments. Barrier 10K would be 1,082 meters (3,550 feet) in length, and would have a height range of 4 to 8 meters (13 to 26 feet). The barrier would protect all 179 homes and the school impacted under this alternative and benefit an additional 146 homes. This barrier design would cost over $1.2 million, and $3,900 per home. This barrier would meet VDOT's cost-effectiveness criterion.

Noise Barrier 11A. This barrier is designed to protect the homes east of I-495 between the I-495 interchanges with Route 7 and Route 123, including the Regency at McLean high-rise apartments, and homes along Wilson Drive, Enola Street, and Scotts Run. The barrier for the Preferred Alternative would be 1,215 meters (3,990 feet) in length, and would be 9 meters (30 feet) tall. The barrier would protect 353 homes and the park impacted under this alternative. The barrier would benefit an additional 379 homes and cost about $1.8 million, or under $3,000 per home. Noise Barrier 11A would meet VDOT's cost-effectiveness criterion.

Noise Barrier 12A. This barrier would extend along the slip ramp from I-495 northbound to the Dulles Toll Road eastbound, and is designed to protect the Gates of McLean apartments located in the southeast quadrant of the Dulles Toll Road interchange. For the Preferred Alternative, the barrier would range in height from 5 to 12 meters (16 to 39 feet), and have a length of 719 meters (2360 feet). The barrier would protect 379 homes, benefit 47 homes, and cost about $1.0 million, or $2,400 per home. Barrier 12A meets VDOT's cost-effectiveness criterion.

Noise Barrier 13A. This barrier was evaluated to protect single-family homes adjacent to Helga Place, Peter Place, and Spencer Road. Barrier 13A would range in height from 3 to 5 meters (10 to 16 feet), and would have a length of 1,007 meters (3,300 feet). The barrier would protect 14 homes and benefit another 5 homes. Barrier 13A would have a total cost of about $610,000, or $32,000 per home, which exceeds VDOT's cost-effectiveness criterion. A cost-effective barrier could not be designed for this community.

Scott's Run Stream Valley Park was excluded from the cost-effectiveness calculation even though portions of the park would receive at least 5 dB of noise reduction from the barrier.

This barrier's ability to provide cost-effective benefit depends upon the noise-sensitivity of the park, which is evaluated on a case-by-case basis.

Noise Barrier 13B. This barrier would extend from Old Dominion Drive to Road on the west side of I-495, and would protect homes in Timberly. For the Preferred Alternative, the barrier would range in height from 5 to 8 meters (16 to 26 feet), and would have a length of 1,143 meters (3,750 feet). The barrier would protect 24 homes impacted under this alternative, and benefit 13 additional homes. The barrier would cost about $1.3 million, or $33,800 per home.

This barrier would not meet VDOT's cost-effectiveness criterion. A cost-effective barrier could not be designed for this residential community.

Timberly Park was excluded from the cost-effectiveness calculation even though portions of the park would receive at least 5 dB of noise reduction from the barrier. This barrier's ability to provide cost-effective benefit depends upon the noise-sensitivity of the park, which is evaluated on a case-by-case basis.

Noise Barrier 13C. This barrier, which extends from Lewinsville Road to the project's western terminus along the Dulles Toll Road, would replace an existing barrier. The replacement barrier is designed to protect the homes in McLean Hamlet and Falstaff Road in the northwest quadrant of the Dulles/I-495 interchange. The new barrier would range in height from 4 to 9 meters (13 to 30 feet), and would have a length of 1,596 meters (5,240 feet). The total cost of the barrier is about $1.7 million.

For the Preferred Alternative, the barrier would protect 33 homes and benefit another 43 homes, at a net cost of $14,600 per home. Noise Barrier 13C would meet VDOT's cost-effectiveness criterion, not including the benefit provided to the park.

Noise Barrier 13D. This barrier is designed to protect homes along Dulany Drive and Scott's Run Road. Most of the homes in this area are more than 150 meters (500 feet) away from the project roadway. Impact is expected to occur at 13 homes, but the barrier required to protect them would have a total cost of $1.2 million. At a cost of about $100,000 per home, this barrier does not meet VDOT's cost-effectiveness criterion.

Noise Barrier 13E. This barrier is designed to protect the homes in the West Langley community and the McLean Presbyterian Church. Barrier 13E would have a length of 1,226 meters (4,020 feet) and range in height from 3 to 8 meters (10 to 26 feet). The total barrier cost is about $1.2 million. The barrier would protect 35 impacted homes and benefit another 8 homes at a cost of about $27,400 per home. This barrier meets VDOT's cost-effectiveness criterion for the Preferred Alternative, not including the protection provided for the church.

Noise Barrier 14C. This barrier is designed to protect homes in Linganore. The barrier would have a height of 3 meters (10 feet) and a length of 488 meters (1,600 feet). The barrier would protect six homes, but at a cost of $42,000 per home, the barrier would not meet VDOT's cost effectiveness criterion. A cost-effective barrier could not be designed for this community.

The Scott's Run Nature Preserve was not considered in the cost-effectiveness calculation, although the barrier would provide at least 5 dB of noise reduction in certain portions of the park. The reasonableness of Noise Barrier 14C depends upon the noise-sensitivity of the nature preserve, which is evaluated on a case-by-case basis.

Infeasible Barriers. Noise barriers were found to be infeasible in the following locations for the Preferred Alternative:

- Apartments along the southeastern quadrant of the Route 7 interchange adjacent to Marshall High School would be impacted, but access issues prohibit the building of a barrier along Route 7 to protect these homes for any of the alternatives.
- Some single-family homes in the northeastern quadrant of the Route 7 interchange would be impacted, but access issues prohibit the building of a barrier along Route 7 to protect these homes for any of the alternatives.
- Some of the Yancey Drive townhouses adjacent to Lee Highway would be impacted, because not enough noise reduction could be achieved, even with a very tall barrier.

4.8 VISUAL QUALITY AND AESTHETICS

The proposed project would change both the view of the road and the view from the road. The principal changes in the visual environment that would occur as a result of building the project include the following:

- Clearing of existing vegetation to make way for the road improvements and accompanying grading, drainage, and signing structures. In several sections this vegetation provides a buffer between the highway and residential and recreational areas.
- Changes to landforms as a result of grading for cut and fill slopes.
- Installation of sound barrier walls.
- Changes in size and elevation of interchange ramps and overpasses, making them more prominent.
- Changes in lighting that alter the visual prominence of the roadway corridor at night or cause greater "light leakage" into adjacent neighborhoods.

The primary visual effect of the Preferred Alternative would result from clearing existing vegetation buffers between the Beltway and neighborhoods. Where possible, and where sufficient right-of-way remains, landscaping would be provided, or natural vegetation would be allowed to reestablish itself, to replace the vegetative screen.

At locations where noise barriers would be installed, the barriers would screen adjacent neighborhoods from the roadway. The affected neighborhoods will be afforded opportunities to provide input on the design and appearance of the barriers. These barriers typically are constructed of concrete. However, there is a great deal of flexibility in providing surface treatments and landscaping to provide more aesthetically pleasing barriers. Such treatments also can be provided along the road side of the barriers to reduce the “canyon” effect of driving between barriers on both sides of the road.

The new interchanges are likely to be slightly more prominent, and visible from greater distances, than the existing interchanges. This is unavoidable in order to provide safer and more efficient traffic movements at these locations. However, these interchanges would not necessarily be incompatible with the surrounding urbanized conditions.

Adequate lighting will be essential to enhance safety in this congested corridor, particularly at interchange locations where traffic would be constantly entering and exiting. The details of such lighting would be developed during final design. It is not possible at this time to identify the specific locations and styles of lights to be used. However, the provision of such lighting would not be incompatible with the surrounding urbanized conditions and would be expected by drivers in this heavily traveled corridor.

4.9 GEOLOGY, SOILS, AND GROUNDWATER

The Virginia Department of Mines, Minerals, and Energy has indicated that they do not have concerns regarding the presence of significant mineral resources or geological formations that may be affected by construction activities in the study area. Fairfax County soils maps indicate three soil types known to pose engineering constraints. As these soils (Orange and Iredell series and Marine Clay) are readily identifiable, VDOT will implement geotechnical analyses to avoid or manage any problems encountered with these soil types. As there are no prime or unique farmlands, the Farmland Protection Policy Act does not apply.

Most of the project area is served by public water supply systems drawing from the Potomac River. Thus domestic drinking water resources used by most of the public would not be affected. However, a limited area north of I-66 may utilize water wells established in shallow aquifers within the project area.

According to the Fairfax County Department of Health, homes in the vicinity of the Route 236 (Little River Turnpike) interchange and from the Route 193 (Georgetown Pike) interchange to the American Legion Bridge may have individual onsite sewage disposal systems (septic systems) and individual well water supplies. The potential for septic systems or individual wells to be displaced or otherwise impacted is routinely investigated as part of final design and construction. Therefore, the effects on local resources, if any, are expected to be minimal.

The increased impervious surface resulting from the Preferred Alternative may result in localized lowering of groundwater levels, as a result of reduced infiltration. The amount of infiltration of precipitation into the ground may be marginally reduced as a result of new construction. In this case, the project is an expansion of an existing highway where such impacts, if any, would have already occurred with the original construction of the Beltway and little additional effect is expected.

4.10 SURFACE WATERS AND WETLANDS

A summary of the effects to surface waters and wetlands predicted to result from the Preferred Alternative and No-Build Alternative is presented in **Table 4-13**. The effects of the other alternatives considered in the preparation of the Draft EIS and Final EIS are also shown for comparison purposes. Detailed discussions for each of these other alternatives are found in Section 4.10 of the Draft EIS and the *Natural Resources Technical Report*.

Table 4-13
SUMMARY OF IMPACTS TO SURFACE WATERS AND WETLANDS

	Final EIS Alternatives		Revised Alternative	Candidate Build Alternatives Draft EIS[1, 2]		
Effect	**No-Build**	**Preferred Alternative 12-Lane HOT**	**10-Lane HOV**	**Concurrent HOV**	**Express/ Local with HOV**	**Barrier-Separated HOV**
Number of Watersheds Affected	0	3	3	4	4	4
Total Stream Impacts	0	4,452	4,235	8,262	8,031	8,053
Total Wetland Impacts	0	3.03	3.86	4.62	4.74	5.06

Note: 1. Units used for impacts are feet for streams and acres for wetlands and wetlands compensation requirements. 2. Impacts for the Preferred Alternative were calculated based on the cut/fill limits rather than the right-of-way limits to provide a more accurate impact assessment. More conservative Right-of-way limits were used to calculate impacts for the Candidate Build Alternatives in the Draft EIS. For comparison purposes, 4.42 acres of wetland would be predicted to be impacted if the right-of-way limits were used for the Preferred Alternative.

4.10.1 Surface Waters

Installation of new drainage structures, or extensions of existing structures would displace sections of streams, as tabulated in **Table 4-14**. Such displacements would result in losses of aquatic habitat (see later discussion on wildlife and habitat). Temporary siltation of streams would occur during construction, but aggressive implementation and monitoring of erosion and sediment control plans would be included in the project to minimize such effects.

Table 4-14
STREAM IMPACTS BY WATERSHED

		Preferred Alternative	
Watershed	**Primary Streams Impacted**	**Feet**	**Meters**
Accotink Creek	Accotink Creek and tributaries	2,181	665
Cameron Run	Holmes Run and tributaries	1,142	348
Pimmit Run	Pimmit Run tributaries	0	0
Scotts Run	Scotts Run and tributaries	1,129	344
Total Impacts		4,452	1,357

An increase in the amount of impervious pavement surfaces, increases in traffic volumes, and consequent increases in pollutants washed from the road surface into receiving streams could result in effects to water quality. Pollutants would include grease, oil, metals, nutrients, nitrogen, deicing salts, roadside vegetation management chemicals, and suspended solids.

It is expected, however, that quality and quantity treatment of runoff associated with the Preferred Alternative will result in an overall improvement in quantity management and more effective pollutant removal capabilities beyond what is presently occurring in the local watershed. Because none of the receiving streams are elements of any public water supply, the potential for human health effects from roadway runoff is minimal.

Existing water quality in most of the project area has been negatively affected by past discharges to receiving waters. Much of the proposed impacts to surface waters occur from currently untreated road runoff. With the required construction of both temporary and permanent stormwater controls in accordance with current best management practices (BMPs), it is likely that water quality would actually improve over existing conditions. This is primarily due to the fact that much of the Beltway infrastructure was in place prior to enactment of the Chesapeake Bay Preservation Act in 1988.

Implementation of currently required quantitative and qualitative treatment techniques prescribed by the VDOT Drainage Manual and VDOT Erosion and Sedimentation Control and Stormwater Management (ESC & SWM) Manual will ensure that implementation of the Preferred Alternative will meet the requirements established by both state and Federal water pollution prevention regulations. Temporary and permanent stormwater management measures, include detention basins, vegetative controls, and other measures to reduce or detain discharge volumes and remove pollutants. These techniques are designed and analyzed for effectiveness during the development of final roadway design plans.

Compensation for stream impacts may be provided as part of the permit conditions for authorizations issued by the U.S. Army Corps of Engineers (COE) and the DEQ. Because these agencies determine the compensation requirements for stream impacts on a case-by-case basis, the quantitative requirements for this project will be negotiated with them as part of the permit application process. This process may include input from other environmental advisory agencies. The requirements and special conditions of any required permits for work in and around surface waters would be incorporated into construction contract documents. The construction contractor would be required to comply with the conditions and pollution control measures specified in VDOT's Road and Bridge Specifications.

4.10.2 Wetlands

Wetlands adjacent to the Beltway would be displaced by the Preferred Alternative. These displacements would total 3.03 acres (1.23 ha) or about 14 percent of the total wetlands present in the Beltway right-of-way. Several different types of wetlands would be involved, as tabulated in **Table 4-15.** Palustrine forested wetlands comprise approximately 85 percent of the total area of wetlands along the Beltway, and accordingly would be the wetland type most heavily impacted by the Preferred Alternative. Impacts to forested wetlands would account for 75 percent of the total wetlands impacted.

The majority of impacts occur in jurisdictional wetlands, which are regulated by both the COE and DEQ. Isolated wetlands that were determined to be non-jurisdictional by the COE are regulated by the DEQ. The areas of isolated wetlands impacted by the proposed Beltway improvements are calculated separately and included in Table 4-15.

The majority of direct wetland impacts would occur at only two locations. Both of these wetland areas are PFO1 systems that occupy 1.9 acres and 4.0 acres of land adjacent to Beltway, respectively. The larger impact area is located along the Inner Loop, just north of its intersection with Shreve Road and Lee Highway in the headwaters of Holmes Run, in the Cameron Run watershed. The smaller impact area is located along the Inner Loop, just north of the Lewinsville Road overpass, lying parallel and contiguous to Scotts Run. Approximately 2.18 acres of these wetlands would be impacted under the Preferred Alternative. Together, the impacts to these two wetlands account for 72 percent of the total wetland impacts.

Table 4-15
SUMMARY OF WETLAND IMPACTS BY TYPE

			Area Impacted	
	Total Existing Area[2]		Preferred Alternative	
Cowardin Classification[1]	**Acres**	**Hectares**	**Acres**	**Hectares**
PEM1A	1.37	0.55	0.43	0.18
PEM1C	0.84	0.34	0.21	0.08
PFO1A	9.82	3.97	1.16	0.47
PFO1C	9.24	3.74	1.12	0.45
PSS1A	0.40	0.16	0.09	0.04
PSS1C	0.18	0.07	0.00	0.00
Total Jurisdictional Wetlands	21.85	8.84	3.01	1.22
Isolated PEM1C	0.02	0.01	0.02	0.01
Isolated PFO1A	0.46	0.19	0.00	0.00
Isolated PFO1C	0.19	0.08	0.00	0.00
Total Isolated (Non-Jurisdictional) Wetlands	0.67	0.27	0.02	0.01
Total Wetlands	22.52	9.11	3.03	1.23

[1]The Cowardin classifications are: palustrine emergent (PEM) systems with persistent vegetation (1); palustrine forested (PFO) and palustrine scrub-shrub (PSS) systems with broad-leaved deciduous vegetation (1); and temporary (A) or seasonal (C) flooding regimes.
[2]Represents all wetlands within 165 feet (50 meters) of the Beltway.

The effect of wetland losses varies not only among wetland type, but also among watersheds. **Table 4-16** summarizes the impacts on wetlands within particular watersheds. The full impact to wetlands and associated stream systems and watersheds cannot be assessed merely in terms of the area of wetlands displaced by new construction, because all wetlands are not equal in their quality or the ecological and social benefits they provide. **Table 4-17** summarizes the relative losses of wetland functions or values by comparing the sum area of wetlands within the existing Beltway right-of-way that possess certain functions or values to the sum area of impacts to wetlands possessing those functions or values. Most wetlands provide more than one function or value, so the areas presented in this table sum to more than the total area of wetlands present along the Beltway. Overall, approximately 71 percent of the total area occupied by wetlands provides a sediment and/or toxicant retention function, and 16.6 percent of the wetlands that provide that function would be displaced. In comparison, less than 3 percent of the area occupied by wetlands provides sediment stabilization, and 15.5 percent of those wetlands would be displaced by the Preferred Alternative.

Table 4-16
SUMMARY OF WETLAND IMPACTS BY WATERSHED

	Existing Wetland Area[1]		Wetland Area Impacted		
			Preferred Alternative		
WATERSHED	**Acres**	**Hectares**	**Acres**	**Hectares**	**Percent**
Accotink Creek	4.66	1.89	0.33	0.13	7
Cameron Run	6.08	2.46	1.23	0.50	20
Dead Run	0.47	0.19	0.00	0.00	0
Pimmit Run	0.60	0.24	0.00	0.00	0
Scotts Run	10.71	4.34	1.47	0.60	14
Total Impacts	22.52	9.11	3.03	1.23	13

[1]Represents all wetlands within 165 feet (50 meters) of the Beltway.

Table 4-17
WETLAND FUNCTIONS AND VALUES BY AREA AND PERCENT IMPACTED

Rank by Area	Principal Function or Value	Area Possessing Function or Value (acres)	Area Possessing Function or Value Impacted (acres)	Percent Impacted Preferred Alternative
1	Sediment/Toxicant Retention	16.01	2.65	16.55
2	Floodflow Alteration	12.27	1.96	15.97
3	Nutrient Reduction	15.33	2.39	15.59
4	Wildlife Habitat	9.36	0.87	9.29
5	Production Export	6.07	0.04	0.66
6	Groundwater Recharge/Discharge	3.85	0.03	0.78
7	Sediment Stabilization	0.71	0.11	15.49

Both of the two largest wetland impact areas provide sediment/toxicant retention and floodflow alteration capacity. The impacts to these two wetland areas account for the loss of approximately 8 percent of the existing wetland capacity for both floodflow alteration and sediment/toxicant retention. The large wetland area in Holmes Run has a surface hydrology that is largely supported by untreated road runoff and aided by entrapment within higher surrounding topography. The area associated with Scotts Run also provides relatively higher quality wildlife habitat for an area adjacent to the existing lanes of the Beltway. However, the impacts to this wetland under the Preferred Alternative would be unavoidable. While the floodflow alteration and sediment/toxicant retention functions could be replaced by a stormwater management facility, quality wildlife habitat similar to that lost could not likely be replaced at that location. In addition to implementing stormwater management facilities, compensatory mitigation for unavoidable wetland impacts will be provided as needed.

Minimization and Mitigation of Impacts. The potential impacts resulting from the Preferred Alternative have been reduced during the planning and design process. **Table 4-18** provides a comparison of early impact calculations and current calculations. Because previous estimates of impacts were calculated by wetland area and not by Cowardin classification, this comparison is based on overall wetland impacts. Calculations include estimates for jurisdictional wetland impacts as well as isolated wetland impacts.

Table 4-18
WETLAND IMPACT REDUCTIONS DURING ALTERNATIVES DEVELOPMENT

	Area Impacted		Reduction in Impacts from First Estimate	
Alternative	Acres	Hectares	Acres	Hectares
First estimate (1997)	27.64	11.18	N/A	N/A
Second estimate (1999)	25.16	10.18	-2.5	-1.0
Concurrent HOV	4.62	1.87	-23.0	-9.3
Express/Local with HOV	4.74	1.92	-22.9	-9.3
Barrier – Separated HOV	5.06	2.05	-22.6	-9.1
Revised 10-Lane HOV	4.62	1.87	-23.0	-9.3
Preferred Alternative	3.03	1.23	-24.61	-9.9

Compensatory mitigation will be required for unavoidable wetland impacts. **Table 4-19** summarizes the estimated compensatory mitigation acreages for each wetland type, including jurisdictional wetlands and isolated wetlands. Mitigation will be required by the COE and DEQ for impacts to jurisdictional wetlands and will be required for impacts to isolated wetlands by the DEQ.

Compensation mitigation may be required for stream impacts, depending on the extent and nature of impacts, unavoidable stream relocations will incorporate natural stream designs that replicate stream length, meanders, and riparian features. The clearing of stream banks and riparian zones will be minimized to the extent practicable. Final wetland and stream compensation requirements would be developed following the formal Interagency Coordination Meeting (IACM) process. The location of any proposed wetland or stream compensation would be contingent upon the approval of the permitting agencies, location of the impacts, and availability of adequate compensation sites that would replace lost functions and values. Due to the limited availability of wetland and stream compensation sites near the Beltway, it is possible that a mitigation bank (or banks) would be utilized. There are several potential mitigation banks which service the watersheds within the project area, including: Bull Run Wetland Mitigation Bank, Cedar Run Wetlands Bank, Foggy Bottom Wetland Farm, and Licking Run Mitigation Bank in Prince William County; Northern Virginia Stream Restoration Bank in Fairfax County; and, Potomac River Wetland Mitigation Bank, Northern Virginia Regional Environmental Bank, and Great Oaks Mitigation Bank in Fauquier County.

Table 4-19
SUMMARY OF IMPACTS AND COMPENSATION REQUIREMENTS FOR WETLANDS

Cowardin Classification	Compensation Ratio	Area Impacted		Compensation Required	
		Acres	Hectares	Acres	Hectares
Jurisdictional Wetlands					
PEM	1.5:1	0.64	0.26	0.96	0.39
PFO	2:1	2.28	0.92	4.56	1.85
PSS	1.5:1	0.09	0.04	0.14	0.05
Total Jurisdictional Impacts/ Compensation Requirements	--	3.01	1.22	5.66	2.29
Isolated Wetlands					
Total Isolated Wetland Impacts/ Compensation Requirements	1:1	0.02	0.01	0.02	0.01
Total Impacts/Compensation	--	3.03	1.23	5.68	2.30

Note: Totals reported expressly exclude non-jurisdictional features that have characteristics of wetlands, but were determined not to be waters of the United States subject to Section 404 permitting by the Corps of Engineers.

4.11 FLOODPLAINS

Potential impacts to the 100-year floodplain were assessed in accordance with Executive Order 11988 - Floodplain Management and FHWA's Program Manual 6-7-3-2, Location and Hydraulic Design for Encroachments on Floodplains.

Preliminary project designs sought to minimize and avoid impacts to floodplains by including floodplains as evaluation criteria in the early alternatives development process. To evaluate the initial concepts, digital constraints mapping was prepared for the project area that included the approximate 100-year floodplain boundaries. The boundaries were obtained from the National Flood Insurance Maps (FIRM) prepared by the Federal Emergency Management Agency (FEMA). Determining floodplain impacts involved superimposing the alternative designs onto the 100-year floodplain digital mapping.

There are four 100-year floodplains within the 14-mile project area that are spanned or abutted by the existing Capital Beltway. These are associated with Flag Run, Accotink Creek, Holmes Run and Scotts Run (see Figure 3-13). The Preferred Alternatives would further encroach upon the Scotts Run floodplain as detailed in **Table 4-20**. The extent of encroachment was determined by calculating the area between the existing edge of pavement and the new cut and fill line associated with the Preferred Alternative This method recognizes potential retaining walls and other potentially impervious fill areas and thus provides a slightly higher and more conservative estimate of floodplain encroachment than would just the increase in new impervious service associated with pavement alone.

The Scotts Run floodplain runs adjacent to the eastern edge of Beltway for over a mile. Most of this longitudinal encroachment is attributed to the fill outside the actual pavement area. These longitudinal encroachments cannot be avoided by bridging because the majority of the encroachments occur where the floodplains run parallel to the existing roadway and the encroachment is the result of extending existing roadbed fill.

Table 4-20
FLOODPLAIN ENCROACHMENTS

	Area of Encroachment (acres)		
Floodplain	**Longitudinal**	**Latitudinal**	**Total**
Flag Run	0.00	0.00	0.00
Accotink Creek	0.00	0.00	0.00
Holmes Run	0.00	0.00	0.00
Scotts Run	9.67	0.75	10.42
Total Floodplain Encroachment	**9.67**	**0.75**	**10.42**

Sections 107 and 303 of VDOT's specifications require the use of stormwater management practices to address concerns such as post-development stormflows and downstream channel capacity. These standards require that stormwater management ponds be designed to reduce stormwater flows to pre-construction conditions for up to a 10-year storm. VDOT would adhere to its specifications to prevent an increase in flooding risks associated with the proposed improvements. It is expected that backwater elevations and velocity increases at the floodplain encroachments would be nonexistent or minimal.

During final design, a detailed hydraulic survey and study would evaluate the effect of the proposed improvements on stormwater discharge. This evaluation would help ensure that no substantial increase in downstream flooding would occur. In addition, to the extent practicable, VDOT's final design will consider opportunities for retrofitting existing stormwater management facilities within the right-of-way. For these reasons, the project would have negligible impacts to natural and beneficial floodplain values.

4.12 WILDLIFE AND HABITATS

4.12.1 Aquatic Habitats

Displacements of sections of stream bottom by the Preferred Alternative would result in minor losses of benthic (bottom-dwelling) organisms. The water quality of streams that receive runoff from the Beltway and surrounding urban and suburban areas is already impaired, and the increase in pavement and replacement of natural stream channels with culverts or other structures has the potential to further degrade water quality and associated habitats. However, with proper stormwater controls, further degradation can be avoided or minimized. Given the lack of existing stormwater controls, it is possible that the overall water quality of receiving streams could actually improve following the installation of stormwater management facilities as part of the project.

Fish migrate to search for food and to spawn. Of particular concern would be anadromous species (saltwater species that migrate to fresh water to breed). Anadromous species include striped bass, American shad, hickory shad, alewife, and blueback herring. Highway crossings can obstruct movements of anadromous and other fishes by altering stream width, depth, velocity, and gradient, especially on smaller tributaries where culverts are used instead of bridging. Several streams crossed by the project, particularly Accotink Creek, may still support anadromous fishes. Culverts will be designed such that low-flow channels can be maintained to minimize the possibilities for obstructing fish passage.

4.12.2 Terrestrial Habitats

Because the project follows an existing major highway corridor carrying large volumes of traffic within an urbanized area, impacts to terrestrial habitat would be limited to displacements of small amounts of remaining disjunct vegetated areas. Such areas harbor transient or permanent populations of small animals adapted to life in fragmented urbanized environments close to human populations. The existing Beltway already constitutes a barrier to wildlife movements and a constant threat of mortality to wildlife wandering onto the highway. The proposed widening would not substantially change that condition.

4.12.3 Invasive Species

In accordance with Executive Order 13112, Invasive Species, construction of the proposed Beltway improvements will minimize the potential for the establishment of invasive terrestrial or aquatic animal or plant species by following the VDOT Road and Bridge Specifications Manual. Activities related to establishing and maintaining the newly constructed right-of-way follow guidelines set forth in the manual under the following sections: Clearing and Grubbing (Section 301), Drainage Structures (Section 302), Earthwork (Section 303), Selective Tree Removal, Trimming, and Cleanup (Section 601), Topsoil (Section 602), Seeding (Section 603), Sodding (Section 604), Planting (Section 605), Soil Retention Covering (606), Herbicide Spraying (Section 607), and Mowing (Section 608).

Contract bid packages must include special provisions for managing invasive species that relate to those sections of the manual listed above. While the right-of-way is vulnerable to the colonization of invasive plant species from adjacent properties, implementation of the stated construction specifications and special provisions will reduce the potential for the establishment and proliferation of invasive species in the right-of-way.

4.13 THREATENED AND ENDANGERED SPECIES

As described in Chapter 3, consultations with state and federal agencies with responsibilities for threatened and endangered species, along with field inventories of natural resources in the study area, revealed no occurrences of protected species. Therefore, the project will have no effects on threatened or endangered species.

4.14 CULTURAL RESOURCES

Pursuant to Section 106 of the National Historic Preservation Act, the effects of the project alternatives on historic properties have been considered. As discussed in Chapter 3, a comprehensive historic property identification survey found two historic districts in the project's Area of Potential Effect (APE): Holmes Run Acres and the W&OD Railroad. A summary of the effects to Cultural Resources from the No-Build and Preferred Alternative is provided in **Table 4-21**. The effects of the other alternatives considered in the preparation of the Draft EIS and Final EIS are also shown for comparison purposes.

4.14.1 Holmes Run Acres Historic District

The Holmes Run Acres Historic District (VDHR #029-5183), located in the northeast corner of the Gallows Road interchange, is a residential subdivision that originally contained 344 homes. Following publication of the Draft EIS, the interchange concept for Gallows Road was redesigned to eliminate the impacts to the historic district. The subdivision currently is screened from the Beltway by an existing noise barrier. That barrier will be replaced as part of the project. The incremental changes to the visual character in a portion of the historic would not constitute an adverse effect on the district.

Table 4-21
SUMMARY OF EFFECTS TO CULTURAL RESOURCES

	Final EIS Alternatives		Revised Alternative	Candidate Build Alternatives Draft EIS		
Resource	**No-Build**	**Preferred Alternative 12-Lane HOT**	**10-Lane HOV**	**Concurrent HOV**	**Express/ Local with HOV**	**Barrier-Separated HOV**
Holmes Run Acres	No	No	No	Yes	Yes	Yes
W&OD Railroad Regional Park	No	No	No	No	No	No

4.14.2 W&OD Railroad Historic District

The W&OD Railroad Historic District (VDHR #053-0276) is a 45-mile linear district encompassing approximately 545 acres. A regional trail linking a number of parks and residential areas now occupies the former railroad right-of-way. The modern bridges carrying the trail over the Beltway and I-66 are non-contributing elements of the district. These bridges will be replaced as part of the proposed project. Because the project would not alter the characteristics that qualify the district for inclusion on the NRHP, there would be no effect on the district.

4.15 CONSTRUCTION IMPACTS

Construction impacts are short-term environmental effects resulting from the process of building the project. Construction impacts can involve temporary changes in land use and community access, water quality, air quality, and noise levels.

4.15.1 Land Use and Access

Access to businesses could be temporarily disrupted on interchanges and cross roads due to temporary detours that are necessary to allow ample space for staging and construction. These temporary disruptions are unavoidable and will be minimized to the extent possible by carefully planning maintenance of traffic provisions and incorporating them into the design plans.

4.15.2 Wildlife and Habitat

Temporary impacts to wildlife are related to the displacement of vegetated cover within the construction footprint of the Preferred Alternative. The mechanical removal of cover will cause animal migration away from the disturbance, resulting in a temporary decrease in habitat usage by edge-dwelling species. Construction activities may also cause direct mortality of wildlife unable to escape construction equipment. Opportunistic plant species are likely to have a greater competitive advantage during early construction activity. Therefore, temporary impacts could also be associated with slope stabilization effects that could temporarily reduce wildlife usage and foraging behaviors in disturbed areas.

4.15.3 Water Quality and Wetlands

VDOT will avoid stream relocations and implement perpendicular stream crossings as much as practicable to minimize construction impacts. Compensation will be required for unavoidable impacts as described in Sections 4.10 and 4.11. Short-term water quality impacts may result from erosion following ground disturbance and earthmoving operations. After entering streams, the eroded material may increase turbidity levels and sedimentation downstream. Excessive quantities of suspended solids can harm fish and other aquatic life. Deposition of suspended solids may alter the substrate of streambeds, interfere with plant production and fish spawning, smother benthic fauna, and reduce substrate utilization. Eroded material may also contain organic matter and nutrients, such as nitrogen and phosphorus. High inputs of organic matter may result in an increase in biochemical oxygen demand, decreasing dissolved oxygen concentrations. Additionally, inputs of nutrients can increase both turbidity and eutrophication by increasing algae production.

Erosion and sediment control measures will be implemented to minimize water quality impacts from increased levels of sedimentation and turbidity. Control measures may include berms, dikes, sediment basins, fiber mats, straw silt barriers, netting, mulch, temporary and permanent seeding, and other methods. Construction impacts to in-stream aquatic habitats may be minimized to the extent practicable by avoiding stream relocations and by crossing streams at right angles. To the extent possible, construction equipment will be restricted from fording and otherwise disrupting in-stream habitats.

The construction contractor would be required to comply with the conditions and pollution control measures specified in VDOT's *Road and Bridge Specifications*.

4.15.4 Air Quality

Construction impacts on air quality include exhaust emissions from construction equipment and dust generated by construction activities on disturbed earth. These impacts will be minimized by enforcement of construction specifications and adherence to VDEQ regulations.

The VDOT's *Road and Bridge Specifications* regulate construction procedures on all projects. The *Specifications* require the contractor to comply with all applicable local, state, and federal laws, ordinances, regulations, orders, and decrees. This includes compliance with emissions standards for construction equipment and adherence to regulations for burning of materials from clearing and grubbing, demolition, or other operations. The *Specifications* were reviewed by the DEQ and were found to conform to the SIP. The *Specifications* prohibit burning of tires, asphalt materials, used crankcase oil, or similar materials that produce dense smoke. Provisions will be included in the contract for preventing dust from becoming airborne.

4.15.5 Noise

Noise receptors that would be sensitive to highway traffic noise would also be sensitive to noise from construction equipment while the project is being built. To minimize the effects of construction noise, the VDOT's *Road and Bridge Specifications* contain noise control provisions, which include the following:

- Equipment shall in no way be altered so as to result in noise levels which are greater than those produced by the original equipment.
- The contractor's operations shall be performed such that the exterior noise levels measured at a noise-sensitive activity shall not exceed 80 dBA during periods of such activity.
- VDOT reserves the right to prohibit or restrict to certain portions of the project any work that produces objectionable noise during normal sleeping hours, 10 p.m. to 6 a.m., unless other hours are established by local ordinance, in which case the local ordinance shall govern.

4.16 SECONDARY AND CUMULATIVE EFFECTS

The Council of Environmental Quality's (CEQ's) regulations implementing the NEPA divide environmental impacts into three categories: direct impacts, indirect or secondary impacts, and cumulative impacts. The regulations require that all three types of impacts be included in NEPA documents. Direct impacts are discussed throughout this environmental impact statement.

CEQ regulations require consideration of indirect (or secondary impacts), which are caused by the proposed action, but which are "later in time or further in distance" than the direct impacts discussed elsewhere in this document (40 CFR 1508.8). Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air, water, natural systems, or the human environment.

CEQ regulations also require that federal agencies preparing an environmental impact statement consider the cumulative effects of a proposed action and other actions. CEQ defines cumulative effects as an "impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions." CEQ's publication, *Considering Cumulative Effects Under the National Environmental Policy Act* (January 1997), provides a framework for addressing cumulative effects. This handbook outlines general principles about how to evaluate cumulative effects. It does not represent new legal requirements nor is it legally binding; rather, it clarifies a complex area of the NEPA process.

This analysis in this section focuses on three primary areas of concern:

- Determining the secondary effects associated with construction of the Preferred Alternative and the induced development (also referred to in this Final EIS as secondary development) that would be associated with the project;
- Describing the potential cumulative effects that would occur due to construction of the Preferred Alternative in addition to past, present and future reasonably foreseeable projects within the same study area; and
- Suggesting mitigation measures that could reduce the potential for secondary effects caused by the Preferred Alternative.

4.16.1 Methodology for Secondary and Cumulative Effect Analysis

The process used to evaluate secondary and cumulative effects is based on CEQ regulations and involves a multi-step process to identify and evaluate these effects. The first step in the process is the identification of sensitive resources to be analyzed for effects. These resources would include: those that are directly affected by the Preferred Alternative, those affected by any secondary development that is associated with the Preferred Alternative, and those resources that are particularly susceptible to cumulative effects (e.g. wetlands can experience multiple individual impacts from many projects over time, that when summed result in cumulative effects).

Sensitive resources were identified using the environmental information prepared for the various sections of this Final EIS and agency and public comments.

The next step was determining the geographic and temporal boundaries to be analyzed. The geographic boundary for cumulative effects was determined by using a series of overlay mapping. Overlays of the areas of traffic influence, census tracts, and subwatersheds were created. As shown in Figure 1-3, the majority of trips on most segments of the Beltway originate within 2 miles to the east or west. Census tracts that border the project area are shown in Figure 3-5 and cover an area of roughly 50 square miles. As discussed in Section 4.10.1, the project area includes all or portions of four subwatersheds: Accotink Creek, Cameron Run, Pimmit Run, and Scotts Run. A temporal boundary was also determined for the project. According to CEQ guidelines, the design year is a good proxy to use for the evaluation of future conditions and has been selected for this project, specifically year 2020. The use of 2020 also allows the analysis to be consistent with other sections of this Final EIS, as they also use a future timeframe of 2020.

The next step in the process was to evaluate how the Preferred Alternative would affect growth patterns within the study area. This is referred to as the secondary development analysis. The secondary development analysis assesses not only the potential for new growth associated with the project, but is also defines the impacts on sensitive resources due to that growth. According to CEQ guidance, this secondary development has to be directly attributable to the Preferred Alternative. In other words, the growth that would only occur due to the construction of the Preferred Alternative. General growth patterns are assessed in a more general fashion in the cumulative effects analysis which is designed to look at how all past, present, and future reasonably foreseeable projects, including the Preferred Alternative, would affect the sensitive resources previously identified.

In order to determine cumulative effects, other reasonably foreseeable projects within the study area, regardless of type or sponsor, have to be included as part of the evaluation. These projects have been assessed in conjunction with the Preferred Alternative, even though some of the projects are currently just studies and are not considered to be reasonably foreseeable at this time since no preferred alternative has been selected and there is little environmental impact information available to be used in the assessment of cumulative effects.

The final step in the process is to suggest measures that might be appropriate for mitigating secondary and cumulative effects.

4.16.2 Resource Identification

Not all impacts tend to "accumulate" – that is, similar impacts from more than one project do not tend to add together and create a greater impact. Certain resources when they experience independent impacts may have minimal change, but when impacts are summed cumulatively, they may experience substantial effects over time. These impacts may be the result of secondary effects such as induced development or they may be the result of other past, present, and future actions. For example, wetlands within the geographic boundary analyzed may experience a loss in acreage due to several individual actions that might include losses due to the Preferred Alternative, future development, or any of the other projects identified in **Table 4-22**.

Individual impacts may be negligible, but when the impacts are accumulated there may be a cumulative impact to the function or value of the watershed. An example of resources that do not accumulate impacts would be hazardous materials or displacements; these resources would experience only one direct, primary impact.

Table 4-22
OTHER REASONABLY FORESEEABLE PROJECTS INCLUDED IN THE CUMULATIVE EFFECTS ANALYSIS

Project	Description
Springfield Interchange	Interchange improvement project that includes construction of new lanes and additional access patterns to the Capital Beltway.
Braddock Road	Adding two HOV lanes between Burke Lake Road and the Beltway.
Route 236	Roadway widening from Fairfax City line to Alexandria city line (widen to 6 lanes)..
Route 50	Roadway widening between Route 7 and Nutley Street (widen to 6 lanes).
Route 29	Roadway widening between Cedar Lane and the Beltway (widen to 6 lanes)
Route 7	Route 7 within Tysons Corner is planned for expansion from six to eight lanes by 2010. Route 7 is also planned for expansion from four to six lanes between Reston Parkway and the Dulles Toll Road, and Rolling Holly Drive and Reston Parkway.
Route 123	Roadway widening from Route 7 to I-495 (from six to eight lanes; estimated completion by 2010).
Dulles Airport Access Road Widening	From Dulles Airport to Route 123; widen from four to six lanes; estimated completion 2010; not in TIP.
Dulles Corridor Rapid Transit Project	An extension of Metrorail from the Orange Line in the vicinity of West Falls Church through Tysons Corner to Reston (Wiehle Avenue) in Phase 1 (by 2011) and then through Reston, Herndon, Dulles Airport to Loudoun County in Phase 2.
Capital Beltway Rail Feasibility Study	Feasibility study that identified preliminary transit modes that are feasible within the study area.

The effects that do accumulate and that are addressed in this document include the following:

- Neighborhoods, Community Services, and Cohesion Changes (due to proximity impacts, changes in access, or multiple displacements within the same neighborhood)
- Visual and Aesthetic Character
- Cultural Resources
- Parks and Recreation Facilities
- Geologic Resources
- Water Resources
- Aquatic Biota and Habitats
- Terrestrial Biota and Habitats
- Rare, Threatened and Endangered Species
- Traffic

If the proposed project does not result in an impact to a certain resource, then it will not contribute to cumulative impacts to that resource. The Preferred Alternative for the Capital Beltway improvements will not result in impacts to environmental justice populations, air quality, or energy as discussed in the previous sections of this chapter, even though these resources are sensitive to cumulative effects. Therefore, they are not included in this evaluation.

4.16.3 Secondary Development Effects

The ability of a transportation facility to alter or to affect land use patterns is dependent on a number of factors, including the type of access it provides to land available for development, the development potential of the land, and the regulations in place that govern land use in proximity to the transportation facility. The transportation facility, in and of itself, does not create induced or secondary development. However, a transportation facility can encourage development by providing access to new growth locations as allowed by local jurisdictions. When a direct relationship can be proven to exist between a transportation facility and new growth that would occur due to the existence of that facility – this is referred to as secondary development that is associated with the transportation project. The effects of this new growth on sensitive resources are assessed in the secondary development effects analysis.

Secondary development effects typically are perceived to include effects on human and natural systems resulting from changes in land use patterns or growth rate accelerations that are induced by the project. Quantifying these effects is often difficult due to the inability to foresee relationships between the project and future development, as well as the interplay of factors besides transportation (e.g., overall economic conditions, availability of other infrastructure such as water and sewer systems, growth policies and plans of local governments, and inclinations of individual landowners). However, CEQ does provide guidance on the level of detail needed to assess potential impacts – primarily by assessing the potential level of change and location of that change that is directly induced by the project.

Before exploring the secondary development effects of the project, it may be useful to first look at how highway projects can affect development decisions by landowners. Transportation has two basic functions: access and mobility. Access enables landowners to develop or otherwise extract economic value from their properties. Direct access off of a highway enables customers to enter properties to transact business, and enables the landowner to export his products to markets beyond the bounds of the property. Mobility enables commerce and social interaction by providing for travel; the better the mobility, the greater the geographic range of interaction and the reach of commerce. Together, access and mobility provide the linkage for human interaction, from neighborhood to global scales.

If a new highway is built into undeveloped lands, that highway provides new access that may, or may not, influence the landowner to build something on the property or extract natural resources from it. The provision of the new access, in and of itself, does not cause the development; rather, it facilitates the development when there are other factors in place that lead the landowner to a development decision (e.g., a growing population creates demand for additional housing; a market exists for the natural resources on the property; a robust and growing economy provides fertile conditions for new businesses; and other essential infrastructure and services, such as schools, water, sewer, and power, are available at reasonable cost).

Enhancements to mobility reduce travel time, thereby reducing the cost of goods transported and increasing the efficiency of commercial and social interaction. Producers can ship their goods greater distances for less cost, workers can commute greater distances in less time, and shoppers can travel farther for greater purchasing choices and opportunities. Again, however, the enhanced mobility, in and of itself, does not ensure expanded economic or social activity.

Rather, it facilitates it when there are other factors in place enabling people to take advantage of it (e.g., a robust economy that supports a large and diverse labor pool, aggressive economic development policies aimed at recruiting new business and industry, and a population with time and money to take advantage of shopping and entertainment opportunities).

The Preferred Alternative is not projected to result in secondary effects due to induced development. No new access to undeveloped land is provided by the Preferred Alternative. According to CEQ guidelines, the potential for induced development is greatest for new transportation corridors on new location. The Preferred Alternative is located within an existing transportation corridor and no new points of access are proposed as part of any of the alternatives. From a regional perspective, the Preferred Alternative will enhance mobility. In order for secondary development effects to be associated with the Preferred Alternative, it must be shown that the mobility enhancements from the Preferred Alternative is directly linked in some manner to future development patterns in the region. In other words, it must be shown that without the improvements, development projects or the induced development in the region would not occur. No such causal relationship can be shown to exist, since the Preferred Alternative is located within an almost completely built-out urban environment. Since growth has long since moved beyond the area surrounding the Capital Beltway along radial routes into outer counties and most of the new growth projected for the region is to occur well outside of the Beltway, it is difficult to attach any regional induced development to improvements that are designed to improve traffic flow on the Beltway.

The other component of induced development focuses on whether the improvements will change land use patterns within the local environment. No such changes are projected. In Table 3-2 it has been shown that the area surrounding the Capital Beltway is projected to be completely developed by 2020. Coordination with Fairfax County indicated that the only growth projected to occur within proximity to the Beltway is in Tysons Corner and Merrifield. Development in Merrifield is projected to be complete as part of the no-build condition without any relationship to the proposed improvements. Tysons Corner may experience an increase in density, but these increases can not be directly attributed to the proposed Beltway improvements, and are more dependent on the construction of rapid rail through the core of Tysons. In addition, no development projects have been identified that are in any way dependent on the Preferred Alternative. Thus, no causal relationship exists between the alternatives and any secondary, or induced development.

4.16.4 Cumulative Effects

As stated previously, cumulative effects are those incremental consequences of a proposed action that, when added the consequences of past and reasonably foreseeable actions, affect the same resources. Other actions in the project area potentially impacted by cumulative effects include other highway projects and residential, commercial, and institutional development. Cumulative effects occur when there is an additive relationship between the various projects in relation to the resources being analyzed. In the following, section the other major actions that have been identified as being located within the geographic resource boundary are discussed in relation to the Preferred Alternative for the Capital Beltway.

Other Actions. Described below are other projects that have occurred, are ongoing, or are reasonably foreseeable within the geographic and temporal boundaries established above.

Springfield Interchange Improvement Project. The Springfield Interchange Improvement Project located in Springfield, Virginia, is a multi-year program to improve traffic flow at the heavily congested interchange of I-95/I-395/I-495. The interchange improvements include new HOV and general-purpose lane connections to the Capital Beltway. Construction is anticipated to be completed in 2007. FHWA determined that the project would not significantly impact the human environment and that an EIS was not required. This finding was based on the Final Environmental Assessment/4(f) Evaluation dated September 19, 1994, and a Reevaluation dated October 27, 1997. However, the selected alternative has a few direct impacts. There are 0.12 acres (0.05 hectares) of wetlands and 0.21 acres (0.09 hectares) of floodplains within the right-of-way. Of the Resource Protection Areas, 1.54 acres (0.62 hectares) will be impacted. These natural resource impacts occur within the Cameron Run subwatershed, which would also be impacted by the Preferred Alternative as described in Sections 4.10.1 and 4.10.2. Three parks were affected, with a total of 2.33 acres (0.94 hectares) impacted, none of which will be impacted by the Preferred Alternative for the Capital Beltway improvements. No archaeological or historic sites were impacted.

Roadway Widenings (Routes 620, 236, 50, 29, 7, and 123). Six of the roadways crossing the Beltway are planned to be widened with or without the Capital Beltway improvements (see Table 4-22). In each case the Preferred Alternative does not have any direct influence on the proposed projects. The widenings will occur within the existing rights-of-way and minimal environmental impacts are projected to occur.

Dulles Airport Access Road Widening. The widening of the Dulles Airport Access Road does intersect with the Capital Beltway. However, there are no incremental changes that would result due to the Preferred Alternative. The widening will occur within existing rights-of-way and minimal environmental impacts are projected to occur.

Dulles Corridor Rapid Transit Project. The Virginia Department of Rail and Public Transportation (DRPT), in cooperation with the Washington Metropolitan Area Transit Authority (WMATA), Fairfax and Loudoun counties, and the Metropolitan Washington Airports Authority (MWAA), is planning to construct a 23.1-mile transit system in Fairfax and Loudoun counties, Virginia. A Final Environmental Impact Statement (Final EIS) for the project was completed in December 2004. A record of decision was signed by the Federal Transit Administration in March 2005.

The project will extend the existing Metrorail system from the Orange Line (between the East and West Falls Church stations) in Fairfax County through Tysons Corner to Washington Dulles International Airport and beyond the airport to Route 772 in Loudoun County. Most of the extension will be constructed in the median of the Dulles International Airport Access Highway and Dulles Connector Road, but the alignment would also directly serve Tysons Corner and Dulles Airport. The extension will include 11 new Metrorail stations, a new rail yard on Dulles Airport property, and improvements to an existing rail yard at West Falls Church. This alignment was selected because it offers the highest ridership potential with the fewest impacts on residential areas and the natural environment.

Because of federal funding limitations and the timing of local funding availability, DRPT intends to construct the Locally Preferred Alternative (LPA) in two major phases. Phase 1 of the Project will complete the first 11.6 miles of the planned extension and include five new stations (Tysons East, Tysons Central 123, Tysons Central 7, Tysons West, and Wiehle Avenue). Metrorail service to Wiehle Avenue is scheduled to begin in 2011. DRPT began Preliminary Engineering on Phase 1 of the project in October 2004. Phase 2 of the Project will complete the remainder of the LPA from Wiehle Avenue to Route 772 in Loudoun County.

Due to the nature of the planned transit improvements (they run primarily in medians and along developed arterials and they are primarily located outside the study area for the Capital Beltway Study which means that they will not cumulatively impact the same resources that will potentially be impacted by the Preferred Alternative), direct environmental impacts will be minimal. There is some interaction between neighborhoods within the Dulles Corridor project that are in close proximity to the Beltway, but no displacements or relocations are projected to occur that could accumulate over time. However, as mentioned previously, the Fairfax County Comprehensive Plan specifically allows for increased densities in Tysons Corner for parcels in close proximity of a new rail station.

Capital Beltway Corridor Rail Feasibility Study. The Capital Beltway Corridor Rail Feasibility Study was initiated by the General Assembly to develop and identify the most feasible means of running rapid transit between Springfield and Tysons Corner and beyond into Maryland. A total of four transit technologies (heavy rail, light rail, monorail, and bus rapid transit) and three alignments were considered in the study, with three technology/alignment combinations being recommended for further study. Two of the alignments were recommended for further study. The Blue Corridor would parallel the Beltway and the Red Corridor would run from Springfield to Annandale along Backlick and Annandale roads, and then through Merrifield to Tysons Corner along Gallows Road, terminating at the Potomac River. As a feasibility study, the purpose of this project was to identify appropriate technologies and alignments, and to consider only fatal flaw impacts. Because the rail study only represents a feasibility study of potential rail plans in the corridor and no significant commitment has been made to implement the recommendations either in terms of a location study, proposed changes to the CLRP for the region or funding, the proposed rail plans are not considered a reasonably foreseeable future project and as such, not included as part of this cumulative impact analysis.

Maryland Capital Beltway Study. The Maryland State Highway Administration is currently conducting a study which is evaluating improvements to the Maryland portion of the Capital Beltway. Cumulative impacts to the Potomac River may occur, as both projects terminate at the river and will impact the river directly or indirectly through impacts to streams draining into the river. The timing of the recommendations from the Maryland Capital Beltway Study and a demonstrated commitment whether the Maryland Capital Beltway Study is considered a reasonably foreseeable future project to be considered in this cumulative impact analysis.

Private Development. Given the relatively built-out nature of development along the Capital Beltway, there are only a limited of number areas that have been identified as potential development sites. The biggest development and redevelopment opportunities in the corridor exist in the Merrifield and Tysons Corner activity centers. Although the Merrifield area is largely developed, there are substantial opportunities and plans for redevelopment. Several buildings are currently under construction, and recently adopted comprehensive plan amendments provide opportunities for additional redevelopment. In general, the new plans seek to take advantage of proximity to the Dunn Loring Metrorail Station changing the area from a largely industrial-use area into a mixed-use district with housing, retail, and commercial uses. Because any new development will be in the form of redevelopment and there are no sensitive resources in the area, new development is not expected to contribute to cumulative effects for this project. In Tysons Corner, there are both new development and redevelopment sites within proximity of the Beltway. West of the Beltway, the Gannett/USA Today Headquarters complex on Jones Branch Drive includes 820,000 square feet of office space. The Tysons II development, which includes the Tysons Galleria shopping mall, several office buildings, and a large hotel, is planned to include several additional buildings, although exact sizes and uses have yet to be determined. To the east of the Beltway, Capital One developed a new headquarters campus, which resulted in the redevelopment of the Westgate office park area. All of these Tysons Corner developments lie within the Scotts Run watershed. The Preferred Alternative will impact this watershed through direct impacts to 1,129 meters of Scotts Run and its tributaries.

As discussed in Section 4.10.1, urbanization generally increases concentrations of non-point source pollutants in almost all categories associated with higher degrees of development and impervious surfaces. An increase in impervious surface, however, does not necessarily result in an increase in siltation or pollutants. With BMPs in place, the downstream effects on water quality are mitigated to a great extent. Pollutants, including grease and oil, metals, nitrogen, and total suspended solids, are trapped and sequestered in stormwater basins for a short period, and eventually are trapped by bottom-settled sediments. BMPs may also offset increases in peak stormwater flows that would otherwise result from increases in impervious surface. Implementing BMPs for the periodical maintenance of control structures and dredging of stormwater basins is now a requisite activity that also improves and maintains water quality by reducing concentrations of harmful pollutants. As a result of BMP implementation, new construction has the potential to improve water quality because they usually treat a greater area of runoff than what has been disturbed by the project.

Existing Development and Roadway Network. As the areas surrounding the Capital Beltway have been developed and built up over the last 40 years, an extensive roadway network has been constructed to serve these new neighborhoods and activity centers. The development of these neighborhoods, activity centers, and roadway network has resulted in the fragmentation and displacement of natural land cover in the project area. As a result, the improvements to the Capital Beltway are occurring in an already-disturbed area and will cause little additional impact.

Air Quality. Despite increases in traffic volumes and vehicle miles traveled, air quality in the metropolitan Washington region is improving for each of the six pollutants for which the U.S. Environmental Protection Agency has established standards: ground-level ozone, carbon monoxide, sulfur dioxide, nitrogen dioxide, particulate matter, and lead. Today, the region is meeting standards for four of the six pollutants with ample margins. Ground-level ozone and $PM_{2.5}$ are the pollutants for which the region has not yet reached the federal health standard.

Ozone levels have been decreasing over the past two decades. There are fewer days when unhealthful ozone air quality occurs. The study area currently is classified as a moderate non-attainment area for the eight-hour ozone standard and a non-attainment area for $PM_{2.5}$. As a result, conformity to the SIP is determined through a regional air quality analysis performed on the TIP by the Metropolitan Washington Council of Governments. This regional air quality analysis is based upon a regional model which accounts for traffic not only from proposed improvements to the Capital Beltway but also from other transportation projects planned in the region as well. This cumulative traffic is then used to determine the cumulative impact of these planned transportation improvements on ground level ozone for several milestone years over the life of the CLRP. This analysis, which is dated 2004 and available from the Metropolitan Washington Council of Governments, demonstrates that the pollutants, which make up ozone, will be below the budgets established for the region by the DEQ.

Summary of Cumulative Impacts. Quantifying cumulative impacts depends on the availability of data for each of the projects and resources. In some cases, these data are not available due to the timing of this and other studies, as is the case with the Capital Beltway Rail study. In other cases, impacts are evaluated only qualitatively, making only qualitative assessments of cumulative impacts possible. The proposed improvements to the Capital Beltway will affect resources, particularly water resources that have been impacted by prior public and private projects and will likely be impacted in the future. On the other hand, this project and others in the region will have a net benefit on regional air quality due to reductions in congestion.

A summary of the potential for cumulative effects as they relate to the other major actions is presented in **Table 4-23.**

Table 4-23
SUMMARY OF CUMULATIVE EFFECTS

Resource Considered	Potential Effects Due to Other Major Actions in Conjunction with the Preferred Alternative
Neighborhoods, Community Services, and Cohesion	Minimal direct effects, some interaction with Dulles Corridor Rapid Transit Project where neighborhoods overlap, but no changes in access or community cohesion projected due to cumulative effects.
Displacements	Displacements from Preferred Alternative. No cumulative effects projected.
Visual and Aesthetic	Direct changes only projected for Preferred Alternative. No cumulative effects projected.
Cultural Resources	No cumulative effects projected.
Parks and Recreation	Direct effects from Preferred Alternative. No cumulative effects projected.
Geologic Resources	No cumulative effects projected.
Water Resources	Direct effects from Preferred Alternative. Likely cumulative effect is improvement in water quality due to use of current BMPs and upgrades to current stormwater management for watersheds for Beltway improvements and other transportation projects such as the Dulles Corridor Rapid Transit Project and Springfield Interchange Project.
Aquatic Biota and Habitat	Direct effects to wetlands and floodplains from project. Minor cumulative effects to Scotts Run watershed as a result of floodplain encroachments from Beltway improvements and Dulles Corridor Rapid Transit Project. Minor cumulative effects to Cameron Run watershed due to Beltway improvements and Springfield Interchange Project.
Terrestrial Biota and Habitat	No cumulative effects projected.
Rare, Threatened and Endangered Species	No cumulative effects projected.
Traffic	No cumulative effects projected, some benefit projected due to increased mobility.

4.17 RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF THE ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Local short-term uses of the environment principally include the construction impacts described in Section 4.15 and the resources used in the construction of the proposed improvements, including materials, energy, and labor. The short-term environmental impacts and use of resources must be balanced against the long-term benefits of the project, both locally and regionally. The Capital Beltway is a major transportation facility for the region. Improvements to the Beltway are based on local and regional transportation plans and are needed to assure the productivity of Fairfax County and the entire region. The local short-term impacts and use of resources for the project are consistent with the maintenance and enhancement of long-term productivity.

4.18 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

The implementation of the improvements to the Capital Beltway involves a commitment of natural, physical, human, and fiscal resources. Land used in the construction of the improvements is considered an irreversible commitment during the time period that the land is used for highway facilities. However, if a greater need arises for use of the land or if the Beltway improvements are no longer needed, the land can be converted to another use. At present, there is no reason to believe such a conversion will ever be necessary or desirable.

Considerable amounts of fossil fuels, labor, and highway construction materials, such as cement, aggregate, asphalt, and steel, would be expended. Additionally, large amounts of labor and natural resources would be used in the fabrication and preparation of construction materials. These materials are generally not retrievable; however, they are not in short supply and their use would not have an adverse effect on the continued availability of these resources. Any construction would also require a substantial one-time expenditure of local, state, and federal funds that are not retrievable.

The commitment of these resources is based on the concept that residents in the immediate area and the region will benefit from the improved quality of the transportation system. These benefits would consist of improved accessibility and safety, time savings, and greater availability of quality services, which are anticipated to outweigh the commitment of these resources.

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LIST OF PREPARERS

This Final Environmental Impact Statement/Section 4(f) Evaluation was prepared by the Virginia Department of Transportation in close coordination with the Federal Highway Administration. Personnel from these agencies who were instrumental in the preparation of this document and related technical studies include:

- **Virginia Department of Transportation**
  - Kenneth Wilkinson, Environmental Program Planner
  - Loretta Markham, Environmental Program Planner
  - Jeffrey Cutright, Senior Transportation Engineer
  - Thomas Campbell, Senior Transportation Engineer
  - Bart Thrasher, Senior Transportation Engineer
  - Lloyd Arnold, Environmental Planner – Noise
  - Samuel Curling, Environmental Planner – Air Quality
  - Amy Costello, Environmental Planner – Air Quality
  - Jim Ponticello, Environmental Planner – Air Quality
  - Kathy Graham, Transportation Planning Engineer
  - Jackie Keeney, Cultural Resources Manager
  - Helen Ross, Cultural Resources Manager
  - Steve Russell, Chief Wetlands Scientist
  - Robert Condrey, Environmental Planner

- **Federal Highway Administration, Virginia Division**
  - Tarsem Lal, Senior Field Operations Engineer
  - Tom Jennings, Transportation Management Engineer
  - Ed Sundra, Senior Environmental Specialist

CAPITAL BELTWAY STUDY TEAM

The Beltway study team, which assisted in the preparation of this Final Environmental Impact Statement/Section 4(f) Evaluation, was comprised of the following representatives from federal, state, and local transportation agencies:

Kenneth Wilkinson	VDOT, Environmental Division
Jeffrey Cutright	VDOT, Location and Design Division
Thomas Campbell	VDOT, Location and Design Division
Kathy Graham	VDOT, Transportation Planning Division
Bahram Jamei	VDOT, Northern Virginia District Office
Susan Shaw	VDOT, Northern Virginia District Office
Tarsem Lal	Federal Highway Administration
Ed Sundra	Federal Highway Administration
Corey Hill	Virginia Department of Rail and Public Transportation
Karl Rohrer	Virginia Department of Rail and Public Transportation
Doug MacTavish	Fairfax County Department of Transportation
Tony Giardini	Metropolitan Washington Council of Governments
Jennifer Straub	Northern Virginia Regional Commission
Kathleen Donodeo	Washington Metropolitan Area Transit Authority

PROJECT CONSULTANTS

The following consultants were involved in the preparation of this Final Environmental Impact Statement/Section 4(f) Evaluation, and related technical reports. A brief resume for each consultant and his/her role in the study are listed below.

Parsons Transportation Group

Stephen Walter	B.S., M.S., Environmental Science; 29 years in environmental planning and NEPA studies.	Project Manager
J. Stuart Tyler, P.E., A.I.C.P.	B.A., Environmental Science and M.S., Civil Engineering; 29 years in environmental planning and NEPA studies.	Deputy Project Manager
Bruce Barnett, P.E.	B.S., Civil Engineering; 16 years in transportation engineering.	Preliminary Engineering, Cost Estimates and Constructability
Kevin Chrisman	B.S., Advertising Design; 17 years in illustration and graphics design.	Illustrations and Computer Graphics

Anne McNulty Darnall	B.S., Chemistry and M.S., Geology; 18 years in environmental planning and impact assessment.	Public Involvement, Environmental Analysis
Elizabeth Federico, A.I.C.P.	B.A., Art History and M.R.P., Land Use and Environmental Planning; 7 years in environmental planning and NEPA studies.	Land Use and Section 4(f) Analysis
Warren Gray, P.W.S., C.F.	B.S., Forest Biology; 18 years in environmental planning and natural resources assessments.	Natural Environment and Wetland Analyses
Kenneth Mobley, A.I.C.P.	M.S. Public Policy and Management; 16 years in Land Use, Transportation, and Environmental Planning	Environmental and Cumulative Impact Analysis
Mary Pickens	B.A., English; 31 years in technical editing, writing, and document production.	Technical Editing
Daniel Prevost, A.I.C.P.	B.A., Environmental Science and Policy; 10 years in environmental planning and policy analysis.	Air Quality Analysis, Land Use and Socioeconomics, Relocation Analysis
Sina Raouf, A.I.C.P.	M.C.P. City Planning; B.S. Architecture; 26 years experience in transportation planning, master planning and environmental documentation.	Environmental Analysis
Patricia Vokoun, P.E.	B.S., Civil Engineering; 19 years in design and NEPA studies.	Environmental Analysis
Joshua Wade, P.E.	B.S., Civil Engineering; 13 years in transportation engineering and computer-generated graphics and presentations.	Alternatives Development, Cost Estimates, CADD Graphics
Robert Wright, P.W.S.	B.S., Environmental Science and B.S., Natural History; 17 years in ecological studies and environmental planning.	Natural Environment and Wetland Analyses

Gray and Pape Inc.

Brad Bowden, RPA	B.A., Sociology/Anthropology and M.S., Anthropology; 16 years in archaeology and Section 106 compliance.	Task Manager for Cultural Resources, Archaeological Analysis
Ashley Neville	B.A, Historic Preservation and M.A. (candidate), American Studies; 19 years in architectural history surveys and Section 106 compliance.	Historic Architecture Analysis

Harris Miller Miller & Hanson Inc.

Christopher Menge	B.S., Physics; 34 years in transportation noise analysis.	Task Manager for Noise Analysis

Christopher Bajdek	B.S., Mechanical Engineering; 16 years in transportation noise analysis.	Noise Analysis
Jason Volk	B.S., Mechanical Engineering; 6 year in transportation noise analysis.	Noise Analysis

Vanasse Hangen Brustlin, Inc.

Jim Curren, P.E.	B.S., Civil Engineering; 29 years in transportation planning and engineering.	Task Manager for Traffic and Transportation
Surbhi Ashton, P.E.	B.S., Civil Engineering; 12 years in transportation planning and engineering	Transportation Analysis
Sung Shin, P.E.	B.S., Civil Engineering; 6 years in transportation planning and engineering	Transportation Analysis
Olegario Villoria	B.S., Civil Engineering; 20 years in transportation planning and engineering	Transportation Modeling
Jose Ojeda	B.S., Civil Engineering; 20 years in transportation planning and engineering	Transportation Modeling

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DISTRIBUTION LIST

The following agencies and organizations were provided copies of this Final Environmental Impact Statement/Section 4(f) Evaluation. Those agencies which provided written comments on the Draft Environmental Impact Statement are noted in the following by an asterisk (*).

6.1 FEDERAL AGENCIES

Advisory Council on Historic Preservation - Eastern Office

Council on Environmental Quality

Federal Emergency Management Agency*

U.S. Coast Guard
- Fifth District (OAN)*

U.S. Department of Agriculture
- Department of the Secretary
- Natural Resources Conservation Service

U.S. Department of the Army
- Corps of Engineers – Norfolk District*

U.S. Department of Energy

U.S. Department of Commerce, National Oceanic & Atmospheric Administration
- National Marine Fisheries Service
- Office of the Chief Scientist

U.S. Department of Health and Human Services
- Office of Public Health and Science

U.S. Department of Housing and Urban Development
- Region 3, DC Field Office

U.S. Department of Interior
- Fish and Wildlife Service, Regional Director
- Fish and Wildlife Service, Virginia Field Office
- National Park Service, National Capital Region
- Office of Environmental Policy and Compliance
- Office of Environmental Project Review

U.S. Department of Transportation
- Federal Transit Administration
- Federal Railroad Administration

U.S. Environmental Protection Agency
- Region 3, Virginia Field Office

U.S. House of Representatives
- Frank Wolf
- Jim Moran
- Tom Davis

U.S. Senate
- George Allen
- John W. Warner

6.2 COMMONWEALTH OF VIRGINIA AGENCIES AND OFFICIALS

Chesapeake Bay Local Assistance Department

Virginia Commission for the Arts

Virginia Department of Agriculture and Consumer Services

Virginia Department of Aviation

Virginia Department of Commerce and Trade

Virginia Department of Conservation and Recreation
- Division of Natural Heritage*
- Northern Virginia Soil and Water Conservation District

Virginia Department of Environmental Quality
- Air Division*
- Waste Division
- Water Division*

Virginia Department of Forestry

Virginia Department of Game and Inland Fisheries

Virginia Department of Health
- Division of Drinking Water*

Virginia Department of Historic Resources

Virginia Department of Housing and Community Development

Virginia Department of Mental Health, Mental Retardation, and Substance Abuse Services

Virginia Department of Mines, Minerals, and Energy

Virginia Department of Rail and Public Transportation

Virginia Economic Development Partnership

Virginia House of Delegates
- Albert C. Eisenberg
- James M. Scott

Virginia Institute of Marine Science

Virginia Marine Resources Commission

Virginia Museum of Natural History

Virginia Outdoors Foundation

Virginia Port Authority

Virginia State Forester

6.3 REGIONAL AGENCIES AND ORGANIZATIONS

Greater Washington Board of Trade

Metropolitan Washington Airports Authority*

Metropolitan Washington Council of Governments

National Capital Region Transportation Planning Board

Northern Virginia Planning District Commission

Northern Virginia Regional Park Authority

Northern Virginia Regional Commission*

Northern Virginia Transportation Commission

Virginia Railway Express

Washington Metropolitan Area Transit Authority*

6.4 FAIRFAX COUNTY AGENCIES AND OFFICIALS

Fairfax County Board of Supervisors*

Fairfax County Executive

Fairfax County Department of Housing and Community Development

Fairfax County Department of Planning and Zoning

Fairfax County Department of Public Works and Environmental Services

Fairfax County Department of Community and Recreation Services

Fairfax County Department of Transportation

Fairfax County Economic Development Authority

Fairfax County Health Department

Fairfax County Park Authority

Fairfax County Non-Motorized Transportation Committee*

Fairfax County Planning Commission

Fairfax County School Board

6.5 OTHER LOCAL GOVERNMENTS

City of Fairfax

City of Falls Church

County of Arlington

Town of Herndon

Town of Vienna

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COMMENTS AND COORDINATION

Federal, state, and local agencies were contacted to inform them about the proposed Beltway improvements, identify issues of concern, and obtain information about environmental resources within the project area. The general public was notified about the scope of the proposed improvements and was provided numerous opportunities to provide comments about the proposed alternatives and environmental concerns. These agency and public comments helped the Virginia Department of Transportation (VDOT) develop alternatives that meet the project's purpose and need, while minimizing adverse effects on the environment and adjacent communities.

7.1 AGENCY COORDINATION

Coordination with various federal, state, and local agencies on the scope of this project began early and continued throughout the study, supplemented by regular meetings of the Beltway Study Team, interagency coordination meetings, and meetings with individual agencies.

7.1.1 Early Agency Coordination

Coordination with appropriate federal, state, and local agencies was initiated in July 1998, when VDOT formally notified these agencies of its intent to prepare an Environmental Assessment (EA) for proposed improvements to the Beltway between the I-95/I-395/I-495 interchange and the American Legion Bridge. Each agency listed in **Table 7-1** was given a detailed brochure outlining the scope of the proposed improvements. The brochure included maps and a description of the project location, a discussion of the necessity for improvements to the Capital Beltway, descriptions of the types of alternatives being considered, and a summary of the environmental review process. In a scoping letter accompanying the brochure, VDOT asked each agency to identify concerns about the project and provide information regarding any potentially sensitive environmental resources in the project area. This early notification and coordination allowed for the timely identification, evaluation, and resolution of environmental and regulatory issues. Coordination with interested agencies continued throughout the remainder of the study.

Table 7-1
AGENCIES AND OFFICIALS CONTACTED DURING EARLY AGENCY COORDINATION

FEDERAL AGENCIES

Advisory Council on Historic Preservation
Federal Aviation Administration, Eastern Region
Federal Emergency Management Agency, Region III
Federal Transit Administration, Region III
National Capital Planning Commission
National Marine Fisheries Service, Northeast Region
National Ocean Service–National Geodetic Survey
National Park Service, National Capital Region
U.S. Army Corps of Engineers, Norfolk District
U.S. Coast Guard, Fifth District
U.S. Department of Agriculture – Natural Resources Conservation Service, Southeast Regional Office and Virginia State Conservationist
U.S. Department of Housing and Urban Development, Virginia State Coordinator
U.S. Department of Interior, Office of Environmental Compliance and Policy
U.S. Environmental Protection Agency, Region III
U.S. Fish and Wildlife Service, Northeast Region

VIRGINIA AGENCIES

Virginia Department of Agriculture and Consumer Services
Virginia Department of Aviation
Virginia Department of Conservation and Recreation:
- Planning and Recreation Resources Division
- Soil and Water Conservation Division
- Natural Heritage Division

Virginia Department of Environmental Quality:
- Air Division
- Policy and Legislation Division
- Technical Services Division
- Environmental Sciences Division
- Customer Services Division
- Water Division

Virginia Department of Forestry
Virginia Department of Game and Inland Fisheries
Virginia Department of Health
Virginia Department of Historic Resources
Virginia Department of Housing and Community Development
Virginia Department of Mines, Minerals and Energy
Virginia Department of Rail and Public Transportation
Virginia Institute of Marine Science
Virginia Marine Resources Commission
Virginia Outdoors Foundation

REGIONAL AGENCIES

Washington Metropolitan Airports Authority
Metropolitan Washington Council of Governments:
- Transportation Planning Board
- Citizens Advisory Committee

Northern Virginia Planning District Commission
Northern Virginia Regional Park Authority
Northern Virginia Soil and Water Conservation District
Northern Virginia Transportation Commission
Northern Virginia Transportation Coordination Council
Potomac and Rappahannock Transit Commission
Virginia Railway Express
Washington Metropolitan Area Transit Authority

FAIRFAX COUNTY AGENCIES/OFFICIALS

Fairfax County Board of Supervisors:
- Chairman
- Braddock District
- Dranesville District
- Hunter Mill District
- Lee District
- Mason District
- Mt. Vernon District
- Providence District
- Springfield District
- Sully District

Fairfax County Executive
Fairfax County Department of Environmental Management[1]
Fairfax County Department of Fire and Rescue
Fairfax County Department of Health
Fairfax County Department of Housing and Community Development
Fairfax County Department of Police
Fairfax County Department of Public Works[1]
Fairfax County Economic Development Authority
Fairfax County Office of Community and Recreation Services
Fairfax County Office of Comprehensive Planning[2]
Fairfax County Office of the Sheriff
Fairfax County Office of Transportation[3]
Fairfax County Office of Waste Management
Fairfax County Park Authority
Fairfax County Planning Commission
Fairfax County School Board
Fairfax County Transportation Advisory Commission
Fairfax County Water Authority
Fairfax County Wetlands Board

OTHER LOCAL GOVERNMENTS

Arlington County Manager
City of Alexandria, Mayor's Office
City of Fairfax, Mayor's Office
City of Falls Church, Mayor's Office
Town of Herndon, Mayor's Office
Town of Vienna, Mayor's Office

1. Now the Fairfax County Department of Public Works and Environmental Services.
2. Now the Fairfax County Department of Planning and Zoning.
3. Now the Fairfax County Department of Transportation.

A total of 39 agencies and elected officials formally responded to VDOT's early coordination efforts. Although most of the responding agencies did not have any comments or concerns about the scope of the project, some agencies requested that specific issues be discussed in the NEPA document. Comments received during early agency coordination are summarized below.

Federal Agency Comments:

Advisory Council on Historic Preservation

- Initiate coordination with the Virginia State Historic Preservation Officer.
- Identify and assess impact to historic properties as required by Section 106 of the National Historic Preservation Act.

Federal Aviation Administration, Eastern Region

- No comments; project not a concern with respect to FAA facilities.

Federal Emergency Management Agency, Region III

- Assess impacts to 100-year floodplains.

National Capital Planning Commission

- Proposed improvements are in conformance with National Capital Planning Commission's Comprehensive Plan for the National Capital Region.
- Include enhanced intermodal connections and signage (e.g., improved access to park and ride lots) in improvement plans.
- Avoid impacts to the George Washington Memorial Parkway and coordinate any changes/impacts with the National Park Service.

National Oceanic Service—National Geodetic Survey (National Oceanic and Atmospheric Administration)

- No comments.

National Park Service, National Capital Region

- Evaluate impacts to park resources.

U.S. Coast Guard, Fifth District

- No comments; project does not cross navigable waterways.

U.S. Environmental Protection Agency, Region III

- An Environmental Impact Statement (EIS) should be prepared for this project to fully study issues such as: residential and business displacements, removal of forested buffers, noise and visual impacts, disruption of commuting patterns, increased congestion and delay, and secondary impacts. The EIS should also assess cumulative impacts from all ongoing transportation projects in the region, including: traffic, delays, air pollution, increased congestion on other roads, alternative traffic patterns that will result, impacts to level of service on the Beltway, and impacts to local roads.
- Explain how proposed highway improvements would fit into a new regional rail network and if improvements would preclude future rail improvements.
- Conduct a project-level air quality conformity analysis and assess air pollution impacts.

- Assess effect of project on future vehicle miles traveled.
- Explain land use and growth assumptions.
- Analyze effects of alternative land use and growth scenarios on travel demand.

U.S. Fish and Wildlife Service, Virginia Field Office

- Wetland issues will be reviewed after the Draft NEPA document is completed.
- Coordinate with the U.S. Army Corps of Engineers regarding wetland identification and impact assessment.

Virginia Agency Comments:

Virginia Department of Agriculture and Consumer Services

- No comments; do not anticipate any adverse impacts related to preservation of agricultural lands or protection of listed endangered or threatened plant and insect species.

Virginia Department of Conservation and Recreation, Planning and Recreation Resources Division

- No concerns related to potential impacts to existing or planned recreational facilities or streams on the National Park Service Nationwide Inventory, Final List of Rivers, potential Scenic Rivers, or existing or potential Scenic Byways.

Virginia Department of Conservation and Recreation, Soil and Water Conservation Division

- Adhere to the State's erosion and sediment control and stormwater management requirements as contained in VDOT's annual specifications already approved by the Division of Soil and Water Conservation.

Virginia Department of Conservation and Recreation, Natural Heritage Division

- Minimize impacts to natural heritage resources and associated habitat.

Virginia Department of Environmental Quality, Technical Services Division

- No comments.

Virginia Department of Environmental Quality, Environmental Sciences Division

- Consider all possibilities for mass transit improvements and enhanced lane management operation; consider strategies that combine transit enhancements and express/local lanes.
- Consider air quality impacts of the project when conducting the regional air quality conformity determination.
- Air quality impact evaluation should include lane management techniques, congestion management systems, or traffic control measures. Assess construction-related air quality impacts, including contributory impacts from construction of other major projects (e.g., Woodrow Wilson Bridge and I-95/I-395/I-495 interchange).
- Show vehicle miles traveled, level of service, peak hour vehicle capacities, changes in average congested speed, and time-delay data for existing conditions, no-build, interim construction period, and build scenarios.

- Include traffic impacts from the new Woodrow Wilson Bridge and I-95/I-395/I-495 interchange in future no-build and build scenarios. Assess latent demand for additional roadway capacity.
- Utilize most recently adopted demographic forecast from the Metropolitan Washington Council of Governments in traffic demand forecasts.

Virginia Department of Forestry

- No concerns; project is not significant with regard to the forest resources of Virginia.

Virginia Department of Health

- No concerns; no impacts anticipated to any public water supply or sanitary sewer facilities in the vicinity of the project.

Virginia Department of Housing and Community Development

- Assess potential loss of housing (especially affordable housing) within the corridor. Census tracts with such housing potentially at risk abut the Beltway in Annandale, North Springfield, and Merrifield.

Virginia Department of Mines, Minerals and Energy

- No comments.

Virginia Institute of Marine Science

- No concerns about direct impacts to coastal/marine resources.

Virginia Marine Resources Commission

- Coordinate with the Marine Resources Commission if the proposed improvements encroach on state-owned submerged lands.

Regional Agency Comments:

Northern Virginia Planning District Commission

- Concerned about post-construction stormwater quality management; recommends adherence to Virginia Stormwater Management Regulations.

Northern Virginia Regional Park Authority

- Assess impacts to the W&OD Railroad Regional Park and the parcel adjacent to the park at the Beltway. Any impacts to these lands would constitute a "conversion of use" under 6(f) of the Federal Land & Water Conservation Fund Act and should be evaluated accordingly.
- Maintain the continuity, safety, and convenience of the W&OD Railroad Regional Park at all times during construction.
- Replace or upgrade the current grade-separated crossing for the W&OD Railroad Regional Park over the Beltway to current Authority standards.
- Provide a bridge for the W&OD Railroad Regional Park directly across I-66 to maintain continuity of the trail rather than having it run along Idylwood Park and cross I-66 on the Virginia Lane overpass.

Northern Virginia Soil and Water Conservation District

- Evaluate impacts of increased impervious surfaces (e.g., increased surface runoff, reduced soil infiltration, lower water table, pollution from degraded quality of stormwater runoff, and increased flood discharges downstream).

- Avoid impacts from erosion, sediment, water quality, and stormwater runoff. Avoid aggravating existing sediment, water quality, and water quantity problems in the Scotts Run, Pimmit Run, Cameron Run, and Accotink watersheds.
- Include stormwater management facilities in plans and use Best Management Practices. Stormwater management facilities should be constructed early and be temporarily modified to serve as sediment basins during construction. Utilize sediment traps and basins to control siltation in project area. Consider temporary or permanent seeding to control erosion during construction. Employ a full-time sediment control specialist during construction to ensure correct installation and maintenance of sediment controls.

Northern Virginia Transportation Commission

- Evaluate systemwide effects of proposed multi-modal solutions, including enhanced bus services that are connected to the region's public transit network.
- Design improvements to not preclude future rail improvements and to identify where right-of-way for future rail can be preserved now.
- Consider travel time savings provided by operating express bus service in HOV lanes.
- Include route-specific analysis in this phase of the study.
- Design ramps and lanes to allow express bus service on the Beltway (e.g., wide ramp radii to accommodate the turning radii of buses).
- Consider use of technology to better manage traffic on the Beltway.

Washington Metropolitan Area Transit Authority

- Design improvements to enable use of the HOV lanes by transit and other high occupancy vehicles. Provide exclusive access and egress from the HOV lane to support transit use.
- Design improvements to ramps and arterials to support express bus service. Provide safe areas for bus stops on arterials and safe access to park and ride lots.
- Consider traffic management techniques such as allowing buses to use shoulder to bypass queues at traffic signals or extended green signals for buses approaching interchanges.
- Preserve as much right-of-way as possible so that highway improvements do not preclude future rail improvements. Design interchanges to allow for placement of piers at the proper intervals to support possible future aerial rail structures.
- Consider the travel needs of pedestrians and bicyclists, especially on the arterial roadways.

Fairfax County Agency/Official Comments:

Fairfax County Board of Supervisors, Beltway Improvement Task Force

- Elevate environmental documentation from an Environmental Assessment to an Environmental Impact Statement.
- Reexamine present standards for cost-effectiveness of sound abatement.

- Provide clear and understandable information regarding right-of-way acquisition process.
- Provide prompt resolution of acquisitions.
- Include mass transit elements in proposed improvements.
- Further evaluate rail alternatives.
- I-66 interchange should be developed within the existing right-of-way and consider efficient and safe traffic movement. Coordinate design with Fairfax County Fire Department and Police Department.
- Include citizen input during the public hearings, and subsequent review and design processes.
- Design participation from the community and businesses must be solicited and accepted to the maximum extent practicable, at the earliest possible time.
- Coordinate with other ongoing transportation projects in the area.
- Cost effectiveness must be considered for all options.
- Funding sources and priorities must be identified.

Fairfax County Board of Supervisors, Mason District (Penelope A. Gross)

- Include sound walls, where appropriate and desired by local communities, as part of the project.
- Assess construction-related impacts, including: increase in traffic on local roads, noise pollution in neighborhoods surrounding the Beltway, damage to local roads caused by potential increases in truck traffic, and possible increases in stormwater runoff pollution.

Fairfax County Executive

- No comments.

Fairfax County Department of Fire and Rescue

- Assess impacts on response times as a result of traffic congestion and/or access challenges.
- Concerned about access to hazardous materials incidents on restricted (barrier-separated) roadways.

Fairfax County Department of Health

- Assess adverse effects to properties near Little River Turnpike interchange that have septic systems and individual water wells.

Fairfax County Department of Public Works and Environmental Services

- No comments.

Fairfax County Office of Community and Recreation Services

- No comments.

Fairfax County Department of Planning and Zoning

- Assess existing and projected noise levels. Concerned about noise impacts, particularly in residential areas.

- Determine right-of-way requirements and assess impacts to existing properties, including the number and type of structures to be taken, the number of residents displaced, and the effects on neighborhood character.
- Assess air quality impacts, including localized carbon monoxide impacts and regional impacts due to ozone precursors.
- Assess impacts to wetlands and streams, Resource Protection Areas, and Environmental Quality Corridors.
- Provide mitigation measures for any adverse impacts.

Fairfax County Office of the Sheriff

- No comments.

Fairfax County Transportation Advisory Commission

- No comments.

Fairfax County Water Authority

- Incorporate adequate stormwater management facilities into final design of proposed improvements.
- Use appropriate erosion and sediment control measures during construction.

Other Local Government Comments:

City of Fairfax, Mayor's Office

- Assess impacts on operation of Route 123 and historic portion of Old Town Fairfax that result from commuters traveling between Interstate 95 and Tysons Corner.

Town of Herndon, Department of Community Development

- No concerns; alternatives to be considered and review process appear to be adequate.

Town of Vienna, Mayor's Office

- Include improvements to reduce the heavy congestion on Route 123 and adjacent residential streets in Vienna.

7.1.2 Study Team

A multi-jurisdictional study team was formed at the beginning of the environmental review process to assist VDOT in identifying Beltway improvement alternatives, examining their engineering feasibility, and assessing their environmental impacts. This study team worked to build a consensus on the alternatives to be included in the environmental document and to identify key issues and concerns. Members of the study team included representatives from the Federal Highway Administration, Virginia Department of Transportation, Virginia Department of Rail and Public Transportation, Fairfax County Department of Transportation, Metropolitan Washington Council of Governments, Washington Metropolitan Area Transit Authority, and Northern Virginia Transportation Commission.

The Beltway Study Team met regularly to discuss areas of concern, review technical analyses, and manage the environmental review process. Technical expertise and staff support were provided by the project's consultants. During the course of the environmental study, the study team met a total of 31 times. In addition to these formal study team meetings, many informal meetings were held among individual study team members to review conceptual plans, plan citizen workshops, expedite data collection, or review analytical methods.

7.1.3 Interagency Coordination Meetings

The proposed Beltway improvements were discussed at VDOT's Interagency Coordination Meetings (IACM) on September 15, 1998, and October 17, 2000. At the first IACM meeting, the project's purpose and need, history, preliminary alternatives, and preliminary findings of the environmental inventories were presented. The preliminary findings of environmental effects were presented at the second IACM.

Representatives from the U.S. Army Corps of Engineers, Virginia Department of Conservation and Recreation, Virginia Marine Resources Commission, U.S. Fish and Wildlife Service, National Marine Fisheries Service, and U.S. Environmental Protection Agency attended the meetings.

7.1.4 Other Agency Meetings

Individual meetings were held with many of the agencies listed in Table 7-1 throughout the environmental review process. For example, briefings were scheduled with the Metropolitan Washington Transportation Planning Board and the Northern Virginia Transportation Coordination Council at key project milestones. In addition, VDOT met with the Washington Metropolitan Area Transit Authority (WMATA) on several occasions to ensure that the proposed improvements to the Beltway would not preclude extending Metrorail to Tysons Corner or other locations where existing right-of-way could be available.

Meetings were also held with various Fairfax County agencies, including the Department of Transportation, Department of Planning and Zoning, and the Fairfax County Park Authority, to gather additional information about the project area, review County plans and policies, and to discuss specific technical issues. Several other Fairfax County agencies were consulted and provided technical information or details about their facilities and services within the project area.

7.1.5 Scoping for Environmental Impact Statement

Based on an assessment of the project area and the environmental constraints identified during the Major Investment Study (MIS) for the Capital Beltway Improvements, FHWA and VDOT determined that there would be some impacts associated with constructing and operating this project. However, at that stage of the project development process, the extent and degree of environmental impacts were not clear. The information at that time was not sufficient to determine whether impacts were significant, as defined by the Council of Environmental Quality's regulations for implementing the procedural provisions of NEPA. Therefore, FHWA determined that preparation of an EA was appropriate to identify environmental impacts and determine their severity. This approach was consistent with FHWA's NEPA regulations (23 CFR 771), which require that an EA be completed when the significance of impacts associated with the proposed action is not clearly established.

As a result of more intensive engineering and operational studies conducted while preparing the EA, the environmental impacts associated with the proposed improvement alternatives were better defined. The studies indicated the following:

1. Potential impacts to wetlands, residential and commercial properties, parks and recreation areas near interchanges, along the mainline, and in the extended study area were greater than the impacts initially identified in the MIS.
2. Additional right-of-way is needed along the mainline for each alternative. At the outset of the NEPA process for this project, it was assumed that, with the exception of areas next to interchanges, the proposed improvements could be accommodated within the existing right-of-way.
3. Federal, state, and local agencies expressed concern over the level of environmental documentation.

Based on these findings, FHWA and VDOT cooperatively decided to elevate the environmental document from an EA to an EIS. A Notice of Intent was published in the *Federal Register* on July 11, 2000, which advised the public of this decision. Coincident with the *Federal Register* notice, additional scoping letters were sent to federal, state, and local agencies. Because of the level of coordination that had taken place in the development of the EA, it was determined that a formal scoping meeting was not necessary. Twenty-six agencies formally responded to this second set of scoping letters with updated agency points of contact and/or reiterations of previously submitted comments. A summary of the comments received is presented below.

Federal Agency Comments:

Advisory Council on Historic Preservation

- Environmental document should be coordinated with the Virginia State Historic Preservation Officer as required by Section 106 of the National Historic Preservation Act.

Army Corps of Engineers

- Designated point of contact.
- Provide update of project status at next interagency coordination meeting.

Environmental Protection Agency, Region III

- Agreed to participate as a Cooperating Agency.

Federal Aviation Administration, Eastern Region

- Designated point of contact.

Federal Emergency Management Agency, Region III

- Designated point of contact.

Housing and Urban Development

- Designated point of contact.

National Park Service, National Capital Region
- Designated point of contact.

Natural Resource Conservation Commission
- Designated point of contact.

U.S. Fish and Wildlife Service, Virginia Field Office
- Wetland issues will be reviewed after the Draft NEPA document is completed.
- Coordinate with the U.S. Army Corps of Engineers regarding wetland identification and impact assessment.

Virginia Agency Comments:

Virginia Department of Agriculture and Consumer Services
- Project will not involve disturbance or transfer of agricultural lands.
- Contact Department regarding endangered plant and insect species.
- Designated point of contact.

Virginia Department of Conservation and Recreation
- Designated point of contact.

Virginia Department of Economic Development Partnership
- Designated point of contact.

Virginia Department of Environmental Quality
- Project must be shown to conform in a Transportation Conformity Analysis.
- Since project is located within an ozone non-attainment area, fugitive emissions of volatile organic compounds (VOCs) and oxides of nitrogen (NOx) generated from construction activities must be minimized.
- Applicable state air pollution regulations include:
  - Fugitive Dust and Emission Control (9 VAC 5-50-60 et seq.)
  - Open Burning Restrictions (9 VAC 5-40-5600 et seq.)
  - Cut-back Asphalt Usage Restriction (9 VAC 5-40-5490, et seq.)
- Designated point of contact.

Virginia Department of Historic Resources
- Designated point of contact.

Virginia Department of Mines, Minerals and Energy
- No additional data are available.

Virginia Institute of Marine Science
- Designated point of contact.

Virginia Marine Resources Commission
- Designated point of contact.

Virginia Outdoors Foundation

- Foundation holds no easements in vicinity of project.

Regional Agency Comments:

Metropolitan Washington Council of Governments

- Designated point of contact.

Northern Virginia Regional Park Authority

- Authority owns and operates the Washington & Old Dominion (W&OD) Trail, which crosses the Beltway. The Park Authority must review and approve plans affecting this facility. Maintain the continuity, safety, and convenience of the W&OD Railroad Regional Park at all times during construction.
- W&OD Trail was acquired and developed with assistance from Land and Water Conservation Funds (LWCF). Under Section 6(f) of the LWCF Act, any conversion from park use to roadway use must be approved by the National Park Service, Virginia Department of Conservation and Recreation, and the Regional Park Authority.

Fairfax County Agency/Official Comments:

Fairfax County Board of Supervisors

- Designated point of contact.

Fairfax County Department of Health

- Consider properties adjacent to or directly affected by construction that are served by on-site sewage disposal systems and groundwater wells.
- Recommend attention be paid to the effect of construction activities on air pollution and stream water quality.
- Designated point of contact.

Fairfax County Park Authority

- Designated point of contact.

Fairfax County Public Schools

- Improvement alternatives should include: (1) some form of physical separation of lanes, and (2) adequate grade, deceleration, and turning radius for large vehicles at interchange and access.

Other Local Government Comments:

Arlington County, Office of County Manager

- Designated point of contact.

City of Falls Church

- Designated point of contact.

Town of Vienna, Mayor's Office

- Designated point of contact.

7.1.6 Comments on the Draft EIS

A total of 14 agencies responded to receipt of the Draft EIS. The comment letters received are presented in **Appendix A**. Upon receipt, each letter was reviewed and comments were assigned a number. Responses to each comment are also presented in Appendix A. The following federal, state, regional, and local agencies or elected officials submitted comments on the Draft EIS for the Capital Beltway Study:

Federal Agencies

Federal Emergency Management Agency

U.S. Coast Guard

U.S. Department of the Army, Corps of Engineers

Virginia Agencies

Department of Conservation and Recreation

Department of Health, Division of Drinking Water

Department of Environmental Quality, Virginia Water Protection Permit Program

Department of Environmental Quality, Office of Air Data Analysis

Regional Agencies

Metropolitan Washington Airports Authority

Northern Virginia Regional Commission

Washington Metropolitan Area Transit Authority

Local Elected Officials and Agencies

Fairfax County Board of Supervisors, Providence District

Commonwealth of Virginia, House of Delegates, 47th District

Commonwealth of Virginia, House of Delegates, 53rd District

Fairfax County, Countywide Non-Motorized Transportation Committee

7.2 PUBLIC INVOLVEMENT

VDOT developed an extensive public involvement program to ensure that concerned citizens, interest groups, civic organizations, and businesses had adequate opportunities to express their views throughout the environmental review process. Following are the objectives of the public involvement program:

- Educate the public regarding the existence, purpose, and scope of the project;

- Encourage and provide opportunities for public participation throughout the study process;
- Report findings of technical analyses at key project milestones; and
- Document how public suggestions and concerns have been considered and incorporated into the project's planning.

Various communication media, including newsletters, brochures, questionnaires, informational videos, the Internet, a project telephone hotline, and citizen workshops were used to provide information about the project and gather input from citizens and other interested parties. In addition, VDOT representatives met personally with numerous interest groups, civic associations, and businesses to discuss the project and answer questions about the proposed improvements and the environmental review process.

7.2.1 Outreach Program

A variety of outreach techniques and materials were used to inform citizens and other interested parties about the details of the proposed Beltway improvements and to solicit their comments and concerns. Specific tools used to notify the public and engage them in the study process are described below. In addition to these outreach methods, VDOT officials conducted interviews with local and regional newspapers, television news organizations, and public radio to raise awareness of the project, answer questions, and describe the environmental review process.

Project Hotline. A telephone hotline (703/359-MOVE) was established to handle information requests and record public comments about the project. Calls are answered from 8 a.m. to 5 p.m., Monday through Friday, for the duration of the study. At other times, messages are recorded and calls returned at a later date, if necessary. In addition, a project e-mail address (*beltway_study@parsons.com*) was established to provide another way for citizens to comment or request project information. During the course of the study, more than 600 calls were made to the project hotline and more than 900 messages were sent to the project e-mail address.

Internet. Information was also available on the Internet for the duration of the study. A summary of the project is available on the Virginia Department of Transportation's web site (*http://www.vdot.state.va.us/proj/beltwayx.html*). In addition, a separate project-specific web site was created to provide more detailed information about the proposed Beltway improvements. This web site (*http://project1.parsons.com/capitalbeltway*) includes information on the project's background, the environmental review process, alternatives being considered, traffic and transportation issues, and an extensive set of Frequently Asked Questions (FAQs). The project web site also includes electronic versions of project newsletters, public meeting displays, conceptual plans, and other project documents.

Project Mailing List. A project mailing list, which VDOT used to send announcements of upcoming public meetings and distribute project newsletters, was created at the beginning of the environmental review process. The mailing list included entries for local, state, and federal elected officials; representatives from local, regional, state, and federal government agencies; interested citizens; civic associations in Fairfax County; local transportation and planning agencies; and the news media. The project mailing list is being continuously updated throughout the study to include citizens who asked to be included, attendees at VDOT and Fairfax County public meetings on the Beltway project, and attendees at meetings with interest groups, civic associations, and businesses. The mailing list contained approximately 2,000 entries at the beginning of the environmental review process; it now contains more than 3,500 entries.

Newsletters. Seven project newsletters were prepared during the course of the study to keep interested parties informed about its status and progress. Topics discussed in these newsletters included: the Beltway MIS recommendations, an overview of the environmental review process, VDOT's public involvement program, public meeting announcements and agendas, the types of alternatives being considered, the scope of environmental analyses, and the project schedule. Each newsletter also provided an address for written comments and the telephone hotline number for questions, comments, and information requests. The newsletters were mailed to all individuals, organizations, and agencies on the mailing list; were made available at public meetings; and were sent to hotline callers who requested additional information about the project. Additional copies of the newsletters were also provided to elected officials and civic associations upon request.

Brochures. Informational brochures describing the need for Beltway improvements, the types of alternatives being considered, and the environmental review process were prepared for each of the citizen workshops and public meetings. These brochures were distributed to workshop attendees, citizens or groups that requested copies, and attendees at informal meetings with VDOT representatives. The brochures supplemented the information being presented at the workshops and presented an overview of the project in a concise, easy-to-read format. A similar informational brochure summarizing the environmental impacts of the various alternatives being considered was distributed at the Location Public Hearing.

7.2.2 Meetings with Interest Groups, Homeowners Associations, Community Organizations, and Property Owners

In addition to formal public meetings for the project, VDOT representatives met with several interest groups, civic and homeowners associations, community organizations, and individual property owners to discuss the proposed Beltway improvements, outline the environmental review process, and answer specific questions about the alternatives and potential environmental impacts. During the course of the study, more than 40 meetings were held with the following groups. Audiences at these meeting ranged from small groups (five or six people) to several hundred. Multiple meetings were held with some groups.

- Braddock District Council
- BF Saul Company
- Coscan (Brookfield Homes)
- Camelot Civic Association
- Dunn Loring Improvement Association
- Fairfax Coalition for Smarter Growth
- Fairfax County Chamber of Commerce
- Falls Church/Merrifield Chamber of Commerce

- Greater Washington Board of Trade, Transportation Committee
- Hines Construction (Gannett Corporation)
- Mason District Council
- McLean Citizens Association
- McLean Citizens Association, Transportation Committee
- McLean Hamlet HOA
- Merrifield Task Force
- Opus East (Metro Place)
- Ravensworth-Bristow Civic Association
- Ravensworth Farm Civic Association
- Regency of McLean
- Sandburg Station HOA
- Shrevecrest/Fallswood HOA
- Stone Haven Civic Association
- Tysons Corner Center
- TYTRAN

7.2.3 Citizen Workshops

Two sets of workshops have been held to gather public input about the range of alternatives being considered and the scope of the environmental review. Because of the size of the project area, each set of workshops was held in three locations between the I-95/I-395/I-495 interchange and the American Legion Memorial Bridge on consecutive nights. Identical information was presented at each night's workshop.

These "open house" workshops offered an opportunity for interested citizens and nearby residents to learn more about the proposed Beltway improvements and participate in the ongoing environmental review process. Materials that provided background information about the project were available at the workshops, including informational videos; detailed displays on the need for Beltway improvements, the environmental review process, and traffic studies; and large maps showing conceptual plans for the proposed roadway and interchange improvements. Informational handouts, including project newsletters, brochures, and summaries of existing conditions, were also available. VDOT staff and project consultants were present throughout the evening to answer questions and explain the study process, traffic analysis, and conceptual plans. All workshop attendees were provided with comment forms to express their comments and concerns about the project in writing. Verbatim reporters were present to record people's oral comments.

November 1998 Workshops. The first set of citizen workshops was on November 17, 18, and 19, 1998, from 4:30 p.m. to 8:00 p.m., at Luther Jackson Middle School in Falls Church, Poe Middle School in Annandale, and Franklin Sherman Elementary School in McLean.

Various methods were used to advertise the workshops. More than 2,000 newsletters, summarizing the study process and announcing the workshops, were mailed to citizens, interest and civic groups, businesses, local elected officials, and local media outlets (including minority newspapers) on October 31, 1998. Advertisements for the workshops appeared in the Washington Post, Washington Times, Fairfax Journal, and Times Community newspapers approximately three weeks and one week prior to the workshops. In addition, 75,000 postcards were mailed to the residents of Fairfax County, and more than 650 fliers were mailed to employers in the study area.

A total of 461 citizens registered as workshop attendees. These workshops provided participants with an overview of the environmental review process, a review of the types of alternatives being considered, and possible interchange improvement concepts. To help VDOT understand more about how, when, and why drivers use the Beltway, workshop attendees were asked to complete a short questionnaire. This questionnaire also asked attendees what types of improvements were preferred and where improvements should be a priority.

Questionnaires were completed by 175 of the persons attending the workshops. Following are among the key findings:

- Most respondents (75 percent) live within one mile (1.6 kilometers) of the Beltway; 39 percent live within ¼ mile (0.4 kilometer).
- Most respondents use the Beltway daily, generally during the morning and evening peak periods.
- More than half of the trips made on the Beltway are journeys to work; most other trips are for shopping or personal business.
- More than two-thirds of respondents use alternate routes to avoid congestion on the Beltway.
- Beltway interchanges at I-66, Leesburg Pike, and Chain Bridge Road were considered the worst-performing interchanges.

A complete summary of the questionnaire results is included in the *November 1998 Citizen Workshop Summary Report*.

VDOT received comments from 270 citizens, businesses, civic associations, and interest groups.[1] A total of 197 comment forms, 29 e-mail messages, and 9 letters and postcards were submitted, and 35 people spoke to the verbatim reporters. There were 208 unique comments made by the respondents and a wide range of issues was identified. The most prevalent comments were: (1) include a rail transit alternative in current study (65 commentors), (2) evaluate noise impacts and add sound barriers (55 commentors), and (3) improve the region's public transportation system (41 commentors). Many commentors also expressed concerns about impacts to properties adjacent to the Beltway and supported construction of a new bypass around the Washington, D.C. area. A summary of all comments received and copies of the actual comments sheets (or other correspondence) are included in the *November 1998 Citizen Workshop Summary Report*.

June 1999 Workshops. The second set of citizen workshops was on June 8, 9, and 10, 1999, from 5 p.m. to 9 p.m., at Poe Middle School in Annandale, Shrevewood Elementary School in Falls Church, and the Best Western Tysons Westpark Hotel in McLean.

To maximize participation by interested citizens and ensure that all potential stakeholders were notified, a comprehensive notification campaign was carried out. All 3,400 individuals, businesses, associations, and interest groups on the project mailing list received notification of the workshops through the project newsletter. In an effort to reach citizens who had not previously expressed interest in the project, postcards were mailed to

[1] This total includes all comments received between the beginning of the environmental review process (July 1998) through the November 1998 Citizen Workshops.

all addresses, comprising more than 82,000 citizens and businesses, in the zip codes immediately adjacent to the project area. Multiple advertisements announcing the meetings were placed in the Washington Post and Washington Times, as well as local newspapers that are distributed throughout the county, such as the Fairfax Journal, Times Community, and Connection newspapers. Letters announcing the June workshops were also mailed to each of the groups VDOT has met with to help ensure that their members were notified of the June workshops.

The second set of workshops was even more well-attended than the first set, with more than 700 registered attendees. This series of workshops provided citizens with another opportunity to learn more about the Capital Beltway Study and to provide input at an early stage in the environmental review process. In response to requests from the public, agencies, and local elected officials, the format for this set of workshops was expanded from the traditional open house format to include a scheduled presentation and question-and-answer session. These workshops also featured representatives from VDOT's right-of-way office to answer property-related questions, the project's acoustical consultant to answer noise questions, and information about other planned transportation improvements in the region.

As a result of these workshops, VDOT received comments from 400 citizens, businesses, civic associations, and interest groups.[2] A total of 164 comment forms, 57 e-mail messages, and 128 letters and postcards were submitted, and 51 people spoke to the verbatim reporters. There were 252 unique comments made by the respondents and a wide range of issues was identified. The most prevalent comments were: (1) interchange improvements are needed (88 commentors), (2) general support for the 12-lane Express/Local with HOV improvement alternative (84 commentors), and (3) interchange designs should accommodate transit links in radial corridors (83 commentors). A summary of all comments received and copies of the actual comments sheets (or other correspondence) are included in the *June 1999 Citizen Workshop Summary Report*.

7.2.4 Fairfax County Beltway Task Force Public Meetings

Because of concerns about the potential impacts of the proposed Beltway improvements, the Fairfax County Board of Supervisors created the Beltway Improvement Task Force in December 1998. Chaired by Jack Herrity (former Chairman of the Fairfax County Board of Supervisors), the Task Force was comprised of representatives from neighborhoods and businesses adjacent to the Beltway. Acting as a community liaison to the county government, the Task Force provided additional citizen involvement in the process and worked to minimize impacts to affected residents, businesses, and property owners.

The Task Force held a series of public meetings in January and February 1999. Although these meetings were not part of its public involvement program for this project, VDOT participated in these public meetings at the Task Force's request. At the Task Force meetings, displays from the November 1998 workshops were available for review. VDOT representatives also presented an overview of the proposed Beltway improvements and

[2] This total includes all comments received during the 60-day comment period for the November 1998 Citizen Workshops.

answered questions from citizens attending the meetings. Following these public meetings, the Task Force submitted a report to the County Board in April 1999 that identified the major issues and concerns of communities along the Beltway and included several recommendations. This report was forwarded to VDOT and was considered in developing Beltway improvement alternatives and conducting the environmental review process.

7.2.5 Location Public Hearing

Public hearings for the Capital Beltway Study were held on May 28, 29, and 30, 2002. The hearings were held at the Hilton Springfield Hotel in Springfield, the Tyson's Westpark Hotel in Mclean/Tyson's Corner, and the Fairview Park Marriott Hotel in Falls Church, respectively. This series of public hearings was intended to provide citizens with an opportunity to provide input on the findings of the Draft EIS.

To maximize participation from interested citizens and ensure that all stakeholders were notified, a comprehensive notification campaign was carried out. Efforts were made to ensure that all potentially interested parties received notice of the hearings. All individuals, businesses, associations, and interest groups on the project mailing list received notification about the hearings through the project newsletter. The mailing list, which included approximately 3,900 names.

In an effort to reach stakeholders who had not previously expressed interest in the project, postcards were mailed to all addresses in the zip codes immediately adjacent to the project area, comprising more than 250,000 residences and businesses. Multiple advertisements announcing the hearings were placed in the Washington Post and Washington Times, as well as local newspapers, such as the Journal and Times Connection newspapers, that are distributed throughout Fairfax County. In addition, letters announcing the May hearings were mailed to each of the groups VDOT has met with to help ensure that their members were notified. Finally, press releases were mailed to the local media before the hearings and a press briefing was held on May 28, 2002 immediately prior to the first hearing. The project hotline and e-mail address were also monitored daily to handle information requests, answer questions, and accept public comments.

A total of 927 citizens signed the attendance logs located at the entrance of the hearings. After signing in, attendees were offered a project brochure and comment form. Upon entering the hearing area, citizens were guided to the detailed displays of the environmental review process, traffic studies, and preliminary plans for the alternatives and interchanges between Springfield and the American Legion Bridge. Members of the study team were available throughout the display room to answer questions and offer explanations of the study process, traffic analysis, and preliminary plans. Due to the large number of previous questions and comments regarding the Department's right-of-way policies, tables dedicated to these issues were set up and staffed by VDOT right-of-way personnel. Right-of-way plans that indicated all potential displacements were available for review and discussion. Copies of the Draft Environmental Impact Statement as well as copies of the supporting technical reports were available at the public hearings. Attendees were able to review the documents, as well as discuss them with study team members.

A presentation, followed by a citizen comment session, began each evening at 6 p.m. Verbatim reporters for oral comments were available in the display room throughout the evening, enabling individuals to have their testimony recorded even if they did not sign up to speak in front of all in attendance. A total of 1,823 citizens, businesses, civic associations, interest groups, and elected officials submitted comment statements for the Capital Beltway Study during the public hearing period, and 191 participants had their oral testimony recorded at the May 2002 public hearings. Following the hearings, all of the comment forms, letters, faxes, postcards, e-mail messages, petitions, and records of testimony were given a unique identification number and logged into the project's database, to facilitate their review. To facilitate review by the study team, the comments were categorized as explained in **Appendix B**. A summary of all comments received and responses to those comments is also presented in **Appendix B**.

More detailed information about these hearings, including copies of the notification materials, display boards, handouts, and comment statements received, is presented in the *Summary Report for the Location Public Hearing, Volumes I, II, III*, and *IV*.

7.2.6 June 2004 Public Workshops

Based on the large number of comments received from local governments and the general public regarding the physical impacts associated with the proposed improvements presented in the Draft EIS, VDOT decided to evaluate modifications which would reduce the size of the Candidate Build Alternatives. In addition, the feasibility and effectiveness of High-Occupancy Toll (HOT) lanes on the Beltway was also evaluated.

The results of these additional studies were presented at two citizen information meetings held on June 29 and 30, 2004 near Falls Church (at the Fairview Park Marriott and in Tysons Corner (at the Tysons Westpark Hotel). Notice of these meetings was provided in the same manner as for the previous Location Public Hearings.

Both of the meetings were well attended with nearly 400 citizens participating over the two nights. Detailed plans of the revised alternatives were available for review, as well as displays of associated environmental impacts and traffic operations. As a result of the meetings, VDOT received more than 200 written comments about the revised Candidate Build Alternatives. These comments and additional technical studies were considered by the Commonwealth Transportation Board in the selection of the Preferred Alternative on January 20, 2005.

8

SECTION 4(f) EVALUATION

8.1 INTRODUCTION

Section 4(f) (49 U.S.C. 303) of the U.S. Department of Transportation Act of 1966 protects public parks and recreational lands, wildlife habitat, and historic sites of national, state, or local significance from acquisition and conversion to transportation use. Section 4(f) is implemented by regulation 23 CFR 771.135. Section 4(f) applies to publicly owned parks, recreational areas, and wildlife or waterfowl refuges, but it does not apply to these land uses if they are privately owned. Publicly owned land includes parks, recreation areas, or wildlife or waterfowl refuges when the land has been officially designated as such or when the federal, state, or local officials having jurisdiction over the land determine that one of its major purposes or functions is for park, recreation, or refuge purposes.

Section 4(f) also applies to all historic sites, whether or not they are publicly owned, that are in, or have been determined to be eligible for listing in, the National Register of Historic Places (National Register). In historic districts, Section 4(f) normally does not apply where an affected or potentially affected property is not individually historic, is not an integral part of the historic district in which it is located, and does not contribute to the factors that distinguish the district historic. Section 4(f) also applies to all archaeological sites in or eligible for inclusion in the National Register if it has been determined, after consultation with the State Historic Preservation Officer (SHPO) and, if applicable, the Advisory Council for Historic Preservation (ACHP), that the site warrants preservation in place. If the site is determined to be important chiefly because of what can be learned by data recovery and has minimal value for preservation in place, Section 4(f) does not apply.

According to Section 4(f), the use of public lands for transportation purposes may only occur if there is no “feasible and prudent” alternative to such use and if the project includes all possible planning to minimize harm to resources from such use. The determination of feasible and prudent alternatives must include supporting information that demonstrates unique problems or unusual factors involved with implementing avoidance alternatives or that the cost, social, economic, and environmental impacts, or community disruption resulting from such alternatives would reach extraordinary magnitudes. An alternative may be rejected as not being feasible and prudent if it meets one of the following criteria:

- Would not meet the project purpose and need;
- Would have excessive costs of construction; or
- Would result in severe operational or safety problems; unacceptable adverse social, economic, or environmental impacts; serious community disruption; or accumulation of the aforementioned impacts that, when combined, would reach an unacceptable level.

Section 6(f) of the U.S. Land and Water Conservation Fund Act of 1965 (16 U.S.C. 4601-4 to 4601-11) preserves, develops, and assures the quality and quantity of outdoor recreation resources through purchase and improvement of recreational lands, wildlife and waterfowl refuges, and other similar resources. Section 6(f) contains provisions to protect and maintain the quality of federal, state, and local investments in parkland and/or recreational resources. The Act established a funding source for federal acquisition of park and recreation lands and matching grants to state and local governments for recreation planning, acquisition, and development. Once purchased using these funds, these lands are protected from conversion to uses other than public outdoor recreational uses. Any such conversion must be in accordance with an existing comprehensive statewide outdoor recreation plan and must be approved by the Secretary of the Interior. If a conversion occurs, the land must be replaced with other recreational properties of at least equal fair market value and with reasonably equivalent usefulness and location. The conversion requirements for Section 6(f) land are outlined in 36 CFR 59.3. The Section 6(f) conversion process is usually conducted jointly by the Virginia Department of Conservation (VDCR) and the US department of Interior (USDOI) following the completion of the NEPA process.

8.2 PURPOSE AND NEED FOR THE PROPOSED ACTION

The Federal Highway Administration (FHWA), in conjunction with the Virginia Department of Transportation (VDOT), proposes to improve the Capital Beltway (I-495) in Fairfax County, Virginia, between the I-95/I-395/I-495 Interchange and the American Legion Bridge. Improvements are needed to increase the Beltway's capacity to accommodate expected growth in daily traffic volumes and to remedy current congestion, operational, and safety problems on this critical link in the region's transportation system.

The Capital Beltway provide connections to other major roadways within the Washington, D.C. region and carries more traffic than any other road in Virginia. Although there have been incremental improvements to correct specific safety and operational problems during its 42 years of operation, the last major improvements to the Beltway were completed in 1977, when it was widened from four to eight lanes. Because of its role as a key link in the region's transportation system, major improvements to the Beltway have been recommended in local, regional, and state transportation plans for almost a decade. Major factors contributing to the need for Beltway improvements are listed in the **Table 8-1.**

Table 8-1
PURPOSE AND NEED FOR BELTWAY IMPROVEMENTS

Purpose of the Beltway Improvements	Why Improvements Are Needed
1. Provide safer and more efficient travel on the Beltway.	▪ Accidents on the Beltway are increasing. ▪ Congestion and the current roadway design are the cause of many accidents. ▪ Beltway travel speeds are decreasing. ▪ Travel times and the length of back-ups on the Beltway are increasing.
2. Correct substandard roadway and interchange design.	▪ Beltway and interchanges were not designed to handle current traffic volumes. ▪ Many interchanges and portions of Beltway do not meet current engineering and safety standards.
3. Ease Beltway congestion and reduce "cut-through" traffic on local roadways and neighborhood streets.	▪ Expansion of the regional roadway network has not kept pace with population and employment growth. ▪ Major capacity improvements to the Beltway have not been made in almost 25 years. ▪ Beltway congestion spills over to adjacent roadways. ▪ Congestion levels will worsen in the future.
4. Complete the regional HOV roadway network and enhance connections with other regional roadways.	▪ Beltway serves both local and through traffic. ▪ Regional HOV system is incomplete; Beltway link between existing HOV facilities is missing. ▪ Beltway is important to regional freight movement.
5. Expand availability of mass transit options and improve access to other transportation modes.	▪ Transit on the Beltway would increase its capacity and enhance mobility. ▪ Existing Beltway does not support effective express bus operations. ▪ Beltway provides access to other transportation modes and facilities.
6. Accommodate growing travel demand and changes in regional trip characteristics.	▪ Changing demographics and employment patterns are increasing the number of trips made each day. ▪ Suburb-to-suburb trips are on the rise. ▪ Combined trips (with intermediate stops) are increasing. ▪ Most trips in the region are made by automobile.
7. Better serve the diverse mix of land uses and improve access to regional activity centers in Fairfax County.	▪ Fairfax County has urbanized rapidly since 1975. ▪ New development is occurring primarily in suburban areas. ▪ Non-residential land uses are increasing. ▪ Density of suburban activity centers is increasing. ▪ Additional development is already approved to take place as provided for in Fairfax County's land use plan.
8. Preserve key link in transportation system that sustains regional economy.	▪ Fairfax County is major employment center. ▪ Most new jobs and businesses are being created in the suburbs. ▪ Work force changes are increasing travel demand. ▪ Congestion has economic costs. ▪ Regional employment to grow substantially over the next 20 years.

Table 8-1
PURPOSE AND NEED FOR BELTWAY IMPROVEMENTS

Purpose of the Beltway Improvements	Why Improvements Are Needed
9. Meet the transportation needs of a growing population.	▪ Population of Northern Virginia has increased 50 percent since 1980. ▪ Center of region's population has shifted to Fairfax County. ▪ Population will grow another 40 percent by 2020. ▪ Number of households is growing even faster than the population.
10. Upgrade the region's transportation infrastructure in accordance with local and regional plans.	▪ Improvements to the Beltway have been recommended for more than a decade by local governments, regional planning agencies, and state transportation officials.

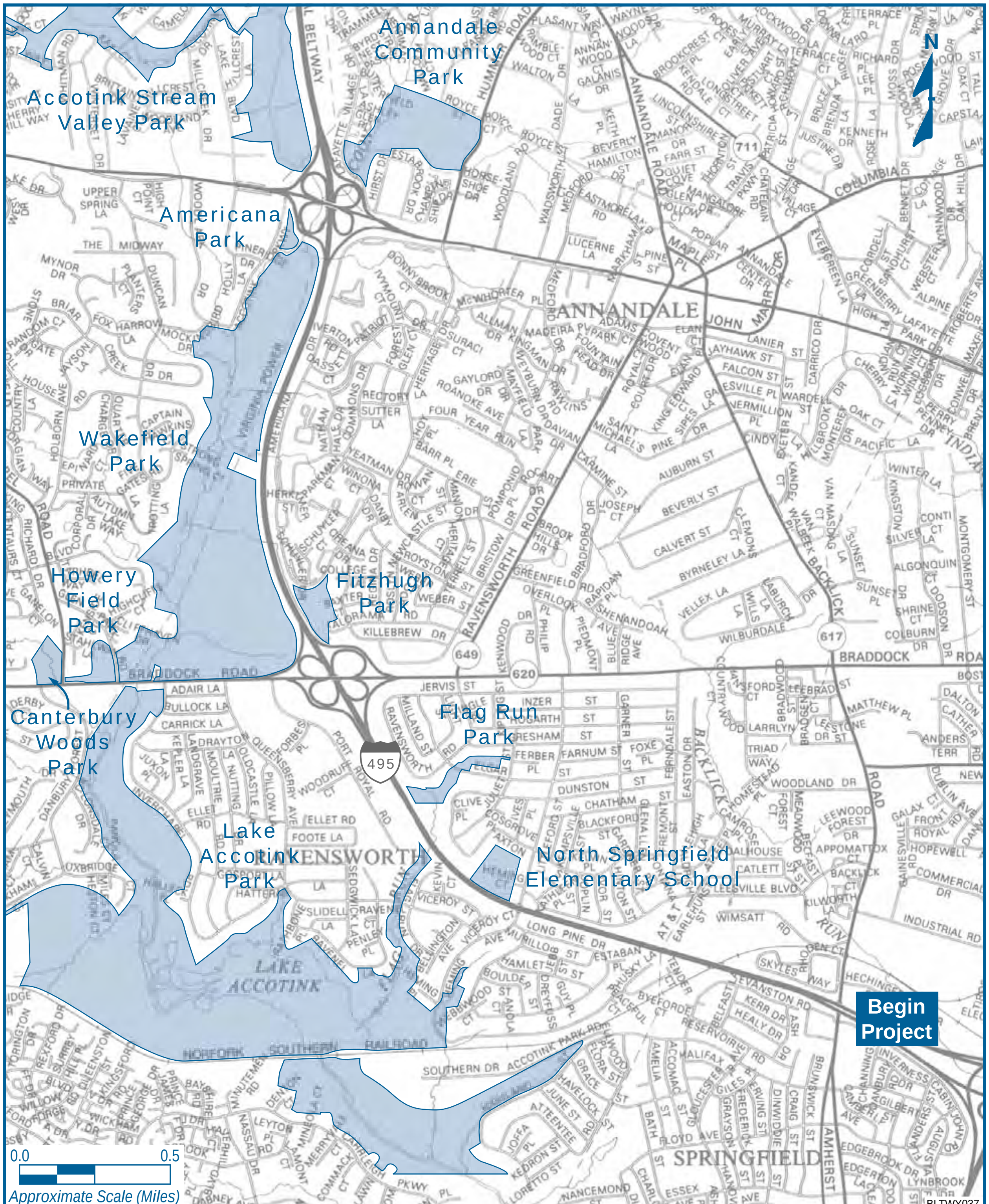
Based on its ability to best satisfy the noted criteria of purpose and need, the Commonwealth Transportation Board (CTB) selected the 12-Lane HOT / Managed Lanes Alternative as the Preferred Alternative. As described previously in Chapter 2, the Preferred Alternative is one of two revised alternatives developed from the Candidate Build Alternatives presented in the Draft EIS. Substantial reductions in the amount of right-of-way required for the revised alternatives also resulted in similar reductions in the use of Section 4(f) resources. Each of the Candidate Build Alternatives in the Draft EIS could potentially affect eight parks and one historic district – involving the direct use 15.05 to 19.88 acres of Section 4(f) properties. Designs for the two revised build alternatives (12-Lane HOT and 10-Lane HOV) reduced the number of effected Section 4(f) properties to five parks and substantially reduced the amount of Section 4(f) lands used to 1.14 to 2.5 acres. Although the Preferred Alternative required the use of approximately 1.36 acres of Section 4(f) lands than the revised 10-Lane HOV Alternative, it far outperformed the 10-Lane Alternative in each of the ten operational and safety merits contained in the purpose and need. In each case of additional 4(f) use by the Preferred Alternative, the property involved is a linear sliver of parkland adjacent the existing Beltway right-of-way and in each case the properties are far distant from area of active park functions.

8.3 SECTION 4(f) PROPERTIES

As listed in **Table 8-2** and shown on **Figure 8-1**, there are 25 properties along the Beltway subject to protection under Section 4(f). They include county parks, regional parks, a national park, public school recreational facilities that are available for public use, and historic districts. The following section describes the five Section 4(f) properties which are directly affected by the Preferred Alternative. Details on the other properties may be found in the Draft EIS.

Table 8-2
SECTION 4(f) PROPERTIES

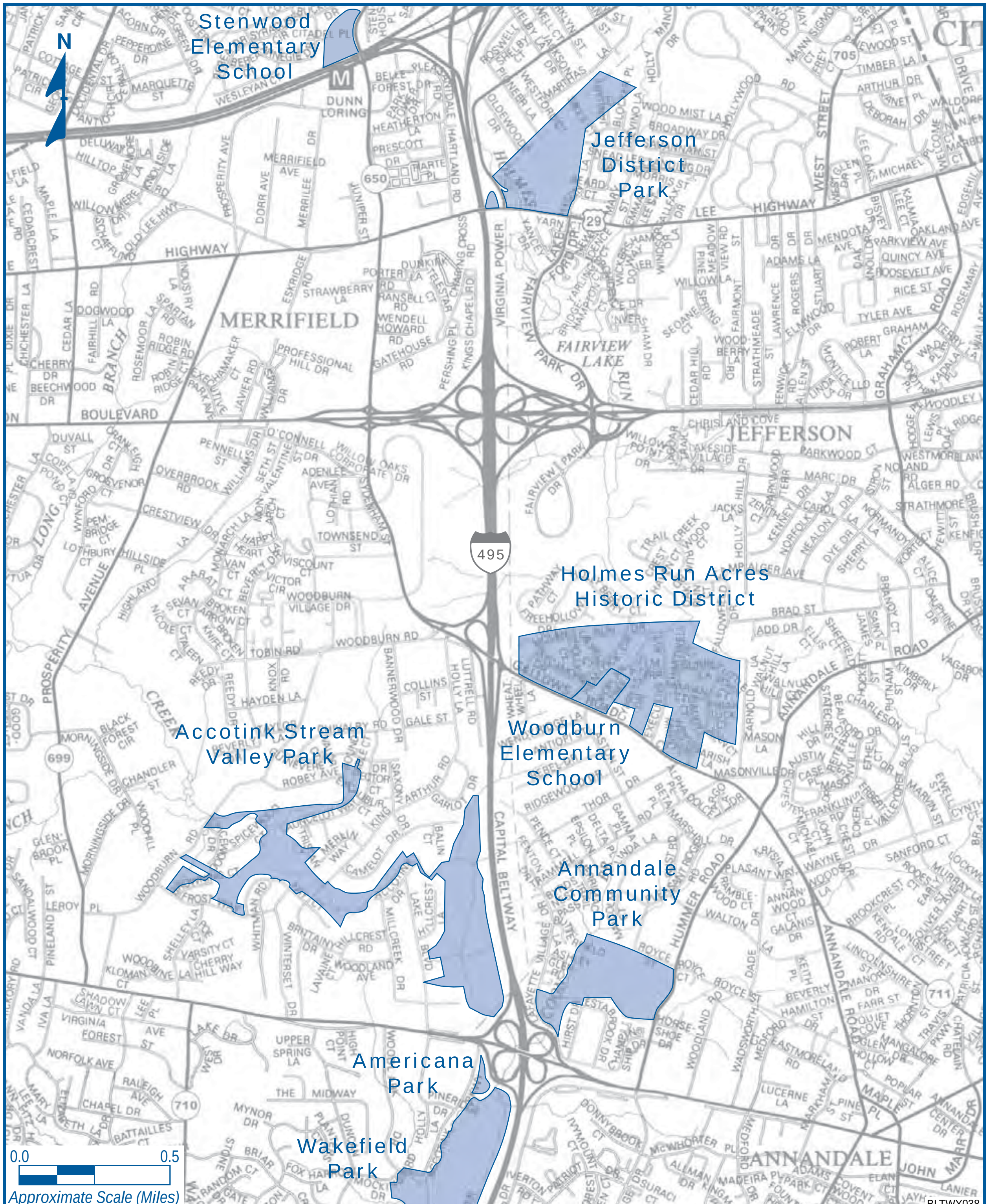
Name	FACILITIES/AMENITIES											
	Indoor Recreation Center	Community Center	Ball Diamond(s)	Multi-Use Field(s)	Basketball/ Multi-Use Court(s)	Tennis Courts	Golf or Miniature Golf Course	Recreational Trail(s)	Playground or Tot Lot	Picnic Area(s)	Natural Area(s)	Open Space
North Springfield Elementary School			✔	✔	✔				✔			
Lake Accotink Park				✔	✔		✔	✔	✔	✔	✔	✔
Flag Run Park								✔			✔	
Canterbury Woods Park					✔			✔				✔
Howery Field Park			✔	✔								
Wakefield Park	✔	✔	✔	✔	✔	✔		✔	✔	✔	✔	✔
Fitzhugh Park					✔			✔	✔		✔	
Americana Park			✔					✔				
Annandale Community Park		✔	✔		✔	✔		✔	✔	✔	✔	✔
Accotink Stream Valley Park								✔			✔	
Woodburn Elementary School			✔		✔	✔						
Holmes Run Acres Historic District												
Jefferson District Park					✔	✔	✔					
Stenwood Elementary School			✔	✔	✔				✔			
W&OD Railroad Regional Park								✔			✔	
Idylwood Park			✔	✔	✔	✔		✔				✔
George Marshall High School			✔	✔	✔	✔						
Lisle Park					✔				✔			✔
Scotts Run Stream Valley Park								✔			✔	
McLean Hamlet Park											✔	✔
Falstaff Park										✔	✔	✔
Timberly Park											✔	
Cooper MIddle School			✔	✔	✔	✔						
Scotts Run Nature Preserve								✔			✔	
George Washington Memorial Parkway								✔			✔	



SECTION 4(f) PROPERTIES
I-95/I-395/I-495 Interchange to Little River Turnpike

Figure 8-1a
(1 of 4)

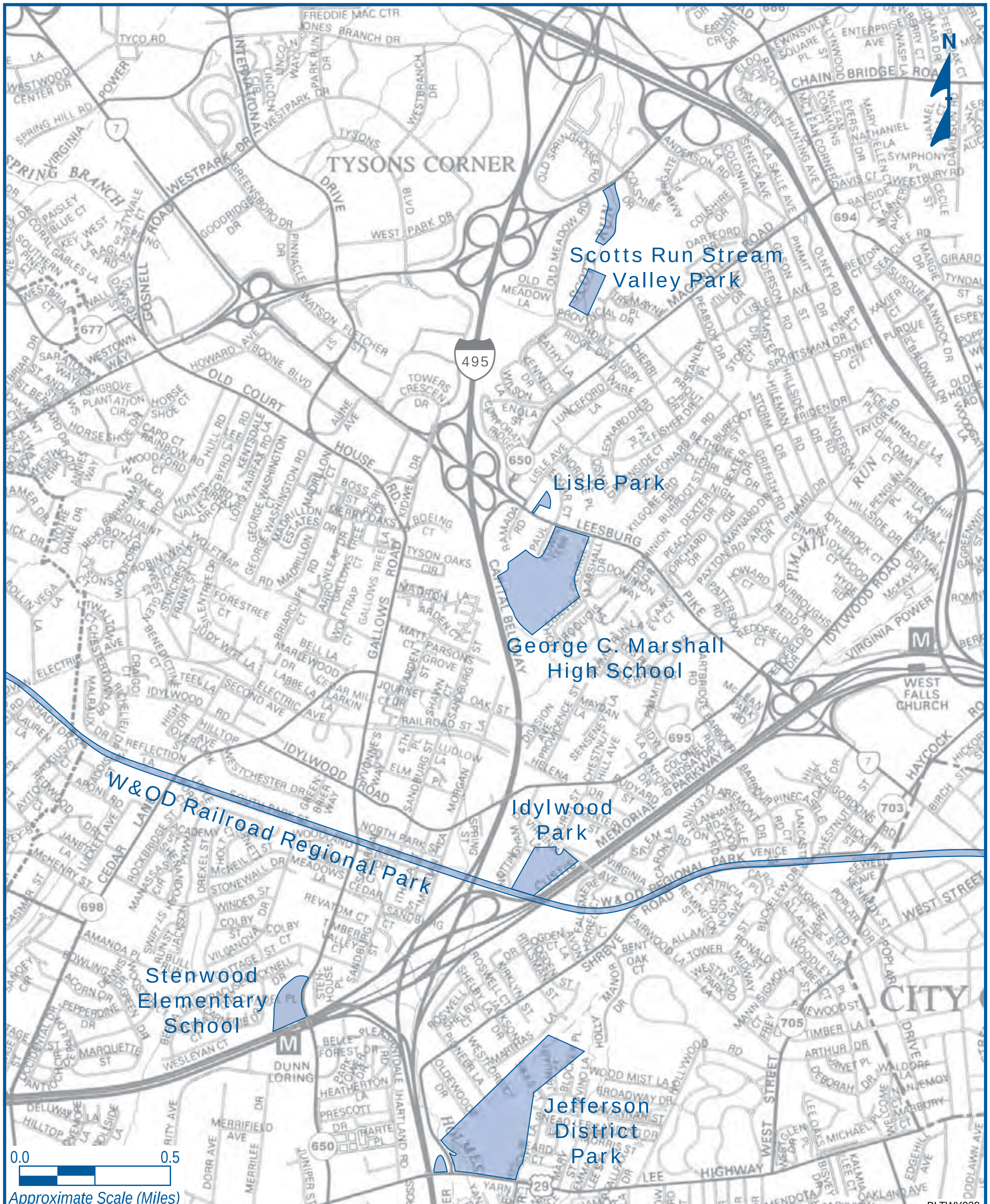
CAPITAL BELTWAY STUDY



SECTION 4(f) PROPERTIES
Little River Turnpike to I-66

Figure 8-1b
(2 of 4)

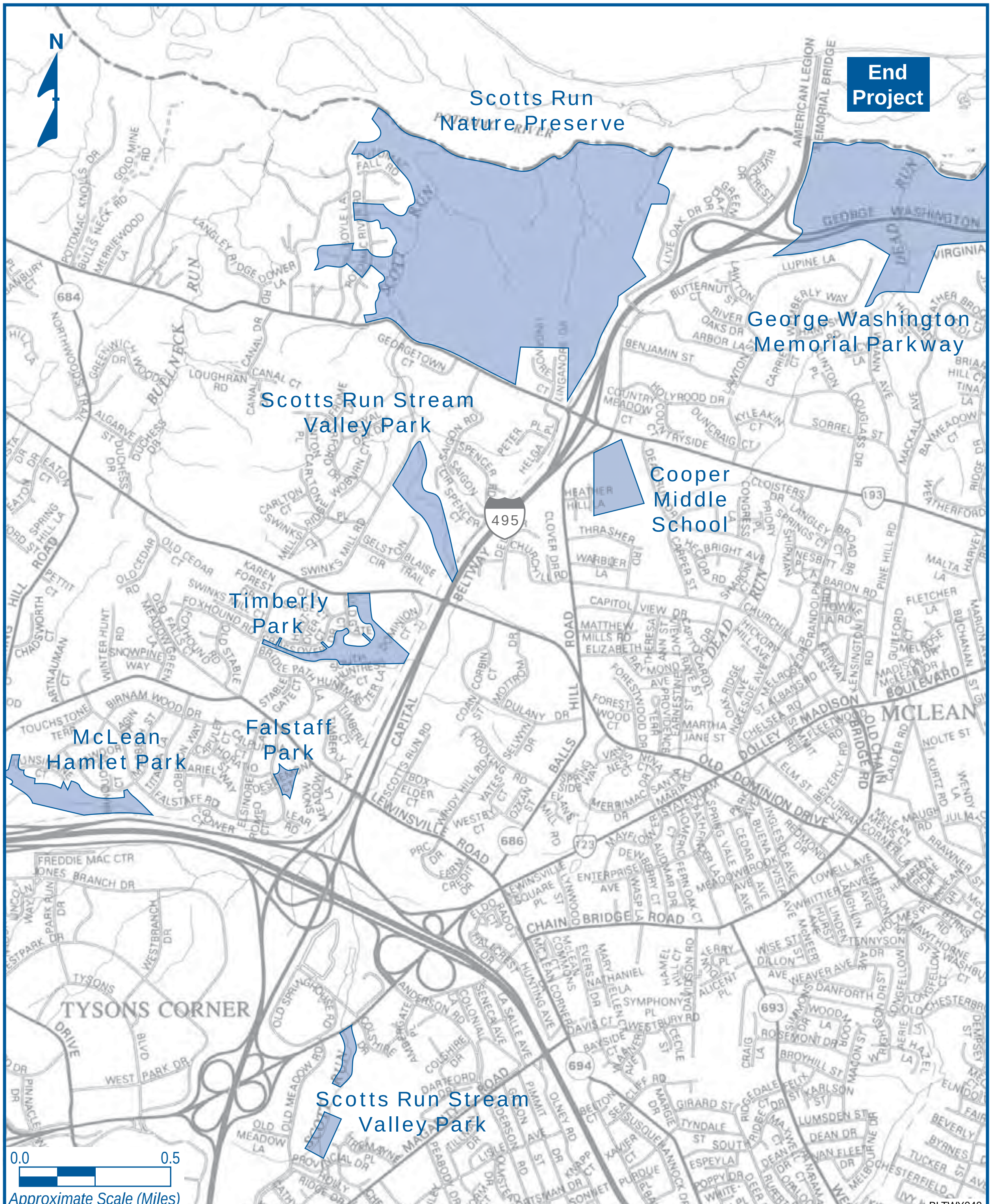
CAPITAL BELTWAY STUDY



SECTION 4(f) PROPERTIES
I-66 to Dulles Access/Toll Road

Figure 8-1c
(3 of 4)

CAPITAL BELTWAY STUDY



SECTION 4(f) PROPERTIES
Dulles Access/Toll Road to American Legion Memorial Bridge

CAPITAL BELTWAY STUDY

Figure 8-1d
(4 of 4)

The parks and recreational facilities are owned and operated by the Fairfax County Park Authority, the Northern Virginia Regional Park Authority, the National Park Service, or the Fairfax County School Board. The Fairfax County Park Authority categorizes its parks by functions and service areas:

Neighborhood Parks generally encompass 3 to 10 acres and are characterized by easily-accessible, low-intensity recreation. Facilities may include picnic areas, trails, playgrounds, fitness stations, natural areas, and recreational fields or courts. Limited or no parking is typically provided. These parks serve adjacent residential areas within a 15-minute walk.

Community Parks generally encompas10 to 50 acres and include with facilities for a variety of individual and organized recreational activities. Facilities may include athletic fields and courts, playgrounds, trails, picnic areas, and garden plots. Parking is usually provided on-site or co-located with adjoining development. These parks serve neighborhoods within three miles.

District Parks generally encompass 50 to 200 acres and include diversified area-wide recreational services for extended day use and organized activities. Facilities may include interpretative natural or cultural resources, large complexes of athletic fields and courts, picnic pavilions, playgrounds, equestrian facilities, miniature golf, amphitheaters, and trails. Access is provided via multiple transportation modes, with on-site parking provided. Developed facilities may be combined with extensive natural areas. These parks serve large portions of county population and typically have a service area of up to seven miles.

Multiple Resource Parks are normally 200 acres or more and include a variety of recreational opportunities in natural settings and at developed outdoor facilities for individuals and large groups. These parks are often used for day-long or extended activities with large numbers of participants or spectators. Facilities may include camp grounds, boat ramps, visitor centers, tournament-level athletic fields, and swimming pools. Multiple resource parks generally serve all county residents as well as visitors.

Natural Resource Parks preserve and protect areas of sensitive environmental or ecological areas. These parks may include interpretive facilities, visitors centers, and hiking, biking, or equestrian trails. They serve all county residents and visitors.

Stream Valley/Greenway Parks preserve contiguous natural areas for riparian habitat, water quality protection, and environmental corridors (or greenways). This type of park is often located within floodplains. Trails usually provide access and travel routes through stream valley parks. These parks serve all county residents as well as visitors and provide a range of educational experiences.

The Preferred Alternative would require the use of land from the following five park or recreational properties: Wakefield Park, Fitzhugh Park, Accotink Stream Valley Park, Jefferson District Park, and the Washington and Old Dominion (W&OD) Railroad Regional Park. These parks are described in more detail in the following sections.

8.3.1 Wakefield Park

Size and Location. Wakefield Park is a 292.6-acre park located at 8100 Braddock Road. The park is bounded by Little River Turnpike, the Beltway, Braddock Road, and residential properties off of Wakefield Chapel Road.

Relationship to Proposed Action. Figure 8-1a shows the location of Wakefield Park in relation to the Capital Beltway. **Figure 8-2** illustrates the park and how it would be affected by the proposed project. The existing highway rights-of-way for Little River Turnpike, the Beltway, and Braddock Road comprise the northern, eastern, and southern boundaries of the park, respectively. The nearest existing Beltway lane is within 6 feet of the park boundary. None of the park facilities would be displaced by the Preferred Alternative.

Ownership and Type of Property. Wakefield Park is a public park owned by the Fairfax County Park Authority.

Function. This is a multiple resource park providing a variety of recreational opportunities in natural settings and developed facilities for individuals and large groups. The Fairfax County Park Authority estimates that approximately 340,000 people used Wakefield Park in 1998 (at facilities where registration or payment is required).

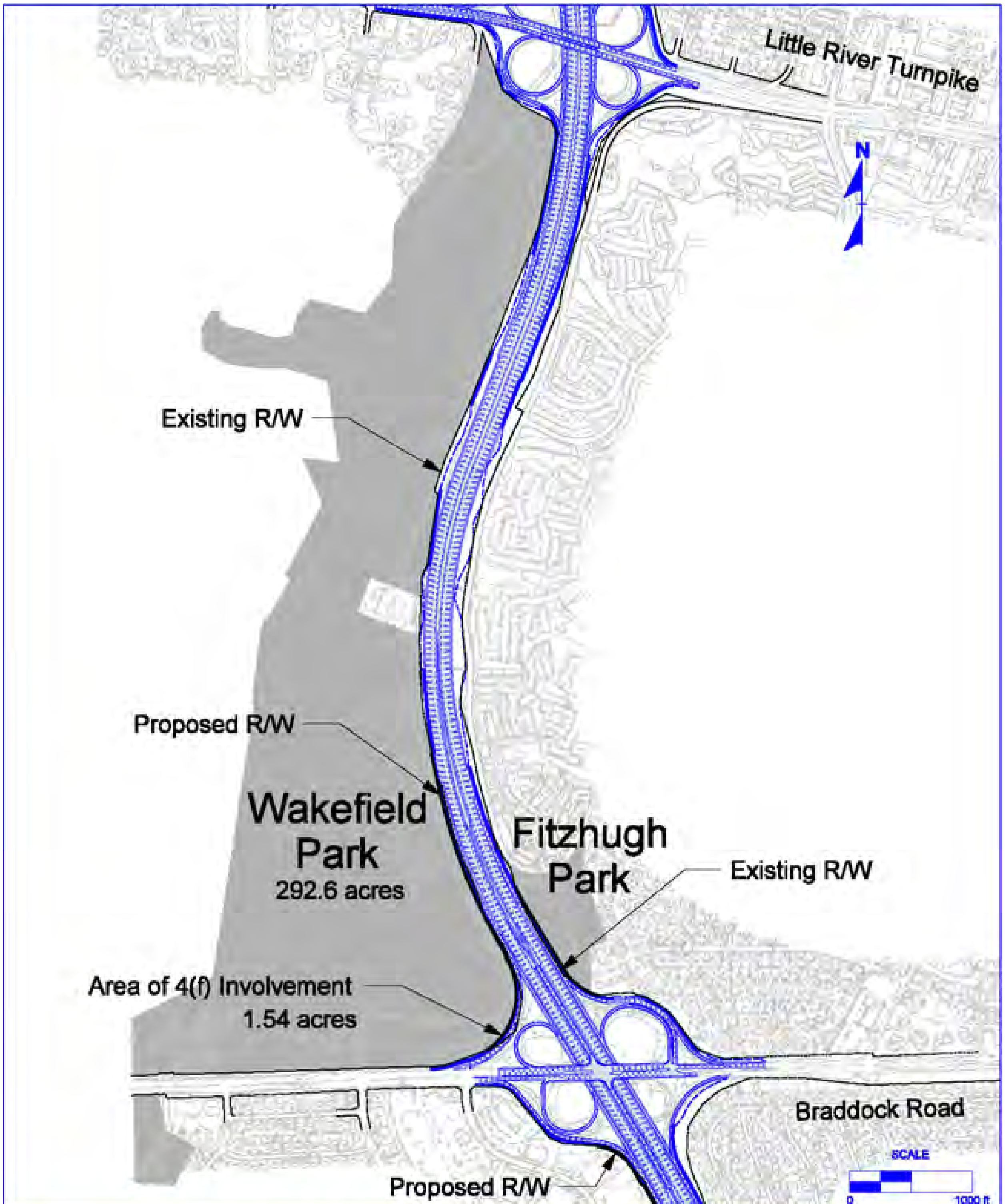
Facilities. Facilities at Wakefield Park include: four ball diamonds, two multi-use fields, two basketball courts, two tennis courts, 10 horseshoe pits, 16 shuffleboard courts, 28 garden plots, several trails (hiking/biking, fitness), natural areas (wooded), open space, picnic areas, playgrounds, outdoor concession stand, restrooms, and recreation center. The recreation center contains an indoor swimming pool, sun deck, sauna, meeting rooms, fitness equipment, racquetball courts, squash courts, and a gymnasium. A maintenance building is located near the park entrance and a recycling drop-off area is located at the north end of the recreation center's parking lot. Planned facilities include a community center, amphitheater, picnic area with restrooms, additional playgrounds, archery area, winter sports area, another multi-use court, and additional parking for approximately 300 cars.

Access. Vehicular and pedestrian access is provided via Braddock Road and a park service road. Additional pedestrian access to and from the east side of the Beltway (in the vicinity of Americana Drive) is provided by an enclosed overpass just north of Herkimer Street.

Relationship to Similarly Used Lands. Other multiple resource parks along the project corridor are Lake Accotink Park and Jefferson District Park.

Applicable Clauses Affecting Ownership. There are no recorded reversionary clauses affecting ownership. Fairfax County funds were used to purchase Wakefield Park. No LWCF monies were used to acquire or develop the park.

Unusual Characteristics. Wakefield Park has no unusual characteristics.



WAKEFIELD PARK
Preferred Alternative
CAPITAL BELTWAY STUDY

Figure 8-2

8.3.2 Fitzhugh Park

Size and Location. Fitzhugh Park is a 10.86-acre park located at 4966 Americana Drive. The park is bounded on the west by the Inner Loop of the Beltway, on the north by Americana Drive, and on the east and south by residential properties on Killebrew Drive and Kalorama Road.

Relationship to Proposed Action. Figure 8-1a shows the location of Fitzhugh Park in relation to the Capital Beltway. **Figure 8-3** illustrates the park and how it would be affected by the build alternatives. The existing Beltway right-of-way forms the western boundary of the park. The nearest existing Beltway lane is within 74 feet of the park boundary, within 123 feet of the hiking trail and multi-use court. No facilities would be displaced by the Preferred Alternative.

Ownership and Type of Property*.* Fitzhugh Park is a public park owned by the Fairfax County Park Authority.

Function. This neighborhood park provides passive recreational use for local residents. The service area for this type of park typically includes residences within a 0.5-mile radius of the park boundary. The Fairfax County Park Authority does not collect usage statistics for Fitzhugh Park.

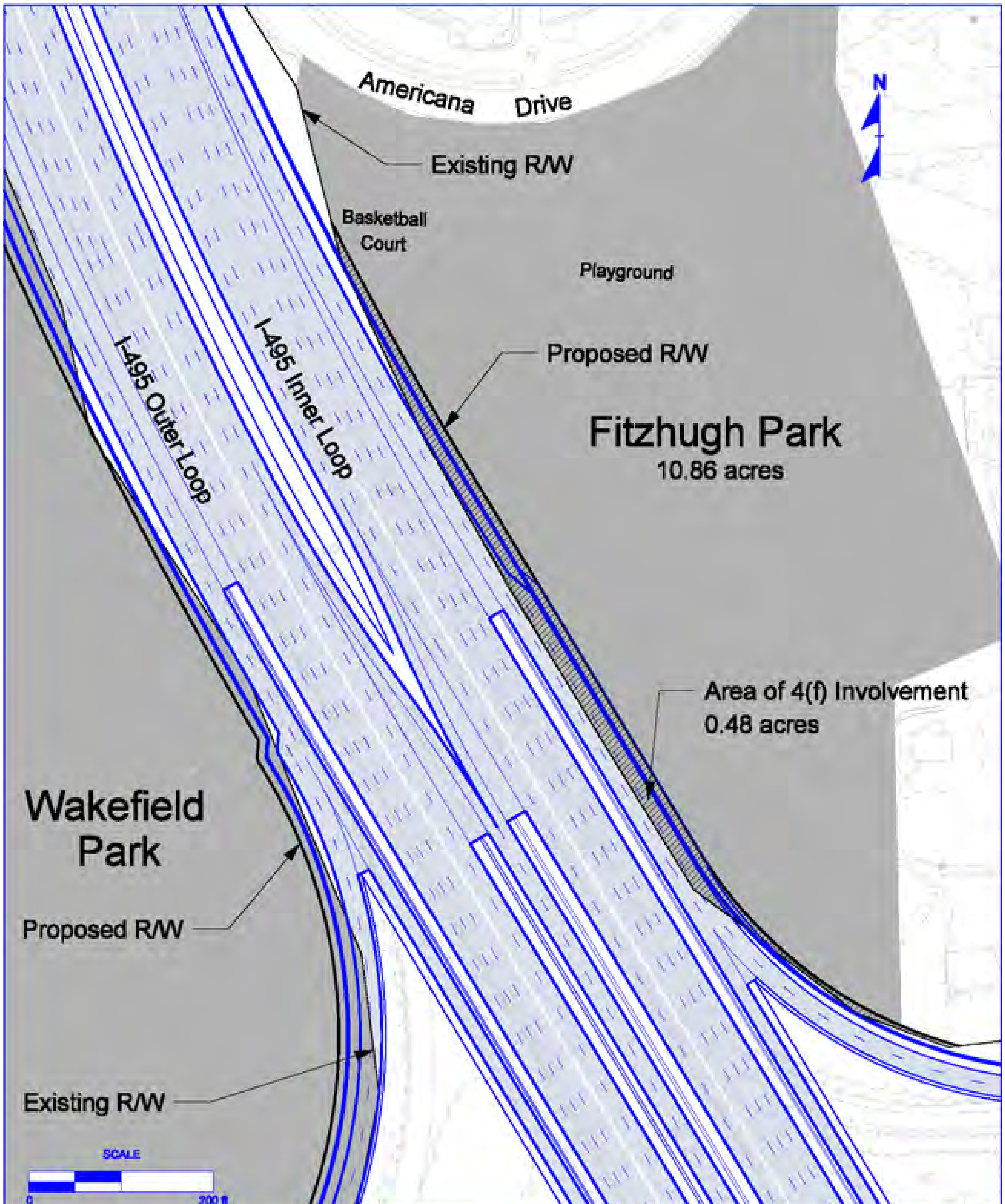
Facilities. Fitzhugh Park is predominantly wooded, with an open area near Americana Drive. Existing facilities include a multi-use/basketball court, playground, tot lot, and trail for hiking, biking, and jogging. No additional facilities are planned.

Access. Pedestrian access is provided via Americana Drive and Kalorama Road. There is no vehicular access into the park. Vehicle parking is available on local streets.

Relationship to Similarly Used Lands. Public parks that offer similar facilities within one mile of Fitzhugh Park include Ossian Hall Park, Flag Run Park, Lake Accotink Park, Wakefield Park, and Oak Hill Park.

Applicable Clauses Affecting Ownership. There are no recorded reversionary clauses affecting ownership. Fairfax County funds were used to purchase Fitzhugh Park. No LWCF monies were used to acquire or develop the park.

Unusual Characteristics. Fitzhugh Park has no unusual characteristics.



FITZHUGH PARK
Preferred Alternative

CAPITAL BELTWAY STUDY

Figure 8-3

8.3.3 Accotink Stream Valley Park

Size and location. Accotink Stream Valley Park is a 728.7-acre park located along Accotink Creek. The park is a collection of unconnected parklands that extend along Accotink Creek through Fairfax County between the City of Fairfax and the Potomac River. Only a small portion of the park is located near the Beltway (62.75 acres). The trails in the Accotink Stream Valley Park provide a critical link in the routing of the 34-mile Cross County Trail which will eventually connect the northern and southern reaches of the county for non-motorized travel.

Relationship to Proposed Action. Figure 8-1a shows the location of Accotink Stream Valley park in relation to the Capital Beltway. **Figure 8-4** is a detailed map of the park showing how the Preferred Alternative would affect it. The existing Beltway right-of-way forms the eastern boundary of the park. The nearest existing Beltway lane adjacent to the park is within 46.5 feet of the park boundary. No recreational facilities in this park would be displaced by the Preferred Alternative.

Ownership and Type of Property. Accotink Stream Valley Park is a public park owned by the Fairfax County Park Authority.

Function. This stream valley park provides primarily passive recreation for local residents. The service area for this type of park typically includes the entire county. The Fairfax County Park Authority does not collect usage statistics for Accotink Stream Valley Park.

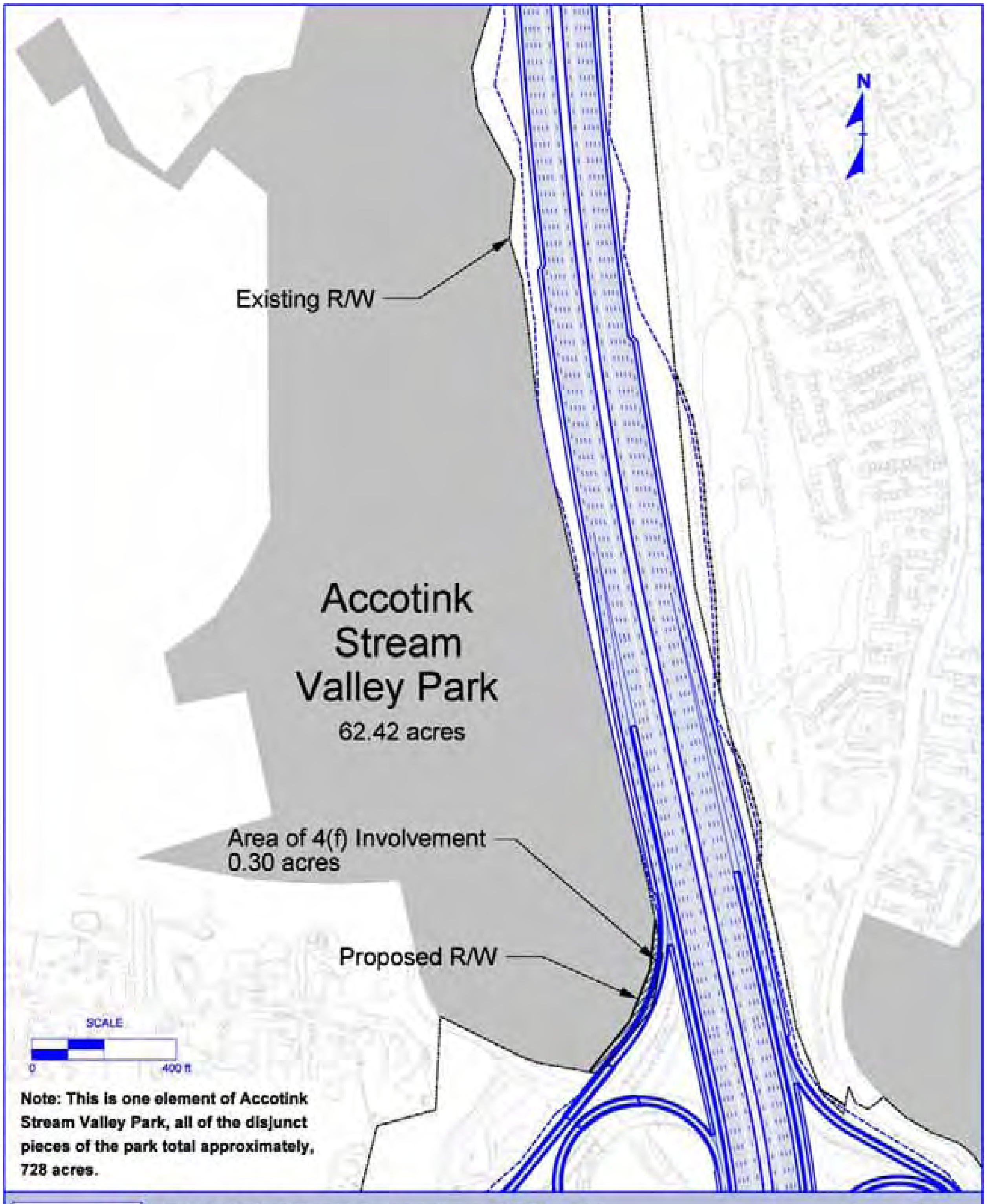
Facilities. The park has an unpaved trail that parallels Accotink Creek. There are no plans for adding facilities to Accotink Stream Valley Park, other than to continue the trail along the creek as additional parcels are purchased.

Access. Pedestrian access to the park is provided via a trail along Accotink Creek. The nearest trailhead is at King Arthur Road, nearly two-thirds of a mile (one kilometer) from the Beltway. There is no vehicle access into Accotink Stream Valley Park within the project area.

Relationship to Similarly Used Lands. Other parks with similar facilities within one mile of Accotink Stream Valley Park include: Annandale Community Park, Americana Park, and Wakefield Park. The trail along Accotink Creek connects to trails running through Americana, Wakefield, and Lake Accotink parks.

Applicable Clauses Affecting Ownership. There are no recorded reversionary clauses affecting ownership. Fairfax County funds were used to purchase Accotink Stream Valley Park. No Land and Water Conservation Fund (LWCF) monies were used to acquire or develop the park.

Unusual Characteristics. Accotink Stream Valley Park has no unusual characteristics.



ACCOTINK STREAM VALLEY PARK
Preferred Alternative

Figure 8-4

CAPITAL BELTWAY STUDY

8.3.4 Jefferson District Park

Jefferson District Park (24.6-hectare) park located at 7900 Lee Highway. The park is bounded by Lee Highway on the south, the Beltway on the west, the Oldewood and Holly Crest neighborhoods on the north, and the Pinewood Greens neighborhood on the east. Shreve Road divides the southwest corner of the park, and the existing highway rights-of-way for the Beltway, Shreve Road, and Lee Highway abut the park.

Relationship to Proposed Action. Figure 8-1b shows the location of Jefferson District Park in relation to the Capital Beltway. **Figure 8-5** illustrates the park and how it would be affected by the proposed project. The closest existing highway lanes on the Beltway are approximately 65 feet (20 meters) from the park. No park facilities would be displaced by the Preferred Alternative.

Ownership and Type of Property. Jefferson District Park is a public park owned by the Fairfax County Park Authority.

Function. This multiple resource park provides a variety of recreational opportunities in a natural setting and at developed outdoor facilities for individuals and groups. Jefferson District Park serves all county residents and visitors. The Fairfax County Park Authority estimates that 115,000 people used the golf facilities in 1998.

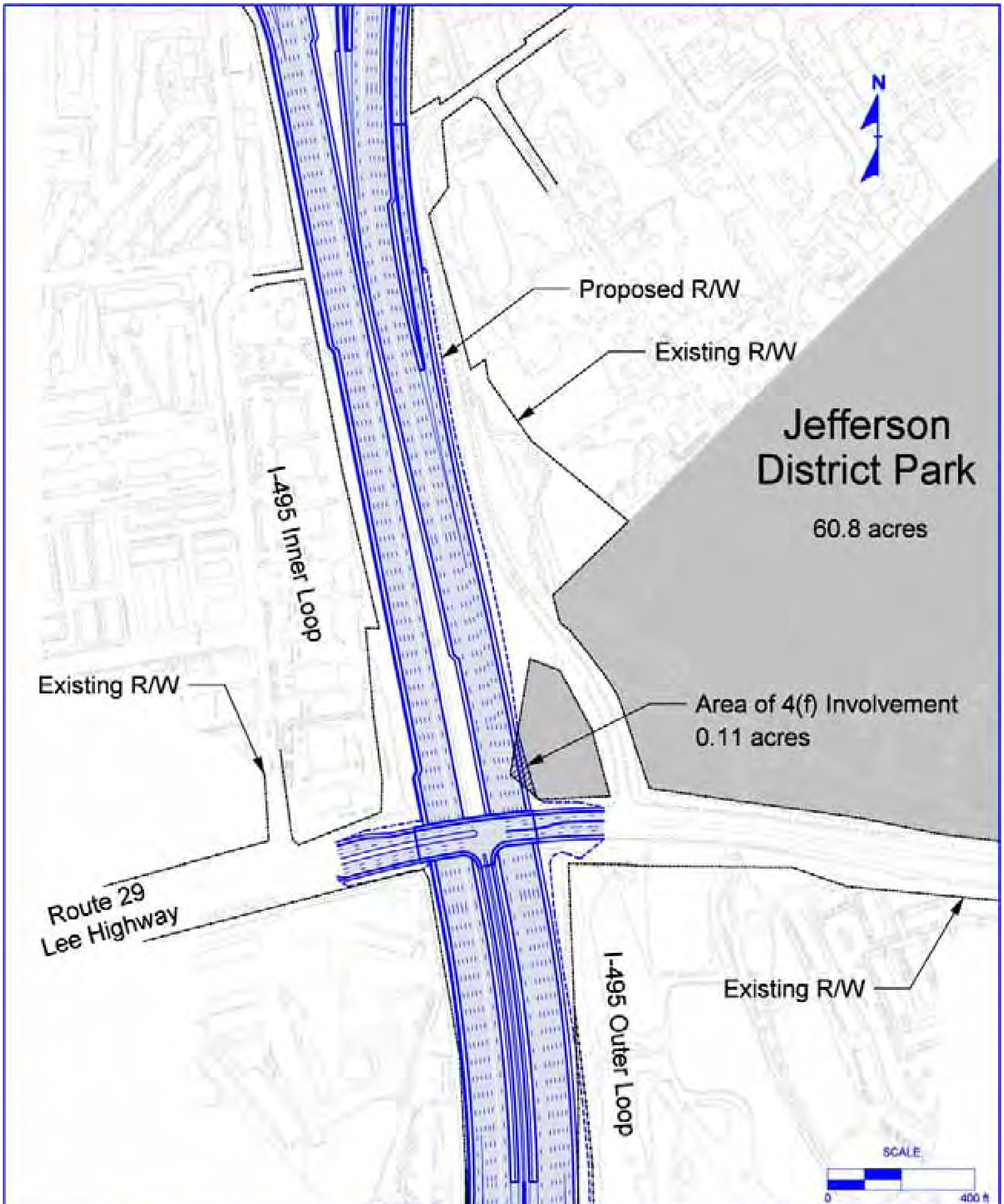
Facilities. Facilities include 2 multi-use courts, 12 tennis courts, a 9-hole golf course, a mini-golf course, a clubhouse, a concession stand, 2 parking lots, and a maintenance area. The Fairfax County Park Authority plans future construction of a games area with a shelter.

Access. Vehicle and pedestrian access is provided to Jefferson District Park via Hyson Lane.

Relationship to Similarly Used Lands. Other multiple resource parks along the project corridor include Lake Accotink Park and Wakefield Park. Similar facilities are offered at Pine Spring Park and Idylwood Park, which are located within 1 mile of Jefferson District Park. No other golf courses are located nearby.

Applicable Clauses Affecting Ownership. There are no recorded reversionary clauses affecting ownership. Fairfax County funds were used to purchase Jefferson District Park. No LWCF monies were used to acquire or develop the park.

Unusual Characteristics. Jefferson District Park has no unusual characteristics.



JEFFERSON DISTRICT PARK Figure 8-5
Preferred Alternative

CAPITAL BELTWAY STUDY

8.3.5 W&OD Railroad Regional Park

Size and Location. Washington and Old Dominion (W&OD) Railroad Regional Park is a linear park extending 45 miles from I-395 in Arlington County to Purcellville in Loudoun County. It is approximately 100 feet wide, encompasses 545.5 acres, and crosses the Beltway just north of the I-66 interchange. Part of the park next to the Beltway was a "replacement parcel" for earlier park impacts elsewhere.

Relationship to Proposed Action. Figure 8-1c shows the location of W&OD Park in relation to the Beltway. **Figures 8-6** shows how W&OD Park would be affected by the build alternatives. The Preferred Alternative would require replacement of bridges carrying the trail over the Beltway.

Ownership and Type of Property. W&OD Park is a public park owned by the Northern Virginia Regional Park Authority. The park also is an historic property eligible for the National Register of Historic Places.

Function. The W&OD trail within the park is a National Recreation Trail and is on the Department of Interior's national register of trails. The trail connects a series of parks (e.g., North Side Park, Idylwood Park, and East Falls Church Park). The park serves the residents of Northern Virginia in urban areas inside the Beltway and suburban and more rural areas outside the Beltway. Usage statistics indicate that 2 million people per year use the trail.

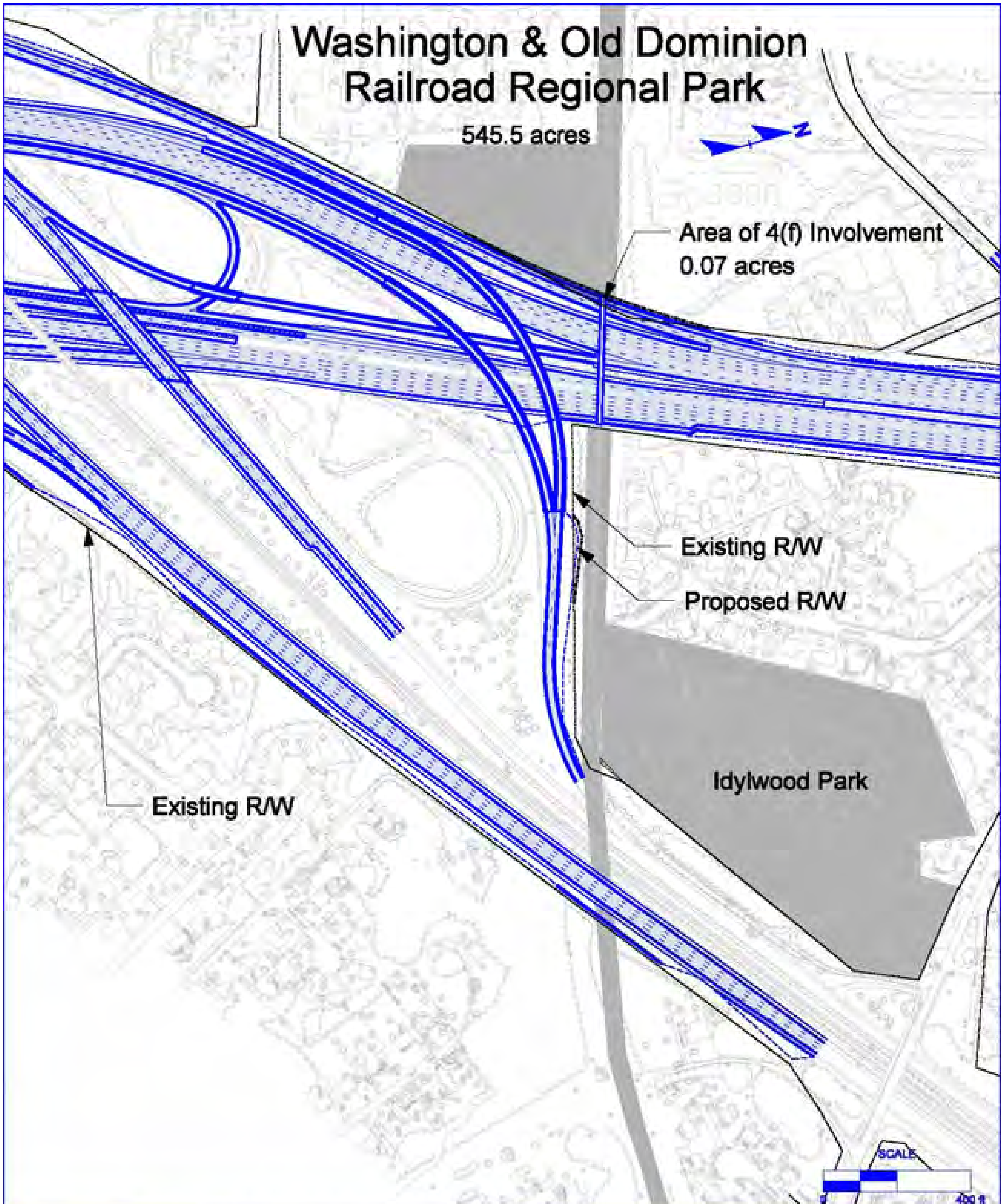
Facilities. Facilities include a multi-use paved trail used for hiking, running, biking, and other activities, and a 30.5-mile gravel bridle path for horseback riding and hiking that runs between Vienna and Purcellville. The park includes a number of overpasses to allow users to safely cross highways. Near the Beltway, the W&OD trail crosses Interstate 66 on the Virginia Lane overpass and the Beltway on a bridge between the Interstate 66 interchange and the Idylwood Road overpass.

Access. Pedestrian, bicycle, and equestrian access is provided at various places along the length of the trail. Near the Beltway, a parking lot is provided at Idylwood Park.

Relationship to Similarly Used Lands. Similar multi-use trails include trails in Wakefield Park and the Potomac Heritage Trail.

Applicable Clauses Affecting Ownership. W&OD Park was developed with LWCF monies. Any conversion of lands within the park to highway right-of-way is subject to approval by the U.S. Department of Interior – National Park Service under Section 6(f) of the LWCFA.

Unusual Characteristics. W&OD Park is a long linear park only about 100 feet wide running for approximately 45 miles. It also is an historic district eligible for the National Register of Historic Places. However, the bridges carrying the park's trail across the Beltway are not contributing resources to the historic district.



W&OD RAILROAD REGIONAL PARK
Preferred Alternative

Figure 8-6

CAPITAL BELTWAY STUDY

8.4 IMPACTS TO SECTION 4(f) PROPERTIES

The No-Build Alternative would avoid all Section 4(f) involvements. However, this alternative would not meet the identified transportation needs.

The Preferred Alternative would require the use of small amounts of land from five parks and recreation areas, as shown in **Table 8-3**. The parks listed in Table 8-3 are those that are directly affected by the Preferred Alternative or the Candidate Build Alternatives studied in the Draft EIS. In some cases, other proximity effects to Section 4(f) resources, such as increased noise levels or changes in visual quality would occur, but would not result in substantial impairment of the use of any of the Section 4(f) resources. As appropriate these effects are also described below.

After publication of the Draft EIS, the proposed cross sections of the mainline and the ramps of all interchanges were minimized to the extent feasible in an effort to reduce and eliminate impacts to private property, commercial land, and parkland and to reduce construction costs.

The Preferred Alternative would have far fewer impacts to Section 4(f) properties than the Candidate Build Alternatives studied in the Draft EIS (See Table 8-3). Under the Preferred Alternative, the impacts to Flag Run Park, Stenwood Elementary School, Lisle Park, and the Holmes Run Acres Historic District were eliminated. However due to land procurements since the publication of the Draft EIS, use of one additional park, Accotink Stream Valley Park, would occur. The following describes the Section 4(f) resources that will be impacted or used by the Preferred Alternative.

8.4.1 Wakefield Park

The Preferred Alternative would use 1.54 acres of land along the east and south sides of Wakefield Park. The use of land in the park would consist of very narrow strips along the interchange with Braddock Road and along the mainline of the Beltway. This area of Wakefield park is not used for active recreation. The park service roadways impacted by the Candidate Build Alternatives studied in the Draft EIS are no longer affected.

Minor changes in noise levels and visual quality would also occur. None of these proximity impacts would be substantial enough to impair the use of this resource.

There are no anticipated impacts to park access or available park activities during construction.

8.4.2 Fitzhugh Park

The Preferred Alternative would use 0.48 acres of land along the west side of the park. The use of land in this park would be in a wooded edge along the western edge of the park. This area is not actively used for recreation. The basketball fields impacted by the Candidate Build Alternatives studied in the Draft EIS are no longer affected. Noise impacts are predicted to occur under all alternatives studied, including the No-Build Alternative.

Minor changes in noise levels and visual quality would also occur. None of these proximity impacts would be substantial enough to impair the use of this resource.

There are no anticipated impacts to park access or available park activities during construction.

Table 8-3

SUMMARY OF IMPACTS TO SECTION 4(f) PROPERTEIS

Name of Section 4(f) Property	Final EIS Alternatives		Revised Alternative	Candidate Build Alternatives Draft EIS		
	No-Build	Preferred Alternative 12-Lane HOT	10-Lane HOV	Concurrent HOV	Express/ Local with HOV	Barrier-Separated HOV
Flag Run Park – 8.66 acres						
Right-of-Way Requirement[1]	0.0	0.0	0.0	0.18	0.007	0.23
Loss of Park Functions	No	No	No	No	No	No
Activity Areas Exposed to Noise Impact[2]	No	No	No	No	No	No
Wakefield Park – 292.6 acres						
Right-of-Way Requirement[1]	0.0	1.54	0.72	7.12	10.42	10.53
Loss of Park Functions	No	No	No	No	No	No
Activity Areas Exposed to Noise Impact[2]	Yes	Yes	Yes	Yes	Yes	Yes
Fitzhugh Park 10.86 acres						
Right-of-Way Requirement[1]	0.0	0.48	0.21	0.40	0.49	0.71
Loss of Park Functions	No	No	No	Yes	Yes	Yes
Activity Areas Exposed to Noise Impact[2]	Yes	Yes	Yes	Yes	Yes	Yes
Accotink Stream Valley Park – 728.7 acres						
Right-of-Way Requirement[1]	0.0	0.30	0.01	NA[3]	NA[3]	NA[3]
Loss of Park Functions	No	No	No	No	No	No
Activity Areas Exposed to Noise Impact[2]	No	No	No	No	No	No
Jefferson District Park – 60.8 acres						
Right-of-Way Requirement[1]	0.0	0.11	0.13	1.60	1.57	1.60
Loss of Park Functions	No	No	No	No	No	No
Activity Areas Exposed to Noise Impact[2]	No	No	No	No	No	No
Stenwood Elementary School – 5.18 acres						
Right-of-Way Requirement[1]	0.0	0.0	0.0	1.45	1.40	1.35
Loss of Park Functions	No	No	No	Yes	Yes	Yes
Activity Areas Exposed to Noise Impact[2]	Yes	Yes	Yes	Yes	Yes	Yes

Table 8-3

SUMMARY OF IMPACTS TO SECTION 4(f) PROPERTEIS

	Final EIS Alternatives		Revised Alternative	Candidate Build Alternatives Draft EIS		
Name of Section 4(f) Property	**No-Build**	**Preferred Alternative 12-Lane HOT**	**10-Lane HOV**	**Concurrent HOV**	**Express/ Local with HOV**	**Barrier-Separated HOV**
Washington & Old Dominion Railroad Regional Park – 545 acres						
Right-of-Way Requirement[1]	0.0	0.07	0.07	4.29	4.23	5.45
Loss of Park Functions	No	No	No	No	No	No
Activity Areas Exposed to Noise Impact[2]	Yes	Yes	Yes	Yes	Yes	Yes
Lisle Park – 0.97 acres						
Right-of-Way Requirement[1]	0.0	0.0	0.0	0.01	0.01	0.01
Loss of Park Functions	No	No	No	No	No	No
Activity Areas Exposed to Noise Impact[2]	Yes	N/A[4]	N/A[4]	Yes	Yes	Yes
Holmes Run Acres Historic District – 137.02 acres						
Right-of-Way Requirement[1]	0.0	0.0	0.0	0.24	0.24	0.24)
Historic Resources Affected	No	No	No	Yes	Yes	Yes
Activity Areas Exposed to Noise Impact[2]	No	No	No	No	No	No
Total Section 4(f) Impact						
Right-of-Way Requirement	0	2.15	1.14	15.05	18.13	19.88
Loss of Park Functions	0	0	0	2	2	2
Impacted Parks with Areas Exposed to Noise Impact	5	4[4]	4[4]	5	5	5
Historic Resources Affected	0	0	0	1	1	1

Notes: 1. Impacts are given in acres. 2. Noise impacts in activity areas are defined as exposure to noise levels greater than 66 dBA. 3. Impacts to Accotink Stream Valley Park from the Candidate Build Alternatives studied in the Draft EIS were not calculated because the no impacts to the park occurred at that time. Additional lands were purchased by the Fairfax County Park Authority in 2004 to expand the park. These new lands would be impacted by the Preferred Alternative. 4. Noise impacts were not measured at Lisle Park because it is outside the study area for the Preferred and Revised 10-Lane HOV alternatives.

8.4.3 Accotink Stream Valley Park

The Preferred Alternative would use 0.30 acres of land along the east side of the Accotink Stream Valley Park. This impact was not reported in the Draft EIS, because the land affected was purchased by the Fairfax County Park authority in July of 2004, after the Draft EIS was published. The area affected is a long sliver of land that is immediately adjacent to the Route 236 westbound exit ramp. The area is not used for active recreation and is well away from the trail along Accotink Creek.

Minor changes in noise levels and visual quality would also occur. None of these proximity impacts would be substantial enough to impair the use of this resource.

There are no anticipated impacts to park access or available park activities during construction.

8.4.4 Jefferson District Park

The Preferred Alternative would use 0.11 acres of land from a disjunct portion of Jefferson District Park lying between the Beltway and Shreve Road. The parcel of park land used by the Preferred Alternative has no recreational facilities or activities on it.

Minor changes in noise levels and visual quality would occur. None of these proximity impacts would be substantial enough to impair the use of this resource.

There are no anticipated impacts to park access or available park activities during construction.

8.4.5 W&OD Railroad Regional Park

The Preferred Alternative would use 0.07 acres of land from W&OD Park. The park land used primarily involves the trail passing through the Beltway/I-66 interchange and a contiguous parcel abutting the south side of the trail and the west side of the Beltway. The Preferred Alternative includes a replacement for the bridges used to carry the trail over the Beltway and I-66. Minor changes in noise levels and visual quality would occur. None of these proximity impacts would be substantial enough to impair the use of this resource.

The W&OD Railroad Regional Park was developed in stages with money from the Land and Water Conservation Fund Act. Therefore, the park is afforded additional protection under Section 6(f) of the act. Under the Preferred Alternative, conversion of Section 6(f) land would occur.

Construction of replacement bridges will be complete before existing bridges carrying the trail are removed. There should be no impact to trail usage during this construction period.

A land-swap at the location of the existing bridges will be conducted to replace the Section 6(f) properties used for the new bridges carrying the trail. Coordination activities initiated during the NEPA phase will be concluded during the design phase (see Section 8.6).

8.5 AVOIDANCE ALTERNATIVES AND MEASURES TO MINIMIZE HARM

The No-Build Alternative would avoid all Section 4(f) involvements. However, this alternative would not meet the identified transportation needs.

A build alternative that would avoid all Section 4(f) involvements would require relocation of the Beltway alignment to go around parks where they lie on both sides of the Beltway. For example, as shown on Figure 8-1a, to avoid any encroachment on both Wakefield Park and Fitzhugh Park would require shifting the Beltway to the east of Fitzhugh Park. Inspection of the graphic readily shows that such an alternative would be massively disruptive to the communities between Fitzhugh Park and Ravensworth Road. Similarly, the long, linear nature of W&OD Park (stretching 45 miles from Arlington to Purceville) makes it impossible to go around it and still keep the Beltway within the study area.

Design alternatives have been considered to avoid Section 4(f) involvements where they occur on only one side of the Beltway, and to minimize the involvements where they occur on both sides of the Beltway. Depending on the location of the Section 4(f) resource, these design alternatives include minor shifts of portions of alignments, design features or modifications to reduce the cross section of the road, changes to the lane or ramp configurations, and alternative interchange concepts. Measures to minimize harm include the same kinds of minor shifts in the roadway alignment and special design features, such as retaining walls and noise barriers. The following sections describe the avoidance alternatives and minimization measures considered for each Section 4(f) involvement associated with the Preferred Alternative.

8.5.1 Wakefield Park

Wakefield Park could be avoided by shifting the Beltway mainline to the east. However, such a shift would cause a comparable (1.5 acre) increase in takings from Fitzhugh Park on the east side of the Beltway (see Section 8.5.2 below) and therefore this would not be a complete Section 4(f) avoidance alternative. Moreover, such a shift of the entire Beltway mainline and the Braddock Road Interchange would create major constructability difficulties and maintenance of traffic problems extending over a mile in each direction of the Beltway. Another alternative would be to shorten or move the southbound ramps going to Braddock Road. Shortening the ramps would not allow sufficient distance for proper grades and for deceleration and merging movements. Braddock Road also would need to be shifted south, resulting in 15 additional residential displacements and damages to several businesses. Another alternative would be to further reduce the cross section over what has already been done since publication of the Draft EIS. Further reductions would require substandard elements, such as in the shoulders or the travel lanes, and are not desirable for safety and operational reasons on this type of facility.

The encroachment on this property by the Preferred Alternative is the minimum necessary to construct a facility meeting the identified needs within acceptable design tolerances. The land impacted by the project does not contain any park facilities.

8.5.2 Fitzhugh Park

Fitzhugh Park could be avoided by shifting each of the alternatives to the west. However, such a shift would impact approximately one-half acre of another Section 4(f) involvement with Wakefield Park, and therefore this would not be a complete Section 4(f) avoidance alternative (see Section 8.5.1 above). As described above, such a shift of the entire Beltway Mainline to the west would create major constructability difficulties and maintenance of traffic problems extending south to the Springfield Interchange and north to the Route 236 Interchange (i.e., tie in points for mainline shifts). Another alternative would be to shorten or move the northbound ramps coming from Braddock Road. Shortening the ramp would not allow sufficient distance for proper grades and for acceleration and merging movements. Another alternative would be to further reduce the cross section over what has already been done since publication of the Draft EIS. Further reductions would require substandard elements, such as in the shoulders or the travel lanes, and are not desirable for safety and operational reasons on this type of facility.

The encroachment on this property by the Preferred Alternative is the minimum necessary to construct a facility meeting the identified needs within acceptable design tolerances. The land impacted by the project does not contain park facilities.

8.5.3 Accotink Stream Valley Park

To avoid Accotink Stream Valley Park, the Capital Beltway mainline and the ramps associated with the Route 236 (Little River Turnpike) interchange would need to be shifted to the east. This shift would require the relocation of approximately three to four power line towers within the Virginia Power easement long the edge of the Beltway's Inner Loop (estimated relocation costs at $1 million each). The shift would also move the ramps located in the northeast quadrant of the interchange and require the use of lands within the previously undisturbed Annandale Community Park (estimated at 0.2 acres which is comparable to the impact to the Accotink Stream Valley Park. Lastly, the mainline shift would entail major constructability and maintenance of traffic problems that are not created by the Preferred Alternative. Another possibility would be to further reduce the width of the cross section in this area over what was done after completion of the Draft EIS. However the cross section of the mainlines in this area are at their minimum width for each of the mainline types and a reduction in their overall widths would require substandard elements such as in the shoulders or the travel lanes. This sort of change would not be acceptable for safety and operational reasons on this type of facility. The encroachment caused by the Preferred Alternative on this property is the minimum necessary to construct a facility meeting the identified needs within acceptable design tolerances.

8.5.4 Jefferson District Park

To avoid the small isolated section of the Jefferson District Park, the Capital Beltway mainline would need to be shifted to the west. This would increase the impact to commercial areas on the west side of the Beltway, resulting in additional project costs of approximately $41.5 million and annual county property tax revenue losses of more than $200,000. Similar to other avoidance alternatives described above, such a shift of the Beltway mainline would entail major constructability issues by affecting the entire segment between Route 50 and I-66 interchanges, as well as causing significant maintenance of traffic problems for this same segment and beyond. Another possibility would be to reduce the width of the cross section in this area. However the cross section of the mainlines in this area are at their minimum width for each of the mainline types and a reduction in their overall widths would require substandard elements such as in the shoulders or the travel lanes. This sort of change would not be acceptable for safety and operational reasons on this type of facility. It should be noted that following the publication of the Draft EIS, the proposed cross sections of the mainline and the ramps of all interchanges were minimized to the extent feasible.

The encroachment on this property is the minimum necessary to construct a facility meeting the identified needs within acceptable design tolerances. The encroachment involves a disjunct portion of the property that is not actively used for recreation.

8.5.5 W&OD Railroad Regional Park

Due to of the long linear nature of this park (extending 45 miles from Arlington to Purceville) and the fixed location of the Capital Beltway of which it crosses, it is impossible to avoid use of this Section 4(f) property. The Preferred Alternative includes replacing the bridges carrying the trail over the Beltway and I-66, thereby preserving the functionality of the trail facility.

8.6 COORDINATION

The National Park Service, Northern Virginia Regional Park Authority, Virginia Department of Recreation and Conservation, Fairfax County Park Authority, and Fairfax County School Board were consulted regarding the potential impacts to parks and recreational facilities. Agency comments and committed actions are summarized below.

During early coordination efforts, the **National Park Service** and **Northern Virginia Regional Park Authority** noted that the W&OD Park was acquired and developed with assistance from the federal Land & Water Conservation Fund (LWCF). In addition, the Regional Park Authority also owns a parcel of land adjacent to the southwest quadrant of the intersection of the W&OD Trail and the Beltway. This 2.8-acre parcel is replacement land that was approved for a previous road crossing project across the W&OD. As noted in the previous section, the Preferred Alternative will replace the bridges carrying the Trail across I-66 and the Beltway. In order to do so will require the use of 0.07 acres of parkland. This conveyance of park land will constitute a "conversion of use" under Section 6(f) of the LWCF Act. Following issuance of FHWA's Record of Decision, VDOT will resume conversion coordination with the National Park Service, Virginia Department of Recreation and Conservation and the Regional Park Authority. Previous discussions noted that the existing bridge that carries the W&OD Trail over the Beltway does not meet Park Authority's current standards for width. New designs will ensure a much improved crossing as well as provide continued access and appropriate maintenance of traffic during and after construction.

The **Virginia Department of Conservation and Recreation's** Division of Planning and Recreation Resources stated that the proposed project is not anticipated to have any adverse impacts on existing or planned recreational facilities, nor will it impact any streams on the National Park Service Nationwide Inventory, Final List of Rivers, potential Scenic Rivers, or existing or potential State Scenic Byways.

The **Fairfax County Park Authority** requested and received an opportunity to review and comment on the Draft EIS.

The **Fairfax County School Board** provided information on the programmed activities occurring on school properties in the project area.

A copy of the Final Environmental Impact Statement / Section 4(f) Evaluation will be provided to each of these coordinating agencies.

8.7 CONCULSION

Based on the discussions above there are no prudent and feasible alternatives which avoid the use of Section 4(f) properties. Design adjustments have been made to minimize the acreage of Section 4(f) property required for the Preferred Alternative and further measures to minimize harm will be developed in the project's final design. Coordination of all mitigations will continue with the National Park Service, Virginia Department of Conservation and Recreation, Northern Virginia Regional Park Authority, and the Fairfax County Park Authority. Based on the final Section 4(f) Evaluation including consideration of the project's stated purpose and need, the Preferred Alternative has been identified as the most feasible and prudent alternative that fully satisfies the project's purpose and needs. All possible planning measures have been incorporated into the proposed project to minimize impacts to Section 4(f) resources.

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INDEX

A

AGENCY COMMENT LETTERS AND RESPONSES

Written comments on the Draft EIS were received from fourteen government agencies and officials. The comment letters from each are presented in the following appendix along with responses as appropriate.

Federal Emergency Management Agency

Region III
One Independence Mall, Sixth Floor
615 Chestnut Street
Philadelphia, PA 19106-4404

FIM

APR 0 8 2002

Mr. Ed Sunda, Senior Environmental Specialist
Federal Highway Administration
400 North 8th Street
Richmond, Virginia 23240-0249

Re: Capital Beltway Study, Fairfax County, Virginia

Dear Mr. Sunda:

The Federal Emergency Management Agency (FEMA) received your Draft Environmental Impact Statement, dated March 2002. The notice describes proposed improvements to the Capital Beltway throughout Fairfax County. Portions of the project are located in areas that have been identified by FEMA as subject to flooding during the 1%-annual chance (100-year) flood. **1**

The National Flood Insurance Program (NFIP) is administered by FEMA and is designed to reduce flood losses through local floodplain management and provide flood insurance to property owners. The NFIP requires participating communities to adopt and enforce floodplain management ordinances with stipulations about modifications of the 1%-annual chance floodplain. As such, Fairfax County has an ordinance requiring permits for all proposed construction within Special Flood Hazard Areas and also requiring that the flood carrying capacity of an altered stream be maintained.

As this proposal involves Federal expenditure, it is subject to Executive Order 11988 which directs federal agencies to "avoid to the extent possible the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative". Each federal agency has issued regulations to comply with the Executive Order. These are administered by the involved federal agency. **2**

To prove that the flood carrying capacity of an impacted stream will be maintained may require an engineering study and completion of the enclosed Conditional Letter of Map Revision Application. Please coordinate the Floodplain Management Officer for the county to assure that the project meets the requirements of their floodplain management ordinance. **3** **1**

If you have any questions regarding this letter, or the NFIP in general, please call me at 215-931-5669.

Sincerely,

Eugene K. Gruber, P.E.
Regional Environmental Officer
Federal Insurance and Mitigation Division

Enclosure

cc: Commonwealth NFIP Coordinator
Region III Community File
Chron File

1. Figure 3-13 in the Final EIS depicts all floodplains within the project area subject to the one percent annual chance (100 year) flood. Section 4.11 quantifies the anticipated floodplain encroachments calculated in a conservative manner. Most of the expected floodplain fills are for longitudinal roadbed fill extensions and cannot be avoided by bridging.

During final design, detailed engineering and hydraulic studies, and any stream capacity maintenance analyses required by Fairfax County would be performed. Since almost all floodplains lie within mapped Resource Preservation Area (RPA) resources, avoidance, minimization, and mitigation for floodplain impacts will be documented to ensure compliance with Chesapeake Bay Preservation Area (CBPA) exemption conditions.

2. As stated in Section 4.11 of the Final EIS, preliminary project designs sought to minimize and avoid impacts to floodplains by including floodplains as an evaluation criteria in the alternatives development process. As stated above and in Section 4.11 of the Final EIS, the expected fills are a result of longitudinal roadbed fill extensions. Since circulation of the Draft EIS, floodplain impacts have been reduced substantially.

3. VDOT will coordinate with all applicable floodplain management officers, or their equivalents, in order to comply with NFIP stipulations as part of Executive Order 11988 requirements. In addition, VDOT's specifications require the use of stormwater management practices to address concerns such as post development stormflows and to prevent increases in flooding risks associated with the proposed improvements. During final design, a detailed hydraulic survey and study would evaluate the effect of the proposed improvements on stormwater discharge.

U.S. Department of Transportation
United States Coast Guard

Commander
United States Coast Guard (Aowb)
Fifth Coast Guard District

431 Crawford Street
Portsmouth, Va. 23704-5004
Staff Symbol: Aowb
Phone: (757)398-6227
FAX: (757) 398-6334

16590
April 25, 2002

Mr. Ed Sunda
Senior Environmental Specialist
Federal Highway Administration
400 North 8th Street
Richmond, Virginia 23240-0249

Dear Mr. Sunda:

This is in response to the Virginia Department of Transportation's letter dated March 22, 2002 regarding Federal Project Numbers IM-495-5(079), IM-495-5(080) and IM-495-5(082) Capital Beltway Study in Fairfax County, Virginia.

The Draft Environmental Impact Statement has been reviewed and since the Capital Beltway Study will not be crossing any navigable waterways of the United States, the Coast Guard offers no comments. You are therefore exempted from Coast Guard permitting requirements. **1**

The fact that a Coast Guard permit is not required does not relieve you of the responsibility for compliance with the requirements of any other Federal, State, or local agency who may have jurisdiction over any aspect of the project.

If you should have any questions regarding this matter, please contact Mrs. Linda Gilliam-Bonenberger, Bridge Management Specialist, at (757) 398-6227.

Sincerely,

Ann B Deaton

ANN B. DEATON
Chief, Bridge Administration Section
By direction of the Commander
Fifth Coast Guard District

1. Comment noted.

DEPARTMENT OF THE ARMY
NORFOLK DISTRICT, CORPS OF ENGINEERS
FORT NORFOLK, 803 FRONT STREET
NORFOLK, VIRGINIA 23510-1096

REPLY TO ATTENTION OF:

May 30, 2002

Eastern Virginia Regulatory Section
98-4538-15

Mr. Edward S. Sundra
Senior Environmental Specialist
Federal Highway Administration
400 North 8th Street
Richmond, Virginia 23240-0249

Dear Mr. Sundra:

This letter provides the comments of the Norfolk District Corps of Engineers on the Draft Environmental Impact Statement (DEIS) prepared for the Capital Beltway Study in Fairfax County. The Federal Highway Administration (FHWA) and the Virginia Department of Transportation (VDOT) are preparing the EIS, and the Corps of Engineers is a cooperating agency in the preparation of documents for this project. The project is planned to improve the Beltway's capacity to address current congestion, operational and safety problems and to accommodate expected growth in traffic volumes. Three alternatives have been evaluated, all of which include high occupancy vehicle options.

The document effectively describes the purpose and need for the project. The problems that need to be addressed are clearly explained. The format used, with each problem serving as a paragraph heading, was helpful.

1 Our primary consideration in reviewing the document is the analysis of the impacts to waters of the United States, including wetlands. Wetland impacts for the three alternatives considered are very similar, ranging from 4.62 to 5.06 acres. Projected impacts to streams are also similar for the three alternatives, ranging from 8,031 to 8,232 linear feet.

2 It is recommended that bridges or bottomless arches be used to the maximum extent practicable in crossing streams and wetlands in order to minimize impacts. Crossings should be designed such that the hydrology of wetlands up and downstream of the crossings is not altered. Compensation will be required for unavoidable impacts to wetlands. Stream relocation should be avoided, and perpendicular crossings should be utilized. Unavoidable stream relocations should incorporate natural stream design that replicates stream length, meanders, and riparian features. Clearing of streambanks/riparian zones should be minimized. Compensatory mitigation may be required for stream impacts, depending on the extent and nature of the impacts. The Final EIS should include conceptual compensation plans for impacts to waters of the U.S.

3 Stormwater management (SWM) facilities should not be located in waters of the U.S. Stormwater facilities should be placed outside of stream/wetland systems. Any request for authorization to place ponds in waters of the U.S. must include an alternatives analysis demonstrating why the purpose of each SWM facility cannot be served with placement in an upland area.

1. Proposed changes to the alternatives have reduced wetland impacts by approximately 24% and stream impacts by approximately 47%

2. VDOT routinely incorporates minimization practices including bridging, retaining walls, and countersinking of culverts in its final designs. Table 4-18 in Section 4.10.2 of the Final EIS presents preliminary documentation of minimization procedures to reduce wetland impacts. In order to implement the least environmentally damaging practicable alternative, VDOT will conduct all stream and wetland crossings in such a manner as to maintain hydrology. As documented in the Final EIS (Section 4.15.3), VDOT will avoid stream relocations and implement perpendicular stream crossings as much as practicable to minimize construction impacts. VDOT acknowledges that compensation will be required for unavoidable impacts to wetlands, as documented in the Final EIS (Section 4.10.2). Specific language contained in your letter will be added to this Section as follows:

> "Compensation mitigation may be required for stream impacts, depending on the extent and nature of the impacts. Unavoidable stream relocations will incorporate natural stream designs that replicate stream length, meanders, and riparian features. The clearing of stream banks and riparian zones will be minimized to the maximum extent practicable."

3. Comment noted.

-2-

3

The cumulative effects analysis appears to need some clarification for the final document. It is noted that the geographic boundary for cumulative effects was determined by using a series of overlay mapping, but no map is provided to show the geographic boundary, and it is not clear what geographic area was selected. As indicated in the DEIS on page 4-71, a cumulative effects analysis looks at how all past, present, and future reasonably foreseeable resources affect sensitive resources. It is stated on that page that the temporal boundary was the design year of 2020. It appears, however, that no temporal boundary in the past was established and no past impacts were analyzed.

4

Table 4-23 on page 4-79 lists resources considered in the cumulative effects analysis, including displacements, water resources, terrestrial biota, endangered species, etc. The table indicates there will be no cumulative effects to displacements, or cultural resources, or terrestrial habitat, and other resources as well. Clearly, there have been substantial cumulative effects to terrestrial habitat in the geographic area analyzed, and more than 4.7 to 5.2 acres of wetlands have been cumulatively effected in the past and more will be impacted by the other projects identified in the geographic boundary. It is not clear, therefore, exactly what information is presented in the table. There appears to be no difference in the discussion of cumulative effects *versus* the incremental cumulative effects of the proposed action.

5

The intent of the presentation of information on page 4-75 with regard to cumulative effects is also unclear. For example, the discussion of cumulative effects with regard to Route 123 states that "selection of any of the Build Alternatives does not have any direct influence on the improvements in the Route 123 project." The document states that the Route 123 project is located with the geographic boundaries established for the cumulative effects analysis for the Capital Beltway. Is the document stating that the Route 123 project will have no effect on any of the resources assessed in the cumulative effects analysis, including aquatic resources? The statements made for the several other projects on that page and the following pages also seem to be saying that there will be no effects to resources by those projects. This section should be clarified. The sum of the anticipated effects of all past and future projects on the resources identified should be determined and presented to the extent possible.

We appreciate the opportunity to review and comment on the DSEIS. Should you have any questions concerning our comments, you may contact Alice Allen-Grimes at 757-441-7219.

Sincerely,

Nicholas L. Konchuba

Nicholas L. Konchuba
Chief, Eastern Virginia
Regulatory Section

3. The geographic boundary for cumulative effects was determined by using a series of overlay mapping. As noted in Section 4.16.1 of the Final EIS, overlays of the traffic, influence, census tracts, and subwatersheds were created. Geographic boundaries for cumulative effects analysis varies depending on the resource evaluated. Because of the differences in geographic boundaries for different resources (e.g. air quality impacts are considered for the entire region and beyond, while water quality is assessed for streams and watersheds), inclusion of a single map would not be useful for communicative or illustrative purposes.

The temporal boundary for past cumulative affects analysis was based, in part, on the availability of data and therefore tends to be addressed in a qualitative manner rather than being quantitatively assessed for a set past time period.

4. Table 4-23 has been revised as part of the Final EIS to make its meaning clear (new table number 4-22). Unavoidable impacts to aquatic resources from this study and others will be compensated for through the creation or restoration of both wetland and stream habitats. These impacts would be compensated for within the same HUC either in advance of or during the projects' construction.

5. The referenced statement was included in the Final EIS to let the reader know that the improvements being studied for Route 123 would work with any of the Beltway alternatives studied and that the Preferred Alternative selected for the Beltway would not influence the type and degree of improvements made to Route 123. The proposed Route 123 improvements likely will have impacts to some of the resources studied as part of the cumulative effects analysis for this project. However, those impacts when viewed in combination with the impacts from the Capital Beltway Study are unlikely to be significant within the geographic and temporal boundaries.

W. Tayloe Murphy, Jr.
Secretary of Natural Resources

Joseph H. Maroon
Director

COMMONWEALTH *of* VIRGINIA

DEPARTMENT OF CONSERVATION AND RECREATION

203 Governor Street
Richmond, Virginia 23219-2010
TDD (804) 786-2121

30 May 2002

Mr. Ed Sundra
Senior Environmental Specialist
Federal Highway Administration
400 North 8th Street
Richmond, Virginia 23240-0249

Re: Capital Beltway Study, Fairfax County, Virginia-Federal Highway Project Numbers IM-495-5(079); IM-495-5(082) and State Project Numbers 0495-029-F29, PE101; 0495-029-F30, PE101; 0495-029-F31, PE101

Dear Mr. Sundra:

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

1 BCD documents the presence of natural heritage resources in the project area. If seeps or springs are found in the right of way areas then those habitats could support several species of rare groundwater invertebrates including Pizzini's Amphipod (*Stygobromus pizzinii*, G2G4/S1S2/NF/SC) and *Stygobromus sp* 15 (G1/S1/SOC/NS). Surveys in these habitats (if found to occur) should be conducted during periods when the groundwater levels are high. DCR-Division of Natural Heritage biologists are qualified and available to conduct inventories for rare, threatened, and endangered species. Please contact J. Christopher Ludwig, Natural Heritage Inventory Manager, at (804) 371-6206 to discuss arrangements for field work.

2 In addition, the Turkey Run Park Slopes Conservation site is located near the northern end of the project limits. Conservation Sites are a tool for representing key areas of the landscape worthy of protection and stewardship action because of the natural heritage resources and habitat they support. Conservation Sites are polygons built around one or more rare plant, animal, or natural communities designed to include the element and, where possible, its associated habitat, and buffer or other adjacent land thought necessary for the element's conservation. Conservation Sites are given a biodiversity significance ranking based on the rarity, quality, and number of element occurrences they contain. The Turkey Run Park Slopes Conservation Site has been ranked a B1 conservation site, which indicates it is of outstanding significance. However, due to the scope of the activity and the distance to the resources, we do not anticipate that this project will adversely impact these natural heritage resources.

3 Under the Memorandum of Agreement established between the Virginia Department of Agriculture and Consumer Services (VDACS) and the Department of Conservation and Recreation (DCR), DCR has the authority to report for VDACS on state-listed plant and insect species. The current activity will not affect any documented state-listed plants or insects.

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

An Agency of the Natural Resources Secretariat

1. Comment noted. However, to date such areas have not been observed within the project area.

2. Comment noted.

3. Comment noted.

4. Comment noted.

continually added to BCD. Please contact DCR for an update on this natural heritage information if a significant amount of time passes before it is utilized or if the proposed alignment changes. **4**

In addition, the proposed improvements impact on a number of local parks and national park resources in the region. Please contact the Northern Virginia Park Authority and the Fairfax County Park Authority to determine if any of the parks being impacted were acquired or developed using Land and Water Conservation Funds (L&WC). If monies from that fund were used in the acquisition or development of those parks then the owner will have to initiate the 6f conversion requirements associated with the fund. Please Contact DCR of any 6f actions resulting from this project. **5**

Thank you for the opportunity to comment on this permit application.

Sincerely,
Derral Jones
Derral Jones

Planning Bureau Manager

CC: Ray Fernald, VDGIF
Kim Marbain, USFWS

5. As noted in Section 8.3.5 of the Final EIS, the Washington & Old Dominion Railroad Regional Park was developed with such funds and conversion of lands within the park to highway right-of-way would be subject to approval by approval of the U.S. Department of Interior under Section 6(f) of the L&WC Act.

Coordination with both the Northern Virginia Regional Park Authority and Fairfax County Park Authority is ongoing.

COMMONWEALTH *of* VIRGINIA

Department of Health
Division of Drinking Water

Environmental Engineering Field Office
400 S. Main St. 2nd Floor
Culpeper, VA 22701

Phone: (540)-829-7340
Fax: (540)-829-7337
www.vdh.state.va.us

MAY 10 2002

SUBJECT: Fairfax County
Water - Northern Virginia

Mr. Ed Sunda
Senior Environmental Specialist
Federal Highway Administration
400 North 8th Street
Richmond, VA 23240-0249

Dear Mr. Sunda:

We have received and reviewed the Draft Environmental Impact Statement for the Capital Beltway Study in Fairfax County.

Please be advised that we do not have any objections to the study. **1**

Please also be advised that it is not necessary to submit the final study to this office for review.

If you have any questions, please contact me.

Sincerely,

HRG

Hamid R. Golesorkhi
District Engineer

HRG/tjb
Cc: Fairfax County Health Department
DDW-Central
O:\tb\fx\w\northern va capital beltway study.doc

VDH VIRGINIA DEPARTMENT OF HEALTH
Protecting You and Your Environment

1. Comment noted.

COMMONWEALTH *of* VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

Street address: 629 East Main Street, Richmond, Virginia 23219
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W. Tayloe Murphy, Jr.
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May 20, 2002

Mr. Ed Sundra
Federal Highway Administration
400 North 8th Street
Richmond, Virginia 23240-0249

Subject: Draft Environmental Impact Statement
Capital Beltway Study

Dear Mr. Sundra:

The Department of Environmental Quality (DEQ) Virginia Water Protection Permit Program has reviewed the Draft Environmental Impact Statement (DEIS) for the Capital Beltway Study.

As reported in the DEIS, all "Build" alternatives will impact State surface waters. As noted in the DEIS, alternative locations and alignments that reduce impacts to surface waters were considered during the design process. The project should attempt to select the most feasible alternative that also avoids and minimizes potential direct and indirect impacts to surface waters to the greatest extent possible. As indicated in the DEIS, unavoidable impacts to surface waters will require compensatory mitigation. **1**

Due to the extent of impacts to State waters, this project will likely require a Virginia Water Protection Individual Permit, including coordination of this project with the Virginia Marine Resources Commission, the Army Corps of Engineers and the DEQ through the Joint Permit Application (JPA) process. The JPA must include documentation of all avoidance and minimization efforts and a conceptual plan for appropriate compensatory mitigation. **2**

In general, DEQ encourages the use of erosion and sediment control measures, adherence to stormwater management regulations, and careful construction practices to minimize temporary impacts to surface waters during site construction activities. **3**

1. Potential impacts resulting from the Preferred Alternative have been reduced during the planning and design process as shown in Table 4-19 presented in Section 4.10.2 of the Final EIS.

2. The impacts to state waters and measures to mitigate those impacts are presented in Section 4.10 of the Final EIS.

3. As stated in Section 4.10.1 of the Final EIS, temporary and permanent stormwater management measures, including detention basins, vegetative controls, and other measures would be implemented to minimize potential degradation of water quality. The requirements and special conditions of any required permits for work in and around surface waters would be incorporated into construction contract documents. The construction contractor would be required to comply with those conditions and with the pollution control measures specified in VDOT's Road and Bridge Specifications.

Mr. Ed Sundra
Page 2 of 2

Please note that any impacts due to grading, clearing, or excavating five or more acres of land will require a stormwater permit for construction. The proponent should coordinate storm water permitting issues with the DEQ Regional Office Storm Water Permitting staff at the Northern Regional Office at 703-583-3800. **4**

We appreciate the opportunity to comment on this project. Please contact me at (804) 698-4420 with any questions or comments.

Sincerely,

Carolyn Browder

Carolyn Browder
Environmental Specialist

cc: VWP Permit File

4. Comment noted.

COMMONWEALTH *of* VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

W. Tayloe Murphy, Jr.
Secretary of Natural Resources

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

Robert G. Burnley
Director

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

ODA-054
May 6, 2002

Mr. Ed Sunda
Senior Environmental Specialist
Federal Highway Administration
400 North 8th Street
Richmond VA 23240-0249

RE: Draft Environmental Impact Statement
Capital Beltway Study
Project Numbers: IM-495-5(079); IM-495-5(080); IM-495-5(082)

1

Thank you for giving Virginia Department of Environmental Quality, Office of Air Data Analysis the opportunity to review the above-referenced project. Since the project site is located within an ozone non-attainment area, fugitive emissions of volatile organic compounds (VOC) and oxides of nitrogen (NOx) generated from construction activities should be minimized. The State air pollution regulations applicable to the construction of the beltway are listed below.

- Fugitive Dust and Emission Control (9 VAC 5-50-60 et seq.)
- Open Burning Restrictions (9 VAC 5-40-5600 et seq.)
- Cut-back Asphalt Usage Restriction (9 VAC 5-40-5490 et seq.)

Please feel free to contact me at (804) 698-4405 with any further questions.

Sincerely,

K.S. Narasimhan

Kotur S. Narasimhan
Office of Air Data Analysis
Phone: (804) 698-4415
FAX: (804) 698-4510

1. Comment noted.

JUN-07-2002 12:26 VDOT ENVIONMENTAL DIV 804 7867401 P.02

METROPOLITAN WASHINGTON AIRPORTS AUTHORITY

May 31, 2002

Mr. Ed Sunda
Senior Environmental Specialist
Federal Highway Administration
400 North 8th Street
Richmond, VA 23240-0249

RE: Comments to Draft EIS Capital Beltway Study
Federal Project Numbers: IM-495-5(079)(080)(082)

Dear Mr. Sunda:

1

Thank you for the opportunity to comment on the draft EIS plans for the Capital Beltway Study. As you may know, the Metropolitan Washington Airports Authority (Authority) has a vested interest in this project since the Authority is the effective "land-owner" of the Dulles International Airport Access Highway (DIAAH) corridor, including a majority of the right-of-way of the DIAAH/267/I-495 interchange, through our lease from the U.S. Department of Transportation. The Authority's primary concern is to preserve the original intent of this corridor when it was constructed and opened in 1962, which was to ensure open access to Washington Dulles International Airport (Dulles) by highway and, ultimately, by rail. For twenty years, prior to the existence of Route 267, this interchange was exclusively an interchange of the DIAAH and the Capital Beltway (Beltway). The Authority, addressing this point a number of times in writing to the Virginia Department of Transportation (VDOT) over the past dozen years and verbally to the consultant staff in this EIS process, believes that the connectivity issue between the Beltway and the Access Highway has been sorely neglected in Beltway and Route 267 planning by VDOT. Additionally, we highlight that some remediation is needed in the near term and must be advanced regardless of decisions or commitments on the Beltway widening issue.

The current access between the Beltway and DIAAH is via ramps between the Beltway and Route 267, and slip ramps between Route 267 and the DIAAH. DIAAH access to and from the Beltway under current conditions is showing several types of operating failure from the standpoint of both safety and delay. Most critical is eastbound travel from DIAAH to the Beltway where vehicles are required to exit via a slip ramp onto Route 267 then weave across five lanes to the ramps for the Beltway north and south. This movement is inherently difficult and is exacerbated by the long back-ups on Route 267 for the northbound Beltway ramp; it is a movement that grows increasingly unsafe and is encroaching intolerable thresholds. In the opposite direction, from the

Ronald Reagan Washington National Airport, Washington, DC 20001-4901 • www.mwaa.com

1. Access to and from the Dulles International Airport Access Highway (DIAAH) from the Capital Beltway will be improved as part of the Preferred Alternative. Additional flyover ramps will be added to facilitate movement of non-HOV traffic to and from the right at the interchange with the Dulles Toll Road on the Capital Beltway. The existing left exit would be for HOV or HOT traffic.

The Preferred Alternative documented in the Final EIS is the 12-Lane HOT Alternative, which was developed in response to public and local government comments about the costs and impacts of the alternatives included in the Draft EIS. This alternative would add two HOT lanes to the Capital Beltway in each direction and modify, improve and reconfigure the interchanges to increase capacity, reduce congestion and improve safety. The far two left lanes would be designated HOT lanes and separated from the general-purpose lanes with a buffer strip. The HOT lanes would be used by HOVs, buses, and tolled single occupancy vehicles. Direct HOV access to the Dulles Toll Road would be included as part of the Preferred Alternative.

Direct access to the DIAAH from the Capital Beltway for airport users only is not included as part of the Preferred Alternative. Such ramps cannot be added to the Preferred Alternative without also adding significant impacts to the neighborhoods adjacent to the interchange and significant additional capital costs. The Preferred Alternative was designed to balance the transportation needs in the corridor with a level of acceptable impacts and costs.

Mr. Ed Sunda
Federal Highway Administration
Page 2

1

Beltway southbound to DIAAH westbound, a four-lane weave is required across Route 267 in a relatively short distance which, with current traffic congestion levels, can also be a dangerous maneuver.

The Authority's concern over this issue has been raised to VDOT in the past. The attached letter, dated March 23, 1990, from the Authority highlighted the difficulties of access and suggested that the situation may need attention well before a Beltway redevelopment might occur. The Authority raised this concern again in 1996 as related to the widening of Route 267, and as reflected in the attached letter dated March 18, 1996. VDOT recognized the Authority's concern and suggested that a solution would be found when the I-495 study was completed, as noted in the attached letter dated March 19, 1996.

Despite the above assurance from VDOT, the Authority does not believe that this draft EIS has adequately addressed the connectivity issues and safety concerns for travel between the DIAAH and the Beltway. Both interchange Alternatives B and E, which are being carried forward in the draft EIS, do little to enhance the current indirect access to the DIAAH from Route 267 and could be considered as exacerbating the current problems.

One of the EIS consultants noted to the Authority that both Alternatives B and E do provide HOV access ramps which, through a policy agreement, could provide the DIAAH with improved access to the Beltway for some (but not all) movements. Although an HOV policy agreement between VDOT and the Authority, similar to that in place on I-66 inside the Capital Beltway, could improve DIAAH access, an HOV policy agreement allowing non-HOV airport vehicles to use the HOV ramps would be undesirable from VDOT's perspective as it would complicate the enforcement of HOV on the Beltway and undesirable from the Authority perspective as the Authority would have little assurance that future policy decisions would not reverse the Authority's use of HOV ramps. The Authority also has concern that movements between the HOV ramps and Route 267 would further complicate, if not eliminate, any continued use of the slip-ramp movements between the DIAAH and Route 267.

Additionally, the quality of Access Highway connections through HOV ramps depends on which alternative is selected to be the preferred beltway lane configuration since different configurations have the effect of limiting the access of airport travelers to subsequent Beltway interchanges such as Route 123. The barrier-separated HOV alternative also has the effect of not allowing non-HOV airport vehicles to merge into unrestricted travel lanes in a timely manner thereby complicating the HOV enforcement issue.

JUN-07-2002 12:27 VDOT ENVIONMENTAL DIV 804 7867401 P.04

Mr. Ed Sunda
Federal Highway Administration
Page 3

While we would encourage any reworking of the interchange concepts to allow connections between the HOV lanes and the Access Highway for those airport trips with qualifying high-occupancy, the best alternatives for the Authority would be those that also include direct access between the DIAAH and the unrestricted lanes of the Beltway through dedicated ramps. Dedicated ramps should be designed to allow a phased implementation to be able to address current access shortcomings prior to the full implementation of a Beltway widening. **1**

Another concern of the Authority regards our ability to preserve the rights-of-way for future rail and a future six lane DIAAH. Though both of the Route 267 interchange alternatives do recognize the need for a six-lane DIAAH, the introduction of dedicated HOV ramps has the effect of squeezing the DIAAH into the center of the right-of-way, into the area currently reserved for future rail. This is currently unacceptable to the Authority. We do recognize that rail is currently planned through Tysons Corner and, thus, bypasses this segment of the corridor, but the Authority sees longer-term possibilities that could result in rail through this location. We believe that, at this early stage, it is not a burdensome requirement that the approximate 50-foot median for a rail right-of-way continue to be protected. **2**

To restate an earlier point, regardless of the disposition of this EIS process, we believe that it is critical to fashion and implement a near-term solution to the failing weave-merge sections linking the DIAAH and the Beltway. We look forward to hearing from VDOT to start a process with the Authority that will address these immediate safety problems. Thank you, again, for providing us with the opportunity to comment on the draft EIS. Should you have any questions related to our comments please direct them to Mr. Michael Hackett, of my staff, at (703) 417-8164.

Sincerely,

William C. Lebegern, P.E.
Manager, Planning Department

copies: Earl T. Robb, VDOT
Ken Wilkinson, VDOT

Enclosures

WCL:sdp

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JUN 6 2002
ENVIRONMENTAL DIV.

2. The interchange improvements planned for the Capital Beltway at the DIAAH and Dulles Toll Road would not preclude widening the DIAAH to 6 lanes in the future.

Preliminary engineering of the Dulles Corridor Rapid Transit Project is underway and the Final EIS is complete. The Locally Preferred Alternative, endorsed by local and state boards, including MWAA's Board of Directors, is an extension of Metrorail through Tysons Corner on Alignment T6 through Dulles Airport to eastern Loudoun County. Currently VDOT knows of no other rail improvements that would utilize the land in the interchange previously reserved for rail transit.

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nvrc

Northern Virginia Regional Commission

May 22, 2002

Mr. Ed Sunda
Senior Environmental Specialist
Federal Highway Administration
400 North 8th Street
Richmond, VA 23240-0249

Re: Capital Beltway Study, Fairfax County

Dear Mr. Sunda:

The Northern Virginia Regional Commission staff has reviewed the document described above and has the following comments.

1

Please be advised that the counties of Arlington, Fairfax, and Prince William, the City of Alexandria, and the Town of Herndon, have all enacted jurisdiction-wide Chesapeake Bay Resource Management Area (RMA) designation. This RMA designation requires that all development result in a no-net-increase standard for phosphorus loadings, based on the jurisdiction's average imperviousness.

Special attention should be given to post-construction stormwater quality management. The developing agency must adhere to the **post-development** water quality requirements set forth by the Virginia Stormwater Management Regulations (VR 215-02-00 Part IV and §2.3). Meeting the Virginia Stormwater Management Regulations should comply with the requirement that state agencies meet the local ordinances pursuant to the Virginia Chesapeake Bay Act.

Please refer to the *Northern Virginia BMP Handbook* for calculation procedures. A copy of the Handbook is available on NVRC's website, www.novaregion.org.

2

We would also suggest that, where possible, opportunities for retrofit of existing stormwater quantity facilities to stormwater **quality** facilities through new construction activities should be explored. NVRC's *Guidebook for Maintaining BMPs in Northern Virginia* is available, without charge, should you need it, and can also be downloaded from our website, or call me if you would like to receive a copy to use as a reference.

A photocopy of this letter should be included with your submission to indicate that the review by this agency has been completed.

Your cooperation in the intergovernmental review process is appreciated.

Sincerely yours,

James Van Zee

James Van Zee
Director, Regional Planning Services

1. VDOT is committed to construction activities that result in no-net increase in phosphorous loadings and all other applicable post-development water quality requirements through the implementation of best management practices, including stormwater management facilities. VDOT will provide quantitative and qualitative stormwater management facilities designed to meet treatment requirements established by VDOT and the VDCR through the VDOT Drainage Manual and the VDOT Erosion Sediment Control and Stormwater Management Manual. Implementation methods are described in Section 4.2.1 of the Natural Resources Technical Report.

2. To the extent practicable, VDOT's final design will consider opportunities for retrofitting existing stormwater management facilities within VDOT's right-of-way (See Section 4.11 of the Final EIS).

June 7, 2002

Mr. Ed Sunda
Senior Environmental Specialist
Federal Highway Specialist
400 North 8th Street
Richmond, Virginia 23240-0249

Dear Mr. Sunda,

The Washington Metropolitan Area Transit Authority (WMATA) appreciates the opportunity to comment on the Capital Beltway Study Draft Environmental Impact Statement (DEIS) for the I-495 corridor (Capital Beltway) in Virginia. Given its high usage and the growing demand for circumferential travel in the Washington, DC area, the Capital Beltway is a vital part of the region's travel system and will continue to serve this role in the future. While WMATA staff has prepared detailed comments (which are enclosed), I would like to highlight some concerns.

1 The Virginia Department of Transportation must preserve a rail transit alignment in the Capital Beltway, much as an option for transit was preserved in the Dulles Corridor years ago, when the need for transit in that corridor was a distant possibility. The high levels of existing and planned development will preclude future construction of new transportation facilities in the areas adjacent to the Capital Beltway. The Commonwealth of Virginia must maintain the option of multi-modal travel in the right-of-way, even if only to the extent of preserving room for aerial alignment piers.

2 Next, construction must not interfere with existing or proposed transit facilities. As you know, WMATA's Orange Line crosses the Capital Beltway at the I-66 interchange. Any proposed construction in this area must take this into consideration, and must be coordinated with WMATA staff. **3** Further, relocation of Dunn Loring Metrorail station facilities, which is discussed in the Section 4(f) evaluation, is not acceptable; this option must be removed from any future consideration.

4 Finally, proposed construction activity in the vicinity of Tysons Corner must accommodate the Dulles Corridor Rapid Transit Project, including the T9 alignment. All rail alignments for the Dulles Corridor cross the Capital

Washington Metropolitan Area Transit Authority
600 Fifth Street, NW
Washington, DC 20001
202/962-1234

By Metrorail:
Judiciary Square—Red Line
Gallery Place-Chinatown—
Red, Green and
Yellow Lines
By Metrobus:
Routes D1, D3, D6, P6,
70, 71, 80, X2

A District of Columbia, Maryland and Virginia Transit Partnership

1. The Capital Beltway Corridor Rail Feasibility Study, completed in March 2001, concluded with four major recommendations for advancing transit within the Corridor. Two of the four are relevant to the Capital Beltway Study and are as follows:

- The effect of introducing rail transit in the Beltway Corridor does not remove the need for highway improvements
- It is not desirable to use the Beltway right-of-way to implement rail transit in the corridor. However, any widening of the Beltway should be conducted so as to not preclude rail transit in the corridor.

VDOT will continue coordination with DRPT and WMATA to ensure that the Preferred Alternative is designed so that it won't preclude piers or structures to carry transit over I-495.

2. The Preferred Alternative would not affect the existing Metrorail bridge for the Orange Line at the I-66 interchange (See Section 2.2.2 of the Final EIS). Construction would be planned and staged so that there will not be service interruptions on the Orange Line. Coordination with WMATA staff will continue throughout final design and construction.

3. The Preferred Alternative would have minor impacts to the walkway connecting the parking to the Dunn Loring Metrorail Station. However it would not affect the Dunn Loring Metrorail Station itself. The preferred interchange concept for I-66 has been reduced in size and scale to eliminate the impacts to the station on the southside of I-66 and to Stenwood Elementary School on the northside. A new walkway would be constructed adjacent to the current walkway location. The existing structure would provide access until the new structure is complete so that there would be no disruption to Metrorail access.

A traction power substation (TPSS) located along I-66 to the west of the Dunn Loring Metrorail Station. This TPSS would need to be relocated to accommodate the redesigned ramp to travel from I-66 eastbound to I-495 westbound.

Mr. Ed Sunda
Page Two

Beltway at Route 123 at Tysons Corner. This project is presently in advanced planning with the Virginia Department of Rail and Public Transportation as its sponsor; the Draft Environmental Impact Statement is expected to be issued later this month. **4**

Should you have any questions regarding this matter, please contact me, or Mr. Jim Ashe at (202) 962-1745.

Sincerely,

Richard F. Stevens

Richard F. Stevens, Director
Business Planning and Development

Enclosure

cc: Mr. Ken Wilkinson, Virginia Department of Transportation
Mr. Corey Hill, Virginia Department of Rail and Public Transportation

4. The Preferred Alternative would accommodate the Dulles Corridor Rapid Transit Project which is planned to cross the Capital Beltway on Alignment T6 at Route 123 (See Section 2.2.2 in the Final EIS). VDOT will continue coordination with the Department of Rail and Public Transportation (DRPT) as the preliminary engineering of the rail transit improvements proceeds to ensure that the improvements planned by both study teams can be accommodated within the Route 123 interchange.

WMATA Comments
Capital Beltway Study Draft Environmental Impact Statement

While it is true that the Major Investment Study found that demand for rail was not sufficient to justify rail by 2020, it did not look beyond that year. Likewise, the Beltway Rail Feasibility Study recommended alignments that did not use the entire Beltway, but portions of it. It may easily be that by 2020, the Beltway corridor may be the only feasible alignment, if not the ideal one. The state has a responsibility to maintain this option for multi-modal travel in the corridor, even if only to the extent of preserving room for aerial alignment piers. Such an option could most likely be preserved by reserving a corridor of approximately twelve feet within the right-of-way. We hope that VDOT and VDRPT will work together to preserve this option for the future, much as an option for transit was preserved in the Dulles corridor years ago, when the need for transit in that corridor was a distant possibility. 1

General Comments:

- WMATA was disappointed to see that, despite the specific comments WMATA provided on the Review Draft of this DEIS, VDOT has continued to present only a very select amount of data regarding the different highway alternatives for the Beltway. By highlighting this data (for example, vehicle throughput and daily traffic numbers) and ignoring other information, such as person throughput and peak period numbers, the report makes it difficult for the public or agency staff to make informed decisions as to which alternatives best meet the project's stated purpose and need. 5

- WMATA fully supports an HOV lane alternative that provides sufficient capacity to meet HOV demand (including a large number of buses) and good access and egress to and from the lanes. Unfortunately, due to the lack of information provided in the DEIS (detailed below) we do not feel we can comment as to which alternative best meets these criteria. 6

- As pointed out above, while citing the need to avoid precluding future rail in the corridor, the DEIS does little to describe how VDOT will accomplish this, or even how impacts to already planned or existing transit alignments will be avoided. In such an already-developed corridor, with every feasible highway alternative already at peak period capacity in the build year of 2020, the 1

5. This EIS like all EISs is focused on a specific set of problems and alternatives to address those problems and concerns. The broader questions raised by WMATA have been/are being addressed by a variety of studies that are part of the continuous regional planning process. The Capital Beltway Improvement Study focused on developing alternatives to address safety concerns, improve traffic operations, and to a limited extent increase capacity. Initially, the Beltway studies placed more emphasis on increasing capacity. However, based on the comments received from the public and political leaders alternatives considered were limited to those that could fit generally within the right-of-way.

6. Comment noted.

Commonwealth has a responsibility to preserve the option of rail transit in this corridor in future years.

Detailed comments follow:

Vehicle vs. Person Throughput

Virginia's 1995 *Statewide Intermodal Long-Range Transportation Policy Plan* concludes with the following statement: "Transportation initiatives must...derive from a vision that reflects a balance of benefits and costs and emphasizes mobility for people and goods...." (p. 29) The DEIS's Purpose and Need statement cites the need to accommodate growing travel demand, demand generated by people, rather than automobiles.

And yet, nowhere in the description of operational performance is the issue of person-movement addressed. Instead, the discussion focuses on vehicle congestion on the mainline. It is easy to lose sight of the fact that a significant number of people are traveling at free-flow conditions in the HOV lanes. How many, we cannot tell, because the numbers of people, or even vehicles, are not presented in the report. In order to truly compare these alternatives, section 2.5.4, on the HOV network, should provide the same level of detail regarding hours of congestion and vehicle throughput as is provided for section 2.5.3, Operation Performance of the Mainline. Similarly, travel times and delays for the HOV lanes should be provided in Table 2-7. Both sections should also contain person-throughput data.

When the primary goal of the project, and of the transportation system overall, is to move people and goods, it is not sufficient to focus the DEIS entirely on the movement of vehicles, and then refer readers to a *Transportation Technical Report* (which does not appear to have been distributed) for information on person movement. Certainly, it is inappropriate to ask for input as to which alternative best meets the project purpose, when such a fundamental component of relevant data has not been included in the report.

7

Finally, the statement that non-HOV roadway concepts would provide 25 percent less person-capacity (section 2.2.4) appears to grossly understate the person-carrying abilities of a well-functioning HOV lane. In this region, during the peak hour, the barrier-separated HOV lanes on I-395 carry more than twice as many people per lane (5,400 vs. 2,600, according to the

8

7. The review of more ambitious and/or alternative projects was limited to an assessment of the ability of other projects, if implemented, to reduce the demand on the Beltway and postpone or eliminate the need altogether for highway improvements. This study and others found that even when projects such as circumferential rail were implemented the concerns and problem areas on the Beltway needed to be addressed.

Inreponse to the identified need alternatives that would allow for the implementation of HOV/HOT lanes were developed. Each of the build alternatives have sufficient capacity to carry the projected HOV demand. Thus the person throughput is similar for each of the build alternatives. Criteria that distinguished each alternative were chosen to compare the alternatives.

This EIS identifies and evaluates alternatives for addressing the highway needs in the Corridor and the implementation of HOV/HOT lanes. It does not address whether or not widening of the Beltway should proceed before, in conjuction with, or following other major transportation projects such as rail. It does assume that if this project is implemented first that it will accommodate a future rail project.

8. Comment noted.

MWCOG 1999 Core Cordon Count) than do the parallel general-purpose lanes.

Daily vs. Peak Period Data

9

The discussion of current and projected conditions in the Purpose and Need suggests that, while daily traffic levels continue to increase, travel demand (and thus congestion) is a peak hour/peak period phenomenon. Consequently, analytical methods to address this issue should also focus on each alternative's ability to reduce recurring congestion during peak travel times.

Given this, the findings from the Beltway MIS regarding rail transit do not present a balanced picture of the potential for rail, or how it compared to other alternatives. For instance, the first bullet in Section 2.2.1 (page 2-9) states that traffic demand on a daily basis would be reduced by less than three percent. The relevant information for this analysis would be the reduction in traffic demand during the peak hour or peak period, information that is also available from the MIS report. In addition, the MIS findings summary should point out that rail was found to reduce the duration of congestion by an amount equal to that reduced by the concurrent-flow HOV alternative. While some of this information is included in Figure 2-2, it is not addressed in the text.

Traffic Reduction vs. Addressing Mobility Needs

10

Figure 2-2 also demonstrates that rail allows many more trips to be served in the peak period (and provides additional capacity not used by 2020) than just those trips "removed from" the Beltway. Thus, while the report focuses on the 12,000 trips "removed from" the Beltway, it ignores the other 18,000 trips in the corridor that would be served by a rail system. In this respect, the report seems to hold rail to a different standard than the highway alternatives under analysis. While rail is noted for its failure to "reduce" traffic demand by more than three percent (over the course of a day), the highway alternatives are evaluated by how many *more* trips they are able to accommodate.

Likewise, the discussion of what percentage of total person trips in the region is made on transit (Section 2.2.2, page 2-13) is irrelevant to this analysis. Trips made on transit in this corridor during congested times would be more helpful, *if attractive transit options in the corridor were*

9. The revised build alternatives do not have enough additional capacity (e.g., additional lanes) to provide substantial reduction of congestion during the peak periods. This reflects the trade-off between reduced right-of-way requirements and increased operational benefits.

10. The analysis was not trying to assess the relative merits of transit improvements vs highway improvements, rather simply to assess whether or not transit improvements could postpone or eliminate the need for highway improvements. It is true that the transit improvements as assumed could serve more individuals than the highway improvement to the Beltway, however, the cost of implementing the transit system would be significantly higher and the right-of-way requirements would cause substantially higher impacts.

available. Since they are not, any description of current transit use, even in the corridor, is of limited value. 10

Physical Configuration of HOV Lanes

11 Overall, the language regarding the HOV lanes in relation to the Express/Local (E/L) configuration is inconsistent throughout the report. For instance, in section 2.1.2 (p. 2-4), one bullet states "E/L roadway alternatives will use one of the HOV lanes as a concurrent HOV lane during peak periods." Further down in the same section, the description of E/L with HOV states that, "One or two HOV lanes, concurrent with the express lanes, would be constructed in each direction." Descriptions of the alternatives should be consistent, and should be clear that up to two HOV lanes would be considered, with the exact number to be determined during design.

12 The operational discussion in Section 2.5.3 suggests that one of the primary reasons that the barrier-separated HOV lanes do not perform as well as the HOV lanes in the E/L alternative is that access to the barrier-separated HOV lanes is poor. The DEIS should address the question of how well the barrier-separated lanes would operate with better connections, such as were assumed for the E/L lanes, or should state why these better connections are not possible with a barrier-separated configuration, if this is the case. It is not surprising that barrier-separated lanes do not perform well if they do not have adequate on/off access connections. It is difficult to justify rejecting one alternative because it was not designed as well as another and any conclusions in this regard cannot be substantiated. TCC members made this comment when the Council was briefed on the preliminary report. However, it appears that this issue has not been addressed.

Impacts on Rail and Plans for Rail In and Around the Beltway Corridor

1 Section 2.2.1 states that, "The (DEIS and Rail Feasibility Study) were launched with the direction that any widening of the Capital Beltway should be constructed so as not to preclude transit in the corridor and the development of transit should not prevent widening of the Beltway." The report, however, does not appear to reflect any work to ensure that this is the case. Even a rail system that does not operate within the right-of-way for the entire portion of the corridor may need to use sections of it, and may need to cross it from time to time. Has VDOT looked at leaving

11. The text notes that depending on the roadway configuration up to two HOV lanes were considered for the Express/Local alternatives (See Section 2.1.2).

12. Direct access to and from HOV lanes would only provided at arterials where HOV lanes are existing or planned (See Section 2.1.2 in the Final EIS). In the case of an express/local system, vehicles are able to merge out the concurrent flow HOV lanes and use any exit. In the case of a barrier-separated system, vehicles are more limited in terms of where they can exit or enter the system. However, it is this limitation that also provides benefits in terms of the operation of the HOV system in that the HOV lanes are physically separated from the general purpose lanes (See Sections 2.5.2 and 2.5.3 in the Final EIS)

1. See response No. 1 above.

spaces for piers for instance, in order to support an aerial alignment or aerial crossings at some point in the future? No evidence of such coordination appears here, nor does any recommendation for consideration of this need as the project moves forward. **1**

The report should contain language regarding anticipated impacts (if any) to the Orange Line Metrorail Bridge. These are not addressed, even in section 4.15, Construction Impacts. Any proposed construction activities near the Orange Line Metrorail Bridge must be coordinated with WMATA's Office of Adjacent Construction. **2**

Dulles Corridor Rapid Transit Project

The Dulles Corridor Rapid Transit Project entered its Federal environmental review process in June 2000. The project sponsor is DRPT, while the technical manager is WMATA. The Project includes four alternative Metrorail alignments, all of which cross the Capital Beltway at its interchange with Route 123. As noted in the DEIS, three of the alignments are compatible with the proposed Alternative C interchange both in their horizontal and vertical locations. This compatibility is due to coordination among the VDOT, DRPT, WMATA, and Fairfax County. **4**

The fourth Metrorail alignment, labeled T9, has a lower vertical alignment that conflicts with the proposed ramps of the Alternative C interchange. The reasons for the development of T9 Metrorail alignment are reduction in capital costs, reduction in visual effects and enhancement of guideway accessibility. With respect to the details, east of the Westpark Drive overpass of Route 123, the top of rail (TOR) of the other three alignments would be 70 feet above existing ground surface. In contrast, the TOR of alignment T9 will be 14 feet lower at 56 feet above existing ground surface. At the location of Scott's Run Road intersection with Route 123, the vertical distances are 62 feet and 52 feet respectively, allowing a lowering there of 10 feet. The T9 alignment has been shared with VDOT, DRPT and Fairfax County; it must be preserved as a viable alternative alignment.

Two factors in the evaluation of the four alternative Metrorail alignments will be the VDOT and FHWA decision between the Capital Beltway No-Build and Build Alternatives and the probability of implementation of the proposed Capital Beltway improvements. WMATA requests that the FEIS reflect the above.

1. See response No. 1 above.

2. See response No. 2 above.

4. See response No. 4 above.

Other Comments

The report's summary of the MIS recommendations (section 2.1.1) implies that the strategies recommended consisted of the *implementation* of the roadway improvements, and the *planning* of express bus service. In fact, the MIS language calls for bus service planning to take place in Phase Two of the study (which this is); clearly the final strategy should be to *implement* bus service, not to plan it yet again. **13**

13. Comment noted.

The fact that only half of a rail system's capacity would be used by 2020 is presented as a negative (section 2.2.1). In fact, this is one of the great strengths of a rail system; it would actually provide the region with capacity to serve additional trips in this corridor beyond those expected in 2020. Every other alternative will be at capacity during the peak periods in 2020, and the region will once again be looking for ways to serve additional demand. **14**

The statement that "Alone, rail transit cannot fully meet future travel demand...." (Section 2.2.1) is true, but irrelevant. Alone, none of the highway alternatives considered fully meet future travel demand either. That is why it is so important to plan for both in the long run.

14. This statement has been omitted from the Final EIS.

Discussion of relocation of any Dunn Loring Metrorail Station facilities in the Section 4(f) Evaluation (p. 8-44) is not acceptable to WMATA, and is vigorously opposed. Further, WMATA believes that the estimate of $195 million to relocate station facilities is low, given the substantial bridgework that would be required. Further, the DEIS does not address the impacts such a relocation would have on the Vienna Metrorail station and to WMATA patrons who use the Vienna station. **3**

3. See response No. 3 above.

Page S-16: "Phased implementation is of rail service in this corridor is now planned." Please delete this sentence; no decision has been made. **15**

Page S-16: "Under the current plan, a bus rapid transit . . . " Please change to "Under the Major Investment Study plan, a bus rapid transit . . ." No decision on BRT has been made.

15. The description of the Dulles Corridor Rapid Transit Project has been updated as appropriate throughout the Final EIS.

15

Page 4-76: "The project would begin with the implementation of a Bus . . ." Please change to "The project could begin with the implementation of a Bus . . . "No decision on BRT has been made.

Page 4-76 " . . . is completed, the BRT system would be replaced in . . ." Please change to " . . . is completed, the BRT system could be replaced in . . . " No decision on BRT has been made.

GERALD E. CONNOLLY
SUPERVISOR
PROVIDENCE DISTRICT
8739 LEE HIGHWAY
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COMMONWEALTH OF VIRGINIA
COUNTY OF FAIRFAX
BOARD OF SUPERVISORS
FAIRFAX, VIRGINIA 22035

June 3, 2002

Whittington W. Clement
Secretary of Transportation
Office of the Governor
State Capitol, 9th Street Office Building
Richmond, VA 23219

Dear Secretary Clement: Whit

I have reviewed the three Build Alternatives presented in the Capital Beltway Draft Environmental Impact Statement (EIS) dated March 2002. I have a number of serious concerns with all of the alternatives.

My concerns are summarized as follows:

- The Build Alternatives do not adequately minimize displacement of homeowners and businesses and, additionally, adversely affect park and cultural resources. We need a solution that optimizes the use of existing right-of-way for both thru lanes and interchanges. 1
- The Build Alternatives are not sufficiently environmentally sensitive. Not enough has been done to encourage car pooling, express bus ridership and assure long term future mobility of what has become our Main Street. 2
- The Build Alternatives do not adequately address the need for the Capital Beltway to provide for assured access for emergency vehicles nor for facilitating evacuation in the event of an emergency or disaster affecting the core of the Washington region. 3
- The Build Alternatives do not address the possible extension of a rail system around the Beltway. 4

1. The Preferred Alternative documented in the Final EIS is the 12-Lane HOT Alternative, which was developed in response to public and local government comments about the costs and impacts of the alternatives included in the Draft EIS. This alternative would add two HOT lanes to the Capital Beltway in each direction and modify, improve and reconfigure the interchanges to increase capacity, reduce congestion and improve safety. The far two left lanes would be designated HOT lanes and separated from the general-purpose lanes with a buffer strip. The HOT lanes would be used by HOVs, buses, and tolled single occupancy vehicles. Direct HOV access to the Dulles Toll Road would be included as part of the Preferred Alternative. In summary, the Preferred Alternative was designed to balance the transportation needs in the corridor with a level of acceptable impacts and costs.

2. Throughout the EIS process, alternatives were modified to minimize environmental impacts and provide mitigation where impacts are unavoidable. The revised alternatives presented in the Final EIS represent a substantial reduction in environmental impacts from what was presented in the Draft EIS. All of the build alternatives include the addition of HOT lanes that would provide priority use for single occupant vehicles paying a toll, carpools, and express busses.

3. All of the build alternatives would have positive effects on highway and traffic safety. The higher capacity would result in improved travel times for all vehicles including those involved in emergency and disaster response.

4. The Capital Beltway Corridor Rail Feasibility Study, completed in March 2001, concluded with two recommendations for advancing transit within the Corridor relevant to the Capital Beltway Study:

- The effect of introducing rail transit in the Beltway Corridor does not remove the need for highway improvements
- It is not desirable to use the Beltway right-of-way to implement rail transit in the corridor. However, any widening of the Beltway should be conducted so as to not preclude rail transit in the corridor.

VDOT will continue coordination with DRPT and WMATA to ensure that the Preferred Alternative is designed so that it won't preclude piers or structures to carry transit over I-495.

1

- The Build Alternatives do not address the possibility for some portion of the new lanes to be tolled as so-called "hot lanes" in order to make the project more fiscally achievable and thus, within a short period of time, a reality rather than a dream, while providing a source of revenue that could be used in the future for other critical transit and transportation projects.

I am aware that in other areas of the country, there are highly popular, innovative concepts and technology that have been used on interstate highway projects which might have applicability here. The citizens of Fairfax are intelligent, sophisticated and open to new transportation concepts, especially if they address the concerns I have summarized. Therefore, I request there be an evaluation of the concept and technology available to provide for the combined use of the HOV lanes with non-HOV toll use of the express lanes. It is my hope that a fair evaluation of these concepts and technology might produce an approach which could address more adequately the concerns expressed above.

I believe that whatever we do to address capacity should be done within the existing right-of-way thus minimizing impacts on neighborhoods, homeowners and the environment.

Thank you for your thoughtful consideration of these suggestions.

Sincerely,

Gerry Connolly
Providence District Supervisor

GEC/lwf

Cc: Capital Beltway Study c/o Parsons Group

COMMONWEALTH OF VIRGINIA
HOUSE OF DELEGATES
RICHMOND

JAMES F. ALMAND
3444 N. FAIRFAX DRIVE
SUITE 102
ARLINGTON, VIRGINIA 22201

FORTY-SEVENTH DISTRICT

COMMITTEE ASSIGNMENTS:
COURTS OF JUSTICE
GENERAL LAWS
FINANCE

June 3, 2002

Capital Beltway Study
c/o Parsons Transportation Group of VA.
10521 Rosehaven Street, 2nd Floor
Fairfax, VA 22030

This is a short commentary letter on the proposed widening of the Capital Beltway from the Springfield Interchange to the American Legion Bridge.

The Capital Beltway is a brightening traffic mover, the very antithesis of the multi-modal transportation system that I would favor in Northern Virginia. It succeeds in speeding motor vehicles from point to point at very high stress to those who traverse it and at the expense of other methods of travel. **1**

I would support inclusion of separate protected bikeways along the Beltway and safe bike crossways built into construction plans. I would also support walking/running trails to be placed alongside, separate from the bike trails. **2**

If we are going to go to this huge expense of widening the Beltway, we should include other transportation opportunities at the same time. **1**

I look forward to your responses to this commentary.

Sincerely,

James F. Almand

James F. Almand

JFA:jem
cc: The Honorable Whittington W. Clement
Secretary of Transportation

Commissioner Philip A. Shucet
Department of Transportation

DISTRICT: (703) 524-9700 • RICHMOND: (804) 698-1047

1. Comment noted.

2. The Fairfax Countywide Trails plan was consulted to ensure that potential impacts to planned and existing trails would be avoided in the design of the alternatives. Currently, Fairfax County's plan does show the trails running parallel to the Beltway. The plans for the Preferred Alternative would not impact these trails. However, planning the location and design of such trails would fall under the jurisdiction of Fairfax County.

One existing trail, the W&OD Railroad Regional Park crosses the Capital Beltway near the I-66 interchange. During the construction of the Preferred Alternative, it will be necessary to replace the bridge. The replacement bridge will be designed to meet the Northern Virginia Regional Park Authority's current standards for bridges and to ensure appropriate access and maintenance of traffic during and after construction.

COMMONWEALTH OF VIRGINIA
HOUSE OF DELEGATES
RICHMOND

JAMES M. SCOTT
POST OFFICE BOX 359
MERRIFIELD, VIRGINIA 22116-0359
FIFTY-THIRD DISTRICT

July 9, 2002

COMMITTEE ASSIGNMENTS:
CORPORATIONS, INSURANCE AND BANKING
MILITIA AND POLICE
SCIENCE AND TECHNOLOGY

Capital Beltway Study
c/o Parsons Transportation Group of Va.
10521 Rosehaven Street, 2nd Floor
Fairfax, Virginia 22030

To Whom It May Concern:

1

I wish to register my strong opposition to each of the "Candidate Build Alternatives" proposed by the Virginia Department of Transportation pursuant to the Draft Environmental Impact Statement for proposed improvements to the Capital Beltway.

The reasons to oppose the VDOT proposals are compelling. The "Candidate Build Alternatives" are too costly, and will divert scarce financial resources from higher priority mass transit, transit-related, and other more urgently-needed road improvements. Just as importantly, the public hearings demonstrated overwhelming citizen opposition. Also, residents of established neighborhoods near the Beltway will be too negatively impacted by each of the proposals. The costs of displacing a minimum of 206 homes and 19 businesses, as well as re-building and moving the Barbour Road bridge over I-66 in Falls Hill are simply not acceptable.

In short, while some improvement to the Beltway may be needed, none of the current proposals merit further consideration.

Sincerely yours,

Jim Scott

James M. Scott

DISTRICT: (703) 560-8338 • RICHMOND: (804) 698-1053 • E-MAIL: DELJSCOTT@AOL.COM

1. The Preferred Alternative documented in the Final EIS is the 12-Lane HOT Alternative, which was developed in response to public and local government comments about the costs and impacts of the alternatives included in the Draft EIS.

The Preferred Alternative would add two HOT lanes to the Capital Beltway in each direction and modify, improve and reconfigure the interchanges to increase capacity, reduce congestion and improve safety. The far two left lanes would be designated HOT lanes and separated from the general-purpose lanes with a buffer strip. The HOT lanes would be used by HOVs, buses, and tolled single occupancy vehicles.

This alternative was designed to balance the transportation needs in the corridor with a level of acceptable impacts and costs. Consequently, the natural and social environmental impacts reported in the Draft EIS have been reduced substantially.

FAIRFAX COUNTY

V I R G I N I A

COUNTYWIDE NON-MOTORIZED TRANSPORTATION COMMITTEE
12055 Government Center Parkway, Suite 700
Fairfax, Virginia 22035-5505
(703) 324-1380 Fax (703) 324-3056

Mr. Stephen Walter
Capital Beltway Study
C/o Parsons Transportation Group
10521 Rosehaven Street, 2nd Floor
Fairfax, VA 22030

Reference: Capital Beltway Study, Draft Environmental Impact Statement Section 4(f) Evaluation, Volume 1, March 2002

Subject: Comments of the Fairfax County Non-Motorized Transportation Committee

Dear Mr. Walter:

The Fairfax County Non-Motorized Transportation Committee (Trails Committee) is an appointed advisory body to the Fairfax County Board of Supervisors. We work on trail and walkway planning issues, funding for and construction of walkways and consider policies to advance the transportation and recreational opportunities of county residents.

The Committee has reviewed the subject draft environmental impact statement (DEIS) with regard to the effects on non-motorized forms of transportation and the updated Countywide Trails Plan. Non-motorized forms of transportation include pedestrians, bicycles, equestrians and a variety of other uses. Our comments are attached. In general, we note that there is no discussion at all in the DEIS of how non-motorized forms of transportation are affected by and will be accommodated in the proposed alternatives. We also question why there is no reference to or mention of the Countywide Trails Plan or a discussion as to how the proposed alternatives will comply with the plan. This is a serious deficiency in the DEIS that must be remedied in the Final EIS. 1

1. The Existing Trails Map and Countywide Trails Plan were reviewed to ensure that none of the existing or planned trails within the study area would be affected by the project. Section 3.4 of the Final EIS has been revised to specifically cite these sources and the trails planned to parallel the Capital Beltway. In addition, Section 4.4 of the Final EIS has been revised to more specifically indicate that none of the existing or proposed trails in the Plan would be affected by the Preferred Alternative.

The provision of protected bikeways and pedestrian paths would be addressed during the final design phase of the project. With respect to crossings of the Beltway for bicycles and pedestrians, Fairfax County's position is that access will be provided at each location, and crossings that currently exist (including all existing free and low traffic crossings) will be maintained during and after construction. Currently there are no dedicated facilities for pedestrians and bicyclists along the Beltway.

The primary purpose of the Capital Beltway Study is to improve traffic conditions on the Capital Beltway, a limited access freeway facility. The location of future trails, planning access to those trails from surrounding developments and assessments of how the future trails and their access would improve pedestrian and bicycle access and mobility falls under the jurisdiction of Fairfax County.

If you have any questions or need any information, you can call me at 703.323.1523 or reach me via email at ann@greenspace.com.

Sincerely,

Ann Bennett

Ann Bennett, Chair
Fairfax County Non-motorized Transportation Committee

Comments of the
Fairfax County Non-Motorized Transportation Committee
on the
Capital Beltway Study, Draft Environmental Impact Statement
Section 4(f) Evaluation, Volume, March 2002

General Comments

1) There is no discussion at all in the draft environmental impact statement (DEIS) of how non-motorized transportation would be affected by and would be accommodated in the proposed alternatives.

   - The EIS should be revised to discuss the impact of the alternatives on non-motorized transportation and how these alternatives would accommodate non-motorized transportation.

2) The DEIS does not mention nor discuss the Fairfax County Trail Plan.

   - The EIS should be revised to describe the effect of the alternatives on the Trail Plan and how these alternatives would accommodate the Trail Plan requirements.

3) The Virginia Department of Transportation (VDOT) has endorsed the concept of a non-motorized trail along both sides of the Beltway called for in the Fairfax County Trails Plan. The DEIS does not mention this concept.

   - The EIS should be revised to confirm the VDOT endorsement and discuss how the alternatives would accommodate this concept.

4) The DEIS does not describe how trails, sidewalks, and bicycle lanes will be accommodated on rebuilt Beltway overpasses and underpasses.

   - The EIS should be revised to discuss the following issues: Will rebuilt overpasses have sidewalks on both sides and be able to accommodate bicycle lanes? Will rebuilt underpasses have sidewalks and trails on both sides and be able to accommodate bicycle lanes? How will safety issues be addressed at ramp crossings?

1

5) The DEIS does not mention the on-going VDOT NOVA Regional bikeway and Trail Network Study of potential northern Virginia bicycle routes.

   - The EIS should be revised to discuss how the alternatives would accommodate the proposals in the VDOT study.

2

Specific Comments

1. Accommodations for trails and non-motorized transportation are discussed in Section 4.4 of the Final EIS.

The engineering designs completed to date are preliminary in nature and do not yet contain enough detail to show sidewalks on overpasses. The provision of protected bikeways and pedestrian paths would be addressed during the final design phase of the project.

The W&OD Railroad Regional Park crosses the Capital Beltway near the I-66 interchange. During the construction of the Preferred Alternative, a new bridge for the W&OD trail would be built. Staged construction of the bridge would ensure that pedestrian and bicycle crossings are maintained at all times. The replacement bridge will be designed to meet the Northern Virginia Regional Park Authority's current standards for bridges.

With respect to crossings of the Beltway for bicycles and pedestrians, Fairfax County's position is that access will be provided at each location, and crossings that currently exist will be maintained during and after construction.

2. Section 3.4 of the Final EIS was revised to cite this study and include a discussion of its recommendations. The recommendations made in the final report currently do not match the Countywide Trails Plan.

1) At the Beltway interchange with the George Washington Memorial Parkway there are a number of non-motorized transportation issues and on-going studies that need to be considered in the EIS. Current on-going federal studies include developing the Potomac Heritage National Scenic Trail along the Potomac River and extending the Mount Vernon Trail from Roosevelt Island in Rosslyn to the American Legion Bridge. The EIS should be revised to address the following issues:

- Identify and consider all current federal and other studies relevant to this interchange area.
- Identify and consider all other known potential future plans for non-motorized trails and issues at this interchange area.
- Address how the EIS analysis process has been coordinated with the current federal studies cited above and other potential plans.
- Address how the proposed Beltway alternatives affect and would accommodate these proposed plans.
- Address how equestrians would be accommodated at this interchange area.

3

2) In Tysons Corner, the Beltway is currently an overwhelming barrier to pedestrian and bicycle access to and from either side of the Beltway. The EIS should be revised to address the following issues:

- Address how the proposed alternatives would affect pedestrian and bicycle access to and from the east and west sides of the Beltway in Tysons Corner.
- Address how the proposed alternatives would improve pedestrian and bicycle access across the Beltway in Tysons Corner.
- Address how the proposed alternatives would improve pedestrian and bicycle access to the proposed Metrorail stations in Tysons Corner.
- Address how pedestrians and bicycles would be accommodated safely at the Leesburg Pike (VA 7) overpass.

3) How would the proposed Beltway alternatives accommodate pedestrians and bicycles at the interchange with Arlington Boulevard (US 50)? How would the plan incorporate such access with the adjacent Arlington Boulevard interchanges with Fairview Park Drive and Gallows Road?

4) The EIS should also discuss the non-motorized crossings at the following Beltway interchanges:

1

3. Modifications to the interchange at the George Washington Memorial Parkway are not planned as part of the Capital Beltway Study. Development of the Potomac Heritage National Scenic Trail would not be affected by this project.

- The connections between the W&OD trail and the trails on both sides of the Beltway in the Fairfax County Trails Plan.

- The crossings for the trails along I-66 in the Fairfax County Trails Plan and the connections of the I-66 trails with the trails on both sides of the Beltway.

- Non-motorized crossings and connections with the Beltway trails at Georgetown Pike, Old Dominion Dr, Lewinsville Rd, Rt 123, Rt 7, Oak St, Idylwood Rd, Rt 50, Gallows Rd, Rt 236 (including a connection with the Fairfax County Cross-County Trail in this vicinity), the pedestrian bridge at Wakefield Park, Rt 620, Heming Ave, and Backlick Rd.

1

B

PUBLIC COMMENTS AND RESPONSES

Public agencies, elected officials, businesses, civic association representatives, interest groups, and the general public submitted comments regarding the Capital Beltway Study during the formal comment period that followed publication of the Draft EIS. The comments were submitted through testimony at the hearings, comment cards, letters, emails, post card campaigns, petitions, written statements, or a combination thereof. Copies of the statements submitted can be found in the *Summary Report for the Location Public Hearing*. All of the comments were carefully reviewed and summarized and then compiled into the categories listed below. The comments received as well as responses to those comments are presented after the list of categories.

B.1 Study Process

- General
- Purpose and Need
- Alternatives Development
- Agency Coordination
- Other Projects or Studies

B.2 Draft EIS Alternatives

- General
- No-Build
- Concurrent HOV
- Express/Local with HOV
- Barrier-Separated HOV

B.3 Other Alternatives Suggested

- Rail Transit
- Tolls or High Occupancy Toll (HOT)
- Outer Beltway
- New Potomac River Crossing
- Other

B.4 Interchange Concepts

- General
- Braddock Road

- Little River Turnpike
- Gallows Road
- Arlington Boulevard
- Interstate 66
- Leesburg Pike
- Chain Bridge Road
- Dulles Airport Access and Toll Road
- Georgetown Pike
- George Washington Memorial Parkway

B.5. Traffic and Transportation

- Traffic Forecasts
- Traffic Operations
- Safety
- HOV Lanes and Access
- Transit
- Bicycle and Pedestrian Issues
- Regional Transportation Planning
- System Connectivity

B.6 Environmental Impacts

- General Environmental
- Land Use
- Right-of-Way/Displacements/Property Values
- Air Quality
- Water Quality
- Historic and Archeological
- Hazardous Materials
- Noise

B.7 Funding and Implementation

- Project Costs and Funding
- Construction Schedule and Phasing
- Tolls/HOT Lanes

B.8 Public Involvement

B.1 STUDY PROCESS

General

1. The potential highway work precludes the ability to operate businesses and affects not just the property owners, but the lenders and the tenants involved as well. We ask that a definitive timetable be presented and that the correct set of facts be presented to ensure an educated and prudent decision. (1 commentor)

The study of improvements for the Capital Beltway should not preclude normal operations for property owners or businesses in the Corridor. The best available information regarding the Capital Beltway Study has been made publicly available through a series of public workshops and public hearings, a project newsletter, and an interactive web site. The project schedule has been published on the project web site and in the newsletters.

The preparation of the study is subject to the requirements of the National Environmental Policy Act (NEPA). The NEPA process requires that several alternatives be considered prior to the determination of a selected alternative and typically takes 2 to 3 years to complete. The Draft EIS included several alternatives for the project that were presented at three public hearings in May 2002. At the public hearings, VDOT representatives were available to answer questions and provide information and maps on the proposed road construction so that owners should be able to get an idea about how the project might affect their property. This Final EIS presents the Preferred Alternative and the reasons for its selection. After a Record of Decision is published by the Federal Highway Administration, final design and funding will be programmed.

Purpose and Need

2. The alternatives in the Draft EIS do not solve the goals established to relieve congestion, fully analyze HOV benefits, or consider rail as an alternative. (1 commentor)

Each of the final Candidate Build Alternatives would result in significant improvement in congestion when compared to future no-build conditions. Section 2.6 of the Final EIS includes a description of the periods of congestion, delays and travel times for each of the alternatives. The analysis does acknowledge that in the year 2020 the levels of congestion on the Beltway with the proposed improvements are comparable to those experienced today. However, the no-build conditions are significantly worse with up to 16 hours of congestion per day being forecasted.

The evaluation of HOV lanes demonstrated several benefits, including: (1) completion of the regional HOV system, (2) improved express bus operation, (3) consistency with state, regional, and local transportation plans, (4) provision of 25% more person-capacity than general purpose lanes, and (5) consistency with regional plans to reduce emissions and improve air quality.

See Section B.3 below for a detailed discussion of the rail transit studies conducted in the Beltway Corridor.

Alternatives Development

3. The Draft EIS is a highway study that was completed in isolation instead of being a transportation system analysis. Not all reasonable alternatives were considered. (4 commentors)

The Capital Beltway Study analyzed a specific corridor for a full range of transportation alternatives. The range of alternatives evaluated in detail included No-Build Alternative, a Transportation System Management alternative, and several build alternatives. The initial set of alternative concepts also included express bus service, non-HOV roadway concepts, rail transit, and HOV roadway concepts. Some of these alternatives were not carried forward for further analyses in the Draft EIS because of specific inadequacies that reduced their ability to meet the purpose and need for the project. See Section 2.5 in the Final EIS for a more detailed description of the alternatives considered and eliminated from further study.

Agency Coordination

4. The study does not adequately coordinate with Maryland's plan for the Beltway or involve regional coordination. (4 commentors + 1 post card campaign with 53 submissions)

Chapter 7 of this Final EIS documents the extensive agency and public coordination that occurred during this study. A list of agencies and officials contacted during early coordination is included on page 7-2. Federal, state, regional, and local agencies were initially contacted in June 1998 as part of the study's scoping process and then continuously throughout the duration of the study. In addition, a multi-jurisdictional study team was formed at the beginning of the environmental review process and met on a regular basis. This study team included representatives from the Maryland State Highway Administration (the agency responsible for improvements to the Maryland portion of the Beltway) and the Metropolitan Washington Council of Governments (the agency responsible for regional planning).

Enhancing mobility in the Beltway Corridor and adding capacity to the roadway has long been recommended in a number of long-range transportation and land use plans prepared by various local, regional, state, and Federal agencies. Current plans that generally endorse or recommend continuing improvements to the Beltway include the following:

- Fairfax County's *Policy Plan*,
- Fairfax County's *Comprehensive Plan*,
- the National Capital Region Transportation Planning Board's Transportation Vision Plan, and the
- National Capital Planning Commission's *Comprehensive Plan for the National Capital*.

Long-range transportation and land use plans that specifically recommend implementing the Beltway improvements include

- Fairfax County's *Comprehensive Plan*, Fairfax County's *Transportation Plan*,

- the National Capital Region Transportation Planning Board's *Update to the Financially Constrained Long-Range Transportation Plan for the National Capital Region*, and
- the Northern Virginia Transportation Coordinating Council's *Northern Virginia 2020 Transportation Plan*.

The Maryland State Highway Administration (MSHA) is currently studying transportation improvements to the Beltway in Maryland. Potential improvement options include the addition of HOV or express toll lanes to the Beltway, new transit alignments, and transportation system management/transportation demand management (TSM/TDM) strategies. Representatives from VDOT and MSHA continue to maintain close coordination to ensure compatible studies and designs. MSHA is currently in the alternatives analysis phase of the study. The terminus for the Virginia improvements at the American Legion Bridge allows for sufficient transition to any improvements the MSHA may advance.

Other Projects or Studies

5. Support for Metrorail extensions to Lorton, Manassas, Dulles, and Tysons Corner. Support for the planning and building of a rail/mass transit system for Northern Virginia, including improvements and additions to Metrorail, VRE, MARC, and AMTRAK. (55 commentors)

Comment noted. Currently, studies are underway for the extension of rail along the I-66 Corridor and the Dulles Corridor, which includes service to Tysons Corner. Rail service to Lorton and other communities in the region is under consideration and planning studies will continue in an effort to improve the rail/mass transit system in the metropolitan Washington area.

6. Virginia has conducted rapid rail studies that have shown its feasibility, but these are not mentioned in the Draft EIS. The studies concluded that rapid rail would move twice the people as a 12 lane beltway, at 1/6th of the cost. Maryland is going to build circumferential rail. (1 commentor)

The feasibility of circumferential rail was studied in the Capital Beltway MIS (1997) and the Capital Beltway Corridor Rail Feasibility Study (May 2000). The findings of these studies were summarized in the Draft EIS (Section 2.2) and the Final EIS (Section 2.5). The findings of these studies indicate that there would be enough ridership to warrant inclusion of rail transit in the Corridor, but that the need for rail transit did not cause enough of a shift from vehicles to rail use to eliminate the need for roadway improvements. In addition, the Rail Feasibility Study noted that rail transit was not best suited within the right-of-way for the Beltway. Rather, the system needed to connect activity centers, such as Annandale, which are several miles distant from the Beltway.

Maryland and Virginia are both now proceeding with planning level studies of rail transit in the Beltway Corridor. The projects would likely be two separate lines that would connect across the Potomac River. These independent studies are planned to continue at the planning level and more study is warranted to assess the feasibility of such a system.

The Maryland State Highway Administration (MSHA) is currently studying transportation improvements to the Beltway in Maryland. Potential improvement options include the addition of HOV or express toll lanes to the Beltway, new transit alignments, and transportation system management/transportation demand management (TSM/TDM) strategies. Representatives from VDOT and MSHA continue to maintain close coordination to ensure compatible studies and designs. MSHA is currently in the alternatives analysis phase of the study. A Draft EIS may be issued in 2005.

7. There are inconsistencies between this study and the Beltway Corridor Rail Feasibility Study. The Draft EIS underestimates rail ridership and the dynamic impacts of ridership when operated with a feeder system. (1 commentor)

The Draft EIS and the Capital Beltway Rail Feasibility Study are two separate studies that assumed different base networks for the estimation of rail ridership. Despite these differences, both study teams concluded that a similar percentage of traffic would be taken off the Beltway.

The Rail Feasibility Study assumed that there were billions of dollars more in transit improvements in the region compared to the Draft EIS, including rail to Tysons, Centreville, and Lorton. Even with the more aggressive assumptions, the Rail Feasibility Study still calculated only a six percent reduction in traffic on the Beltway with the expanded transit service in place. The Draft EIS reported a three percent reduction in Beltway traffic with a base network that included only the Purple Line, the rail improvements in the Constrained Long Range Plan, and an enhanced bus network. While this percentage represents ridership sufficient to support rail transit in the Corridor, it does not indicate that rail transit should be implemented instead of highway improvements.

8. What is the status of rail to Tysons? (1 commentor)

The Virginia Department of Rail and Public Transportation (DRPT), in cooperation with the Washington Metropolitan Area Transit Authority (WMATA), Fairfax and Loudoun counties, and the Metropolitan Washington Airports Authority (MWAA), is planning to construct a 23.1-mile transit system in Fairfax and Loudoun counties, Virginia. A Final Environmental Impact Statement (Final EIS) for the project was issued by FTA in December 2004.

The Project would extend the existing Metrorail system from the Orange Line (between the East and West Falls Church stations) in Fairfax County through Tysons Corner to Washington Dulles International Airport and beyond the airport to Route 772 in Loudoun County. Most of the extension would be constructed in the median of the Dulles International Airport Access Highway and Dulles Connector Road, but the alignment would also directly serve Tysons Corner and Dulles Airport. The extension would include 11 new Metrorail stations, a new rail yard on Dulles Airport property, and improvements to an existing rail yard at West Falls Church. This alignment was selected because it offers the highest ridership potential with the fewest impacts on residential areas and the natural environment.

Because of federal funding limitations and the timing of local funding availability, DRPT intends to construct the LPA in two major phases. Phase 1 of the Project will complete the first 11.6 miles of the planned extension and include five new stations (Tysons East, Tysons Central 123, Tysons Central 7, Tysons West, and Wiehle Avenue). Metrorail service to Wiehle Avenue is scheduled to begin in 2011. DRPT began Preliminary Engineering on

Phase 1 of the Project in October 2004. Phase 2 of the Project will complete the remainder of the LPA from Wiehle Avenue to Route 772 in Loudoun County.

9. The Draft EIS misstates the statistics on the impact of rail in the Beltway Corridor, by saying that rail would reduce Beltway traffic by less than 3% because daily traffic includes the period from 11pm to 6am, when rail would be shut down. Beltway rail could carry up to 72% of the people that travel on the Beltway in peak hour direction. (1 commentor)

The MIS and Capital Beltway Rail Feasibility Study both show that if a rail system were built within the Corridor only 3 to 6 percent of persons driving on the Beltway would switch to rail. The MIS stated that the small reduction in Beltway traffic reflects latent demand and multiple link trips in current use. For each trip that is shifted to transit, others who desire to travel the Corridor would fill the offset. In addition, many trips that occur on the Beltway could not be served by transit because the Beltway is only one link in the trip. Similarly, the Capital Beltway Rail Feasibility Study found that 6 percent of drivers would switch to rail. Therefore, it is not a matter of what rail can carry but what it will carry.

The findings of these studies indicate that both highway and rail transit improvements are warranted in the Corridor. However, an important conclusion of the Capital Beltway Rail Feasibility Study was that rail transit improvements would be more appropriate outside the right-of-way for the Capital Beltway so that activity centers could be directly connected.

B.2 DRAFT EIS ALTERNATIVES

General

1. Support widening or improving the Beltway. (18 commentors)

Comment noted.

2. All of the alternatives studied in the Draft EIS are variations of the same alternative. (9 commentors).

The Capital Beltway Study analyzed a specific corridor for a full range of transportation alternatives. The range of alternatives evaluated in detail included a No-Build Alternative, a Transportation System Management alternative, and several build alternatives. The initial set of alternative concepts also included express bus service, non-HOV roadway concepts, rail transit, and HOV roadway concepts. Some of these alternatives were not carried forward for further analyses in the Draft EIS because of specific inadequacies that reduced their ability to meet the purpose and need for the project. See Section 2.5 in the Final EIS for a more detailed description of the alternatives considered and eliminated from further study.

3. Supports widening, but is opposed to any type of HOV. (4 commentors)

Comment noted. To be consistent with regional, state and local transportation plans, as well as the purpose and need, all of the build alternatives included HOV lanes. The Preferred Alternative includes HOT lanes that can be used by high occupancy vehicles or vehicles paying a toll. The Washington, DC region has one of the nation's most extensive HOV roadway networks, and HOV facilities have been in operation in Northern Virginia since the 1960s. All of the radial freeways in Northern Virginia now have lanes dedicated to HOV use during peak periods. As a result, the region has the highest percentage of workers who carpool (16 percent) of any metropolitan area in the United States, and the second lowest percentage of residents who travel to work by single-occupancy vehicle. Completion of the HOV lanes on the Beltway would connect the HOV elements already in place (I-95/I-395, I-66 and the Dulles Access / Toll Road), improve HOV access to major regional activity centers, and allow high-occupancy vehicles (carpools, vanpools, buses) to operate through the region without mixing with general-purpose traffic.

4. Four lanes should be added to the Beltway. (1 commentor).

Comment noted. Traffic forecasts conducted in the initial phases of the study indicated that the Beltway would have to be expanded to 14 to 16 lanes to satisfy projected vehicle demand for the design year of 2020. Recognizing the significant right-of-way requirements and associated impacts associated with such a widening, Federal, state and local officials decided early in the study process, that the total number of lanes to be considered would be capped at 12 (or 4 more than the existing Beltway).

5. Opposed to alternatives because the data is inadequate (non-specific). (1 commentor)

Comment noted. The data used to develop and analyze the various alternatives for their ability to meet the purpose and need and their social, environmental, and transportation effects was collected from standard sources used throughout the transportation, engineering, and planning professions.

6. Opposed to alternatives in general. (1 commentor)

Comment noted.

7. Supports Beltway Improvements, but is opposed to all of the build alternatives. (1 commentor)

Comment noted. In response to the comments from the general public and local governments, VDOT conducted additional study of the build alternatives presented in the Draft EIS to minimize impacts and reduce costs. Right-of-way impacts were reduced by minimizing shoulders and replacing physical barriers with painted stripes. In addition, high occupancy toll lanes were studied in response to a proposal submitted to VDOT under the Public Private Transportation Act. As a result VDOT developed six modified alternatives (each of the three original mainline concepts with and without HOT lanes). Two of the six were identified as the most promising, the 10-Lane Concurrent HOV and the 12-Lane HOT Managed Lanes. The Preferred Alternative documented in the Final EIS is the 12-Lane HOT Alternative.

No-Build Alternative

8. Supports No-Build Alternative because:

a. Of general support for No-Build Alternative. (45 commentors and 1 campaign with 52 signatures).

Comment noted.

b. Other alternatives will impact homes, personal property, and disrupt communities. (52 commentors).

In response to the comments from the general public and local governments, VDOT conducted additional study of the build alternatives presented in the Draft EIS to minimize impacts and reduce costs. Right-of-way impacts were reduced by minimizing shoulders and replacing physical barriers with painted stripes. In addition, high occupancy toll lanes were studied in response to a proposal submitted to VDOT under the Public Private Transportation Act. As a result VDOT developed six modified alternatives (each of the three original mainline concepts with and without HOT lanes). Two of the six were identified as the most promising, the 10-Lane Concurrent HOV and the 12-Lane HOT Managed Lanes. These alternatives substantially reduced the natural and environmental impacts of the proposed improvements The Preferred Alternative documented in the Final EIS is the 12-Lane HOT Alternative.

c. Other alternatives won't reduce congestion. (49 commentors)

As shown in Section 2.6 of the Final EIS the No-Build Alternative would result in the highest amount of congestion (between 8 to 16 hours). All of the other alternatives studied, including the Preferred Alternative, would result in fewer hours of congestion than the No-Build Alternative.

d. Other alternatives would cost too much. (14 commentors)

In response to the comments from the public and local governments, VDOT conducted additional study of the build alternatives presented in the Draft EIS to minimize impacts and reduce costs. The Preferred Alternative documented in the Final EIS, the 12-Lane HOT Alternative, would cost significantly less than those studied as part of the Draft EIS (See Sections 2.2 and 2.5 of the Final EIS).

e. Maryland is not planning for improvements to the Beltway. (13 commentors)

The Maryland State Highway Administration (MSHA) is currently studying transportation improvements to the Beltway in Maryland. Potential improvement options include the addition of HOV or express toll lanes to the Beltway, new transit alignments, and transportation system management/transportation demand management (TSM/TDM) strategies. Representatives from VDOT and MSHA continue to maintain close coordination to ensure compatible studies and designs. MSHA is currently in the alternatives analysis phase of the study. A Draft EIS may be issued in 2005.

f. Bottlenecks will be created at existing bridges. (13 commentors)

The bridges at each of the ten Beltway interchanges between I-495/I-395/I-95 interchange and the American Legion Bridge will be modified to accommodate improvements to the Beltway mainline. In addition, new ramp connections will be incorporated to avoid queuing of traffic from the interchanges back on to the Beltway, as often occurs today. Potential bottlenecks at the American Legion Bridge (crossing of the Potomac River) will be minimized. Improvements are being coordinated with the MSHA and designed to provide a seamless connection with Maryland.

g. HOV alternatives are not effective. (12 commentors)

High Occupancy Vehicle (HOV) lanes have been demonstrated to be very successful in many urban areas across the country. In fact, the Washington DC region boasts some of the most successful HOV systems, including Shirley Highway (I-95/I-395) and Interstate 66. In congested corridors such as these, the HOV facilities provide 25% more person-capacity than general purpose lanes.

h. Other alternatives would result in impacts to the natural environment. (13 commentors)

Despite being located in a heavily urbanized area, the Beltway Corridor does contain natural resources and parklands. Alternatives were designed to avoid and/or minimize impacts to natural resources and parklands. Commitments to compensate for unavoidable impacts to natural resources and parkland are included in this Final EIS and will be incorporated into the Record of Decision and construction permits.

i. Increasing capacity on the Beltway discourages other modes of transportation. (**1 commentor)**

Improvements to the Capital Beltway are only one element in the solution to the region's transportation problems. In addition to improving safety and operation on the Beltway, the proposed improvements will also benefit other modes of travel. The addition of dedicated HOV lanes on the Beltway would improve express bus service by separating buses from the congested general-purpose lanes that they travel in today. Improved travel times would make the express bus service currently provided on the Beltway more attractive, encourage the initiation of new service on other suburb-to-suburb links, and promote transit connections among the I-95/I-66 and Dulles corridors.

The Beltway is also an important highway link to other transportation modes, including three major airports (Reagan National, Dulles International, and Baltimore-Washington International) and two rail systems (Metrorail and Virginia Railway Express). Congestion on the Beltway increases travel times to these other facilities, which in turn decreases, traveler confidence in being able to travel to these facilities in a timely manor. Furthermore, Beltway congestion causes traffic diversions to other local roads, further compounding the overall reduction in regional mobility.

<u>Concurrent HOV Alternative</u>

9. Supports Concurrent HOV Alternative because:

a. General support for Concurrent HOV Alternative. (7 commentors)
b. This alternative minimizes impacts. (5 commentors)
c. Supports Concurrent HOV Alternative because barriers would make access to and from HOV lanes too restrictive. (1 commentor)
d. Lanes could be converted to Non-HOV during off-Peak use. (1 commentor)

Comments noted.

10. Supports combination of Concurrent HOV Alternative with transit improvements. (1 commentor).

Comment noted.

<u>Express / Local with HOV Alternative</u>

11. Supports Express/Local with HOV alternative because:
- **a. General support. (10 commentors)**
- **b. It appears to work on I-270 in Maryland. (5 commentors)**
- **c. It appears safer than other alternatives. (1 commentor)**
- **d. It matches the trip type. (1 commentor)**
- **e. Main line flow is better. (1 commentor)**
- **f. It could be used 24 hours a day/7 days a week. (1 commentor)**

Comments noted.

12. Opposes Express/Local with HOV alternative because:
- **a. No reason. (1 commentor)**
- **b. Too expensive. (1 commentor)**

Comments noted.

<u>Barrier-Separated HOV Alternative</u>

13. Supports Barrier-Separated HOV Alternative because:
- **a. General support. (11 commentors)**
- **b. It appears safer. (6 commentors)**
- **c. It would make HOV enforcement easier. (2 commentors)**
- **d. It maximizes capacity. (1 commentor)**

Comments noted.

14. Opposed to Barrier-Separated HOV Alternative because:
- **a. General opposition. (1 commentor)**
- **b. Barrier would make HOV access too restrictive. (1 commentor)**

Comments noted.

B.3. OTHER ALTERNATIVES SUGGESTED

<u>Rail Transit</u>

1. Support transit in Beltway Corridor
- **a. Supports a Beltway rail line in the Corridor. (104 commentors, 1 campaign with 774 signatures 1 campaign with 89 signatures, and 1 campaign with 8 signatures)**
- **b. Supports Metro or Light Rail in Annandale, as well as along Gallows Road and/or Backlick Road. (4 commentors)**

c. Supports light rail in the Beltway Corridor. (19 commentors).

d. Supports monorail in the Beltway Corridor. (5 commentors)

e. Build circumferential rail underground. (4 commentors)

Comments noted. The feasibility of rail transit was studied in the Capital Beltway MIS (January 1997) and the Capital Beltway Corridor Rail Feasibility Study (May 2000). The findings of these studies were summarized in the Draft EIS (Section 2.2) and the Final EIS (See Section 2.5). Several transit modes were studied on various alignments. The later study concluded four major recommendations for advancing transit within the Corridor. Two of the four are relevant to the Capital Beltway Study and are as follows:

- The effect of introducing rail transit in the Beltway Corridor does not remove the need for highway improvements, and
- It is not desirable to use the Beltway right-of-way to implement rail transit in the Corridor. However, any widening of the Beltway should be conducted so as to not preclude rail transit in the Corridor.

VDOT will continue coordination with DRPT and WMATA to ensure that the Preferred Alternative is designed so that it won't preclude piers or structures to carry transit over the Beltway.

2. Supports Beltway light rail in combination with peak HOV left lane. (2 commentors)

See response to Comment #1 above with respect to rail transit. Comment noted regarding the preference for the Concurrent HOV Alternative that was studied in the Draft EIS.

3. The Draft EIS does little to describe how VDOT will avoid precluding future rail in the Corridor or how impact to planned or existing transit alignments will be avoided. (1 commentor)

Both the Draft EIS and the Capital Beltway Rail Feasibility Study were undertaken with the direction that any improvements to the Capital Beltway should be constructed so as not to preclude transit in the Corridor nor should the development of transit prevent widening of the Beltway. However, at this time, the designs completed for the Capital Beltway Rail Feasibility Study are only at a conceptual level. While the preliminary engineering has generally taken the concepts into consideration, specific details will not be available until more information is available.

The Preferred Alternative would accommodate the Dulles Corridor Rapid Transit Project which is planned to cross the Capital Beltway on Alignment T6 at Route 123. VDOT will continue coordination with the Department of Rail and Public Transportation (DRPT) as the preliminary engineering of the rail transit improvements proceeds to ensure that the improvements planned by both study teams can be accommodated within the Route 123 interchange. In addition, the Preferred Alternative would not affect the existing Metrorail bridge for the Orange Line at the I-66 interchange. Construction would be planned and staged so that there will not be service interruptions on the Orange Line. Coordination with WMATA staff will continue throughout final design and construction.

4. Opposes Beltway rail line. (1 commentor)

Comment noted.

Tolls or High Occupancy Toll (HOT) Lanes

5. Supports conversion of general-purpose lane to HOT or HOV. (5 commentors)

Based on the current and projected travel demand in the corridor, a reduction in the number of general purpose lanes is not recommended. In addition, conversion of an existing general purpose lane of traffic to HOV use has been attempted at various locations throughout the country and has always met with severe public protest. While it is true that either an HOV or HOT lane could increase the person throughput of the corridor and that some level of peak period congestion in the general purpose lanes is desirable in order to achieve effective utilization of the HOV or HOT lanes, a severe capacity constraint will only increase an already high level of "cut-through" traffic in neighborhoods adjacent to the Capital Beltway, contrary to the stated purpose and need of the project.

Lane utilization (the percentage of vehicles in each lane) on a roadway can be significantly affected when lane use is designated by vehicle type or purpose. For example, on a freeway such as the Capital Beltway, which is a four-lane highway with no lane designations or barriers separating traffic flows, the lane utilization is approximately 25 percent in each of the four lanes under congested conditions. However, if one of these lanes was converted to an HOV lane, leaving only three general purpose lanes on the Beltway, then the lane utilization would not be evenly divided and the three general purpose lanes would probably carry the majority of the vehicles. Projections for HOV volumes on the Capital Beltway for the proposed alternatives during peak periods range between 750 and 1,400 vehicles per hour (vph). While the HOV lane is successful in the sense that it moves more people at free flow speed than the congested general purpose lanes, the vehicular capacity of a lane of traffic on a freeway is higher (for our studies we assumed a capacity of 1,700 vph at free flow speeds). Thus, HOT lanes are being proposed as a means to take advantage of the unused vehicular capacity to achieve additional throughput.

There are significant challenges to implementing HOT lanes. From a travel demand and operations perspective, utilizing the "surplus" capacity without reducing the HOV volumes will be difficult. To achieve satisfactory operations, the lanes will require some form of separation from general purpose lanes, either with pavement striping or physical barriers. In some situations, HOT lanes can be accessed by simply changing lanes. However, in the case of the Capital Beltway, with interchanges spaced less than a mile apart and the high percentage of short trips (1 to 3 interchanges), access to the HOT lanes would be provided via direct access ramps or along the corridor at key locations. The design and location of access to and from either an HOV or HOT lane will be critical; insufficient access will leave the lanes underutilized. Too many access points may make it almost impossible to ensure free flow traffic and some locations will favor HOV over tolled users or the opposite. The lanes would be managed through pricing to maintain free flow conditions throughout the day, even during the peak periods, by using traffic information systems, such as variable message signs, to communicate travel conditions and price levels to non-HOV vehicles.

Thus, in the case of both HOV and HOT lanes, the simple conversion of a general purpose lane would not provide the direct access ramps and additional treatments necessary to safely enter and exit the system, particularly given the number of closely spaced interchanges within the 14-mile corridor, or to operate the system given the requirements of a HOT lane facility. In addition, the conversion would not correct the current safety and design deficiencies with the corridor.

Outer Beltway

6. Supports study of outer Beltway or regional bypass. (59 comments, 1 campaign with 53 signatures).

Since the circulation of the Draft EIS, VDOT has cancelled the Western Transportation Corridor Study (also referred to as the Outer Beltway). In addition, no responses were received to VDOT's recent request for interest in procuring the project through a Public-Private partnership.

New Potomac River Crossing

7. Supports the study of or construction of a new Potomac River crossing northwest of the American Legion Bridge. (21 commentors and 1 campaign with 53 signatures.)

At this time, no new Potomac River crossing or connection to similar roadways in Maryland is planned. New crossings that would be associated with bypasses around the D.C. metropolitan area would primarily serve through trips that do not begin or end in Fairfax County.

Other

8. Supports building and/or improving other roads instead. (45 commentors, 1 Campaign with 113 signatures, and 1 Campaign with 53 signatures)

Improvements to the Capital Beltway do not preclude other roadway improvements in the study area. However, the purpose and need for this study is to consider improvements specifically for the 14-mile portion of the Beltway between the Springfield Interchange and the American Legion Bridge.

9. Support for more bus and bus rapid transit along the Beltway. (20 commentors)

Comment noted. The Preferred Alternative features HOT lanes which would also be used by HOVs and express buses. These lanes could also potentially be used by bus rapid transit vehicles in the future as well.

10. Supports package of multi-modal improvements to include with this project. (15 commentors)

The recommended improvements to the Beltway would not preclude improvements to other modes in the study area or region. Multi-modal transportation will be improved based on the HOV improvements to the Beltway.

11. Supports truck lanes or truck bypass. (8 commentors)

Alternatives that would provide designated lanes for trucks only were not considered to be a feasible or cost-effective alternative that would be capable of meeting the purpose and need for this study.

12. A balance of roads and transit should be considered. Build alternatives, plus rail or monorail - coupled with mass transit incentives would increase the maximum roadway capacity and extend the lifespan of the facility for several years. (6 commentors)

Both rail and highway improvements have been studied as a part of this and other studies. The conclusion of the most recent study, the Capital Beltway Corridor Rail Feasibility Study (May 2000), indicate that both highway and rail improvements are warranted. The study also found that the rail transit was not best suited within the right-of-way for the Beltway. Rather, the system needed to connect activity centers, such as Annandale, which are several miles distant from the Beltway. Rail transit improvements would be provided in the Beltway Corridor as part of separate study as funding permits.

13. Supports improving other roads in addition to the Beltway. (6 commentors).

This study focused only on improvements to the Beltway itself and interchanges that provide access to the Beltway. Improvements to the Capital Beltway do not preclude other roadway improvements in the study area and other improvements do not obviate the needs to improve the Beltway.

14. Supports smaller scale or focused improvements only. (6 commentors)

A Transportation System Management (TSM) alternative was developed that would involve smaller scale actions such as upgrading existing arterial roadways, providing new or additional turning lanes, optimizing traffic signal timing, and enhancing the regional bus system. The evaluation of traffic, operational, safety, and environmental factors showed that the TSM alternative alone would not meet the project's purpose and need. Specifically, the TSM alternative would not reduce cut-through traffic on local roadways, fail to improve peak hour traffic volumes, and not address the Beltway's safety and design deficiencies. The revised alternatives contained in the Final EIS do represent substantial scaling back of the alternatives presented in the Draft EIS.

15. Supports elevated Beltway rather than widening. (6 commentors)

An elevated Beltway would cost significantly more to construct and impose significantly greater noise and visual impacts than any of the alternatives studied in the EIS.

16. Supports improvements combining both mass transit and roads at "hot spots" including extending Metro down I-66 and to Tysons Corner and extending express buses from Metro rail terminal stations. (3 commentors)

Comment noted. Studies are on-going for extension of Metrorail along I-66 from the Vienna Metrorail Station and into Tysons Corner, along the Dulles Toll Road and into Loudoun County from the West Falls Church Metrorail Station. Express bus service has also been implemented the Dulles and Beltway corridors.

17. Supports signal optimization / synchronization. (2 commentors)

Signal optimization and/or synchronization are a part of the selected alternative. The level of service at any intersection has a significant effect on the overall operating performance of the roadway; thus, the existing signals and any new signals located along the crossing roadways within the study area would be optimized in order to achieve the most efficient traffic flow along the corridor.

18. Supports improvements to arterial and collector roads. (2 commentors)

This study focused only on improvements to the Beltway itself and interchanges that provide access to the Beltway. Improvements to the Capital Beltway do not preclude other roadway improvements in the study area.

19. More emphasis should be given to Intelligent Transportation Systems on the Beltway, such as variable message signs on feeder roads. (2 commentors)

Intelligent Transportation System (ITS) solutions, such as variable message signs (VMS), Highway Advisory Radio (HAR), closed-circuit television (CCTV) cameras for traffic management/vehicle detection/incident management, and vehicle detection capability (i.e. radar, video imaging, and loops), will be reviewed during the design and construction stage for possible implementation. These solutions will complement the proposed improvements but not obviate the need for them.

20. Supports ramp metering (2 commentors)

Ramp metering is effective in regulating the number of vehicles entering a highway from on-ramps. This method queues vehicles on the ramps and back onto the local roadways and keeps the highway flowing as the merge points do not become severe bottlenecks. Currently, ramp metering is used in the I-395 and I-66 corridors during the peak periods in the peak direction of travel.

Ramp metering has not been implemented on the existing Beltway, primarily due to the lack of space available for queued vehicles on the ramps, which are tight loop ramps in many locations, and because there is no one peak direction of travel in the morning or evening. The directional split of traffic on the Inner and Outer Loops is approximately 45/55% during the peak periods. In the morning, traffic is heaviest northbound on the Inner Loop from Springfield to Tysons and southbound on the Outer Loop from the American Legion Bridge to Tysons. In the evening, the situation is reversed.

21. The use of high-speed passenger boats for transport should be considered. (1 commentor)

High-speed or other types of passenger boats were not identified as a reasonable alternative that would be capable of meeting the purpose and need for this study. However, VDOT received a grant from Congress in 1999 to study the feasibility of a high-speed passenger ferry service on the Potomac River. The study was completed in February 2000. More detailed information on the study can be viewed on VDOT's website (http://www.virginiadot.org/projects/studynova-ferry.asp).

22. The speed limit should be increased or one lane with an unlimited speed allowance should be added to the Beltway. (1 commentor)

The maximum design speed for the Beltway was determined based on safety and design criteria established by the American Association of State and Highway Transportation Officials (AASHTO). In general, the criteria are based on characteristics of the surrounding area, the functional class of the roadway, geography and terrain, and the total number of roadway lanes. In addition, a study of the 85th percentile speed of drivers on the roadway helps to determine the appropriate speed limit. Selection of the 85th percentile speed as the speed limit is recommended in order to match the desired safe speed of the majority of drivers so as to minimize the speed differential and the amount of lane changing on the roadway, which can lead to more accidents. Based on these criteria, a speed limit of 55 mph was recommended for this section of the Beltway. This speed is consistent with other similar roadways in the area.

Based on AASHTO design criteria discussed above, safety concerns, and legality, an unlimited speed allowance on one or more lanes was not recommended. Speed variance is a leading cause of roadway accidents. Some speed variation may be acceptable on barrier-separated roadways, but without physical barriers, varying speed limits would pose operational (signing and enforcement) and safety (lane changing and confusion) problems within the Corridor. In addition, the maximum allowable speed limit in Virginia is 65 mph (see *Code of Virginia* Chapters 46.2-870 through 46.2-878 and 46.2-1300 for more information).

23. Supports non-HOV reversible lanes. (1 commentor)

Reversible lanes are used primarily in locations where the directional split of traffic is such that the majority, i.e., 70 to 80 percent, of vehicles are traveling in one direction, thereby justifying the additional capacity. For example, if traffic is traveling into a central business district, reversible lanes could be provided to increase the number of lanes inbound in the morning and outbound in the evening. On the Capital Beltway, however, there is no one peak direction in the morning or evening and the directional split of traffic on the two loops is approximately 45/55 during the peak periods. In the morning, traffic is slightly heavier in the northbound direction on the Inner Loop from Springfield to Tysons and in the southbound direction on the Outer Loop from the American Legion Bridge to Tysons. In the evening, the situation is reversed.

24. Supports recessed roadways and tunnels to reduce impacts. (1 commentor)

During final design, revisions will be made to roadway designs intended to minimize any impacts from the project. During the development of alternatives, no locations or situations were identified that would necessitate or support the construction of recessed roadways or tunnels as a part of improvements to the Beltway.

B.4 INTERCHANGE CONCEPTS

General

1. Separate protected bikeways along the Beltway and safe bikeway crossings are needed. (40 commentors)

The provision of protected bikeways and pedestrian paths would be addressed during the design phase of the project when the options are further defined and refined. With regard to crossings of the Beltway for bicycles and pedestrians, Fairfax County's position is that access will be provided at each location, and crossings that currently exist will be maintained during and after construction. Currently there are no dedicated facilities for pedestrians and bicyclists along the Beltway.

2. Existing pedestrian and bike crossings must be maintained during and after construction, including the W&OD Trail bridge and the Wakefield Americana bike bridge. (15 commentors)

As part of the proposed improvements to the I-66 interchange, a new bridge carrying the W&OD Trail across the Beltway would be built. Staged construction of the bridge would ensure that pedestrian and bicycle crossings would be maintained at all times. The widening of the Beltway near Wakefield Park will require the reconfiguration and approach to the Wakefield Americana pedestrian/bicycle bridge. This crossing would be shut down for a short period during construction of the new park-side approach. Staged construction activities will be used at other locations as well so as not to completely disrupt pedestrian and bicycle movements during construction.

3. Interchange improvements are important. (5 commentors)

Comment noted.

4. Supports smaller, less complicated designs. (2 commentors)

While the plan views (footprint) of some of the proposed interchange concepts appear large and complicated, operationally, they are fully functional and very easy to navigate. Proper geometric designs as required by AASHTO guide lines including lane width, shoulder width, curve radii, grades, vertical clearance, transition lengths, auxiliary lanes, lane continuity and lane balance, as well as adequate signing and lighting have been proposed to improve safety and operational efficiency of the interchanges.

Braddock Road (Route 620)

5. Northbound exit to Braddock Road should be a loop instead of a traffic light. (2 commentors)

The traffic analysis indicates that a signalized intersection is the best option at this location. A review of the traffic volumes and a planning level analysis of the proposed intersection's operations suggests that a traffic signal would operate at acceptable levels of service. On the other hand, a loop ramp for this movement would create a weave section on the collector-distributor roadways and hence reduce the effectiveness of the entire interchange.

6. Traffic signals should be located further away from the Beltway. (1 commentor)

The traffic signals at the intersections within the Beltway interchanges are required and recommended at those locations by the designers through their professional judgment and experience and are guided by the Manual on Uniform Traffic Control Devices, the industry standard used in the design of traffic signals that describes the requirements that must be met before an intersection is signalized. Generally speaking, the use of traffic signals is one of the most effective ways of controlling traffic at an intersection. They eliminate conflict by allocating time among conflicting movements of vehicles and pedestrians at an intersection. Since the use of traffic signals adds delay to all vehicles in the traffic stream, they are used only when necessary. And since the level of service at any intersection has a significant effect on the overall operating performance of the roadway, all existing signals and any new signals located along the crossing roadways within the study area would be optimized in order to achieve the most efficient traffic flow along the corridor.

7. Opposed to Interchange Concept E. (1 commentor)

Comment noted.

<u>Little River Turnpike (Route 236)</u>

8. Opposed to Interchange Concept B. (1 commentor)

Comment noted.

9. Move traffic signals further from the Beltway. (1 commentor)

The traffic signals at the intersections within the Beltway interchanges are required and recommended at those locations by the designers through their professional judgment and experience and are guided by the Manual on Uniform Traffic Control Devices, the industry standard used in the design of traffic signals that describes the requirements that must be met before an intersection is signalized. Generally speaking, the use of traffic signals is one of the most effective ways of controlling traffic at an intersection. They eliminate conflict by allocating time among conflicting movements of vehicles and pedestrians at an intersection. Since the use of traffic signals adds delay to all vehicles in the traffic stream, they are used only when necessary. And since the level of service at any intersection has a significant effect on the overall operating performance of the roadway, all existing signals and any new signals located along the crossing roadways within the study area would be optimized in order to achieve the most efficient traffic flow along the corridor.

10. Improve merge lane between Beltway and westbound Little River Parkway. (1 commentor)

The merge lanes on the proposed designs have been improved to meet or exceed required AASHTO safety and operational standards.

<u>Gallows Road (Route 650)</u>

11. Opposed to widening Gallows Road because of community impact. (9 commentors)

This study does not propose the widening of the Gallows Road. Gallows Road widening is proposed as part of the Fairfax County Transportation Plan. The Capital Beltway Study only provides for a wider bridge for Gallows Road Bridge over I-495 to accommodate a possible future widening of the road as well as for the interchange ramps to transition to the existing roadway width.

Since the Public Hearings a revised interchange concept was developed for the Gallows Road/I-495 Interchange to eliminate property impacts to the Holmes Run Acres neighborhood.

12. Concerned with "confining and unsightly" sound barrier proposed near Gallows Road interchange. Impacts access. (4 commentors)

The revised design for the Gallows Road interchange does not include the sound barrier walls originally proposed along Gallows Road. Sound barrier walls are still proposed for areas adjacent to the Beltway, but the walls will not travel up Gallows Road as previously proposed.

13. Supports improvements to Gallows Road interchange including a longer entrance to 495 East. (1 commentor)

The Candidate Build Alternatives meet or exceed the current minimum AASHTO and VDOT safety requirements. Long auxiliary lanes are provided to accommodate exiting, merging and weaving traffic. The number of exiting and merging movements has been minimized to the extent possible along the mainline. At this location, the auxiliary lane continues to meet the next interchange, rather than dropping off after the merge onto I-495.

14. Opposed to changes at Gallows Road intersection due to proximity to Woodburn Elementary for safety reasons. (1 commentor)

Woodburn Elementary is located approximately 1,500 feet away from the Gallows Road interchange and thus will not be directly affected by the interchange construction. The Beltway project only includes improvements to Gallows Road where it connects with the Beltway. Modifications would properly integrate the proposed Beltway and interchange improvements with existing or planned designs and traffic patterns on Gallows Road.

Arlington Boulevard (US 50)

No comments.

Interstate 66

15. Supports Interchange Concept E. (32 comments)

Comments noted.

16. Opposes Draft EIS proposals for Barbour Road Bridge. Supports other alternatives for Barbour Road bridge over I-66. (26 commentors and 1 Petition with 282 signatures)

Since publication of the Draft EIS, design revisions have been made to each of the I-66 interchange concepts. Under the original design concepts, the Barbour Road bridge was to be replaced to accommodate the widening of I-66 beneath it. As a result, five residences on Barbour Road would be displaced. Under the interchange design selected as part of the Preferred Alternative, widening of I-66 transitions down to the existing roadway width before reaching the Barbour Road bridge alleviating the need for widening of the bridge structure. Under the Preferred Alternative the residences along Barbour Road would no longer be displaced.

17. Oppose improvements to I-66 interchange due to community impacts. (7 commentors)

Comment noted. In response to the comments from the general public and local governments, VDOT conducted additional study of the build alternatives presented in the Draft EIS to minimize impacts and reduce costs. Right-of-way impacts were reduced by minimizing shoulders, replacing physical barriers with painted stripes, and reducing the scale of interchange improvements.

18. Improve badly designed merge areas and limited visibility/decision time at road signs. (1 commentor)

The Preferred Alternative addresses many of the problems with the merge areas that currently exist along this section of the Beltway. Auxiliary lanes have been lengthened and in some locations, weaving movements have been eliminated to improve merging conditions. Locations of roadway signs will be reviewed in detail during the final design phase of the project.

19. Improve I-66 interchange. (1 commentor).

Comment noted. The Preferred Alternative will include improvements to the I-66 interchange.

20. Do not build HOV-only ramps between Beltway and I-66 inside the Beltway. (1 commentor).

Comment noted. HOV-only ramps encourage carpooling, which reduces the number of vehicles on the road. HOV-only ramps improve safety and congestion by eliminating the dangerous weaving movement that HOV traffic must make when crossing the general-purpose lanes to access the general-purpose ramps.

21. Improve connections between I-66 East and I-66 West with Beltway. Eliminate the weaving which occurs between I-66 and Beltway exits at Tysons Corner. Reduce the size of the proposed connections at I-66 East interchange to minimize environmental impacts. (1 commentor)

The proposed interchange has improved connections between the beltway and I-66 in both directions. Under the Preferred Alternative, the left hand exit ramps would be eliminated from the general-purpose lanes of the Beltway to address the weaving movements which currently take place. In addition, the scale of the interchange improvements has been reduced in response to public and agency comments to minimize impacts to the surrounding neighborhoods and environment.

Leesburg Pike (Route 7)

22. Opposed to Interchange Concept B. (1 commentor).

Comment noted.

Chain Bridge Road (Route 123)

No comments.

Dulles Access/Toll Road (Route 267)

23. Widen the Lewinsville Road bridge over Beltway from 2 to 4 lanes. (1 commentor)

The scope of the Capital Beltway Study included improvements to the Beltway itself and interchanges that provide access to the Beltway. Other structures, such as overpasses, that do not provide direct access to the Beltway were not considered for widening as a part of this study unless they were slated for widening as part of Fairfax County's Transportation Plan.

24. Improve exit from Beltway to Dulles Access/Toll Road. (3 commentors)

Under the Preferred Alternative the exit from I-495 General Lanes (SB) to the Dulles Access/Toll Road (WB) will be similar to what exists today, including the addition of the second exit lane that is currently under construction. The exit from the general lanes (NB) to the Dulles Access/Toll Road (WB) will be modified to include a right exit lane from I-495. Access is also being provided from the HOT lanes in both directions to Dulles Access/Toll Road (WB). The I-495 General Lanes (SB) exit to Dulles Access/Toll Road (EB) is also being revised to a right exit lane from I-495 and the alignment has been improved by increasing the radius of the ramp alignment. Access to Dulles Access/Toll Road (EB) from the I-495 Hot Lanes (SB) will be provided in approximately the same location of the current exit lane from I-495 (SB).

25. Opposed to Interchange Concept C. (2 commentors)

Comment noted.

26. Opposed to Interchange Concept E. (1 commentor)

Comment noted.

27. Discourage lane jumpers. (1 commentor)

Comment noted.

28. Improve Toll Road/Route 236 interchange first. (1 commentor).

The priorities and phasing of construction would be decided during final design. The phasing of construction would depend on a number of factors including but not limited to the extent of congestion at the particular interchange, safety problems, and funding availability.

29. Do not build the flyover ramp to Dulles Access Road East (northwest quadrant of interchange) because of impact on property values. (1 commentor)

The fly-over ramp in question, provides access from the I-495 SB to the Dulles Toll Road EB for non-HOT/HOV traffic. The interchange will not be functional without this ramp.

Georgetown Pike (Route 193)

30. Supports new exit at Old Dominion Drive and/or Lewinsville Road to redirect Georgetown Pike traffic. (1 commentor)

The proximity of these two roads with the interchanges to Georgetown Pike and the Dulles Access/Toll Road would create an unsafe weaving condition on the Beltway. In addition, a new interchange at either location would require additional right-of-way that is not justified by the improvements that would be gained in terms of safety, traffic operations, and cost.

George Washington Memorial Parkway

No comments.

B.5 TRAFFIC AND TRANSPORTATION

Traffic Forecasts

1. The methodology for the study is flawed because it is based on non-peak hour traffic. (5 commentors).

During preparation of the Capital Beltway Study it was acknowledged that congestion would be similar during peak hour traffic for any of the proposed alternatives. During the AM and PM peak hours, the mainline operates at Level of Service F throughout most of the Corridor for every alternative, and comparing them during these two hours of the day would not provide enough information to differentiate their effectiveness in handling traffic efficiently and safely.

Given the high volumes in the Corridor, queues form, which triggers changes in demand and service volumes in the hours leading up to and following the peak hour. Therefore, demand volumes for five hours in each of the morning (5 AM to 10 AM) and evening (3 PM to 8 PM) peak periods were studied to sufficiently evaluate Beltway traffic. Operational performance was described for the AM peak period, PM peak period, and midday (10 AM to 3 PM) for each of the alternatives. Measures such as hours of congestion, queues and operating speeds, delay and travel times, and daily throughput were used to compare the alternatives. During the grouped five-hour periods, the measures were different enough to allow for reasonable comparison.

2. The Draft EIS misstates the impact of rail. The Draft EIS says rail will reduce traffic on beltway by less than 3%. They mean of course, includes the period from 11pm to 6am when rail would not be operating. Light rail could carry up to 72% of people that travel on beltway in peak hour direction. (2 commentors)

On the Beltway, vehicular traffic demand on a *daily* basis, which includes the peak periods, would be reduced by less than 3 percent with the implementation of rail transit. The circumferential rail line showed a potential ridership of about 60,000 home-based work trips per day when forecasts were made using the approved regional transportation model and several assumptions meant to help identify maximum potential. This service would have a low impact on peak period traffic volumes and congestion on the Beltway lanes would be reduced by about one-quarter hour.

It is important to recognize that even if the ridership on the rail line at the highest load point (most likely during the peak periods) may be higher than the equivalent of 3 or 30 percent of vehicular traffic, only a portion of these rail trips would be diverted from the Beltway. In other words, one rail trip does not mean one less Beltway trip.

3. A 10 or 12-lane highway only maintains the current level of service. Need to develop alternatives that allows for future needs. (2 commentors)

Improvements to the Beltway would serve not only to increase the Beltway's capacity to remedy current congestion and accommodate expected growth, albeit not through the year 2020, but also to address design deficiencies of the roadway and operational and safety problems within the Corridor. As a secondary function, the additional capacity would serve to draw back diverted traffic that ordinarily would cut through local roadways in an attempt to avoid the Beltway. Today, many of the parallel routes along the Beltway experience severe congestion during the peak periods as commuters attempt to find alternate pathways to their destinations. These local roadways were not designed to carry the increased traffic, leading to safety and operational problems on those facilities.

The maximum of 12 lanes on the highway was established to minimize the environmental impacts of the Beltway widening. Widening any more than 12 lanes would involve acquiring a significant amount of additional right-of-way to accommodate the lanes, thus drastically changing the existing character of the Corridor.

4. The study should have addressed the impacts of induced travel on the beltway because if you build more lanes, more traffic will result. (2 commentors)

The possible impact of induced travel was considered and included within the study process and methodologies used to develop traffic projections. Induced travel is generally considered to be additional travel on a roadway caused by additional capacity improvements. Induced travel effects may include route switches made by drivers, additional travel generated by new developments facilitated by the roadway improvements, or by drivers choosing to make more trips because of decreased congestion.

For this study, the impacts caused by route switching were factored into the traffic modeling process. The traffic model recognizes that some drivers would choose to divert trips that would use other adjacent streets onto the Beltway. Likewise, if planned improvements to the Beltway are not completed, drivers may seek alternate routes to the Beltway due to congested conditions resulting in induced travel on other roadways within the study area, including "cut-through" routes in neighborhoods located along the Beltway.

The potential for additional adjacent development on the Beltway as a result of capacity improvements is lower than would be expected for relatively undeveloped areas. Forecasts for future development in the study area were based on regional land use planning efforts by local jurisdictions and data produced by the Metropolitan Washington Council of Governments (MWCOG) and is included in the forecasting process. MWCOG's travel demand model is based on several land use factors, such as employment and population levels and includes planned roadway expansions in the region, including widening the Beltway to 10 lanes from the Dulles Toll Road to the American Legion Bridge and HOV improvements the entire section of the Beltway included in this project. Specific improvements to the Beltway that were included in the transportation demand model are listed in Table 2-6 in the Final EIS.

Induced demand based on other types of travel behavior, such as making additional trips due to lower congestion is more difficult to estimate due to lack of available data and has not been conclusively proven to occur.

5. The Draft EIS states that Beltway traffic would only be reduced by 3% but this did not include peak traffic, which may be reduced up to 30%. There are different data methodologies used with modes. (1 commentor)

On the Beltway, vehicular traffic demand on a *daily* basis, which includes the peak periods, would be reduced by less than 3 percent with the implementation of rail transit. The circumferential rail line showed a potential ridership of about 60,000 home-based work trips per day when forecasts were made using the approved regional transportation model and several assumptions meant to help identify maximum potential. This service would have a low impact on peak period traffic volumes and congestion on the Beltway lanes would be reduced by about one-quarter hour.

It is important to recognize that even if the ridership on the rail line at the highest load point (most likely during the peak periods) may be higher than the equivalent of 3 or 30 percent of vehicular traffic, only a portion of these rail trips would be diverted from the Beltway. In other words, one rail trip does not mean one less Beltway trip.

6. How much traffic per day was the Beltway designed to handle when it was built and how much does it actually hold today. (1 commentor)

The capacity of a single freeway lane is approximately 2,200 vehicles per hour. The Capital Beltway was first opened to traffic in 1964 and originally consisted of 2 lanes in each direction. Between 1974 and 1977, the Beltway was expanded to 4 lanes in each direction. Therefore the capacity of the original Beltway was approximately 4,400 vehicles per hour in each direction. The capacity of the existing beltway, with four lanes in each direction is approximately 8,800 vehicles per hour in each direction. Existing demand volumes on the Beltway often exceed 9,000 vehicles in one hour, resulting in congestion and backup of vehicles over time. Forecasts for the year 2020 indicate a 30 to 40 percent increase.

Traffic Operations

7. The EIS must address impacts on feeder roads to the Beltway. (6 commentors)

The impact of Beltway improvements on feeder roads was taken into consideration in three ways during the study process: physically, operationally, and based on travel demand.

Physically, the project would include improving portions of the 10 roadways that connect to the Beltway via the existing interchanges. Modifications to these roadways would properly integrate the proposed Beltway and interchange improvements with existing or planned designs and traffic patterns on these other roadways.

Operationally, the build alternatives would improve traffic conditions on feeder roads by reducing the amount of cut-through traffic. Feeder roads serve several purposes, including providing access and egress for beltway traffic, accommodating non-beltway trips, and accommodating traffic trying to avoid the Beltway in certain locations (cut-through traffic). Widening the Beltway will improve traffic flow on the Beltway, which would reduce the need for alternative or cut-through routes serving the same travel purposes as the Beltway.

Finally, in terms of travel demand, the impact of the feeder roads was considered by constraining demand forecasts to reflect the ability of the local roadway network to feed the Beltway. The analysis found that peak hour travel demand exceeds the ability of the highway system to process the peak hour volumes of traffic. While capacity on the Beltway would increase as a result of improvements, there is little opportunity for additional capacity on the crossing arterials. Thus, in 2020, the hourly volumes reaching are Beltway are constrained, or limited, by the arterials and the existing road network feeding the interchanges within the study corridor.

Initially, peak hour forecasts were prepared to represent demand in the corridor (i.e., any vehicles desiring to use the roadway were given the ability to do so). Then, to account for the network constraints, the demand forecasts were modified based on the capacities of the crossing arterials east and west of the Beltway. In other words, constrained forecasts were prepared to more realistically represent the volume of traffic that would be able to get to the Beltway during the peak hour. These forecasts of constrained demand were then used to develop the Candidate Build Alternatives and proposed interchange improvements.

8. There is no discussion on the width of travel lanes, breakdown lanes, clearing snow on elevated ramps, and emergency evacuation (incident management). Lanes shouldn't be less than 12 feet. (6 commentors)

The Preferred Alternative would be built to meet current design standards, which dictate that travel lanes will be no less than the standard width of 12 feet on the Beltway. Shoulders will also be provided at the standard widths of 10 to 12 feet.

In addition to serving as refuge areas for vehicles, the shoulders also provide access to incidents for emergency vehicles. Higher capacity on the Beltway will result in improved response time for emergency service providers in the case of the Preferred Alternative. Resources are available to clear snow on elevated ramps as necessary.

9. Barrier-separated roadways may cause more congestion and safety problems because people are not familiar with them. (1 commentor)

The number of weaving and merging maneuvers, which contribute to congestion, will be decreased through the selective use of direct connections at high-volume entrances and exits (or for special purposes, such as HOV connections). In addition, vehicles that generally make discretionary road changes (changing lanes due to slowing traffic) would be reduced because the Beltway would have a smoother flow.

The nearby I-95/I-395 Corridor currently has a 27-mile reversible barrier-separated roadway from Route 234 in Prince William County to between Route 27 and Eads Street in Arlington. North of the Route 27/Eads Street area, there are separate lanes for northbound and southbound traffic up to the Rocheambeau Bridge. Unlike the section of the Beltway currently under study, this highway serves regular northern Virginia traffic, commuters, and interstate traffic not familiar with the system. However, with the use of appropriate signage and standard design, it has proven to be a successful barrier-separated system, serving to reduce congestion and increase the person-carrying capacity of the roadway.

10. We need to know something about why people are choosing to use the Beltway as distinct from other alternatives if they were made available (1 commentor)

The travel forecasting and screening process for all alternatives was based on extensive data and evidence on travel decisions known to affect mode choice and route selection that included population and employment densities, trip lengths, and travel times. The Draft EIS analyzed the existing trips on the Beltway, which showed that most of the trips are locally oriented and thus, much of the use of the Beltway is for local trips.

Safety

11. Statistically rail is safer than highway travel. Highway accident numbers will increase because of more vehicles on bigger highway. Should conduct cost/benefit analysis on reduced accidents from rail use, compared with additional highway lanes. (1 commentor)

While it is true that travel demand forecasts indicate that there will be more vehicles on the highway by the year 2020, the number of accidents *per 100 million vehicle miles of travel*, or the accident rate, is expected to be lower because the factors that contribute to a large majority of the accidents on the Beltway today will be mitigated or eliminated altogether.

The accident rate on this portion of the Beltway has increased steadily in recent years, primarily due to increases in congestion, and will continue to rise as long as congestion becomes more severe. In addition, crashes are caused by ramps with entrances and exits on the left, substandard acceleration and deceleration lanes, tight loop ramps, and closely spaced interchanges. The Preferred Alternative would both reduce congestion and eliminate most of the existing substandard design issues. .

12. The project is supposed to increase safety but increasing speed on Gallows Road won't do this. (1 commentor)

This project does not involve plans to increase speed limits on Gallows Road. Physically, the project would include improving portions of the ten roadways that connect to the Beltway via the existing interchanges. Modifications to these roadways would properly integrate the proposed Beltway and interchange improvements with existing or planned designs and traffic patterns on these other roadways.

13. Driving on Beltway is stressful with confusing signs and lane complexity, increasing number of rules and restrictions, large number of cars changing lanes, and cars entering from either side. (1 commentor)

Construction of the Preferred Alternative would improve traffic operations and eliminate substandard design issues, which largely contribute to the confusion on the roadway. Currently there are exits and entrances on the left, substandard acceleration and deceleration lanes, tight loop ramps, and closely spaced interchanges.

HOV Lanes and Access

14. The HOV to non-Beltway intersections at Braddock Road appear to generate gridlock. (2 commentors)

Both intersections within the Braddock Road interchange, just east and west of the Beltway, will require detailed planning/signal timing to ensure smooth traffic progression along eastbound and westbound Braddock Road and to prevent congestion on the ramps and ramp spurs where left turn movements are provided.

15. Have access and egress issues for emergency vehicles and school busses, which serve the Iliff Nursing and Rehabilitation Center been taken into consideration? Would the facility be impacted? (1 commentor)

The Preferred Alternative would improve access and egress to the Iliff Nursing and Rehabilitation Center. However, temporary detours may be required for limited periods during construction.

16. The Draft EIS should address emergency vehicle access. (1 commentor)

Emergency vehicle access and response time would be substantially improved due to construction of any of the Preferred Alternative. In congested corridors, emergency vehicles responding to incidents must navigate through the traffic queue formed following the incident.

Transit

17. HOV is not equivalent to mass transit. (1 commentor)

Comment noted. High Occupancy Vehicle (HOV) lanes are lanes with restrictions based on the number of occupants per vehicle (e.g. vehicles with only one or two persons can generally not use HOV lanes, unless the restriction is lifted during certain times). Mass transit is generally public transportation that includes such modes as local bus, express bus, bus rapid transit, streetcars, light rail transit, rail rapid transit, and commuter rail. HOV lanes do however provide priority conditions for many mass transit vehicles, such as express busses.

Bicycle and Pedestrian Issues

18. Pedestrian & Non-Motorized Issues are not discussed. (1 commentor)

Section 3.4.6 of the Final EIS includes a discussion of recreational trails located in parklands along the Beltway that are used for pedestrian, bicycle, or other forms of non-motorized travel.

Regional Transportation Planning

19. Need a regional transportation authority (DC, MD, VA) for decisions, in order to develop a balanced system of transportation, including roads, transit, railroads, and air. (7 commentors)

The National Capital Region Transportation Planning Board (TPB) is the designated Metropolitan Planning Organization responsible for coordinating, planning, and prioritizing transportation improvements in the metropolitan Washington region, which includes local governments and agencies in Virginia, Maryland, and Washington, D.C.

The TPB annually updates a Financially Constrained Long-Range Transportation Plan for the National Capital Region, which includes major highway projects, major transit projects, HOV projects, transportation related studies, and bicycle/pedestrian projects. The Plan is "constrained" to include only those projects that can be funded and operated by revenues that are "reasonably expected to be available", as required by Federal law and regulations during a 25 year period.

20. We need an adequate transportation plan for the area, which includes this section of the Beltway, parts of Maryland and the District before we attempt to study the Beltway (1 commentor)

The official long-range transportation plan for the National Capital Region or the "Constrained Long Range Plan (CLRP)" is prepared by member jurisdictions, which include the District of Columbia and surrounding areas of both Virginia and Maryland. The CLRP identifies the capital improvements, studies, actions, and strategies that the region proposes to carry out by the year 2030. It is "financially constrained" to include only projects that the region can afford to build and operate during the 2004-2030 period. The plan is updated at least every three years. Widening the Beltway to 10 lanes from the Dulles Toll Road to the American Legion Bridge and HOV improvements for the entire section of the Beltway included in this project are both included in the CLRP.

Additionally, several jurisdictions, including Fairfax County, coordinate to prepare a transportation plan for Northern Virginia. The Northern Virginia 2020 Transportation Plan identifies many of the projects that are later adopted into the CLRP for the National Capital Region. Both of these plans are developed through processes involving the public.

21. Northern VA needs a 10-15 year urban plan.

The Northern Virginia Transportation Coordinating Council's Northern Virginia 2020 Transportation Plan is one of a number of long-range transportation and land use plans that guide the development of the region's transportation infrastructure. The Council is an advisory group of locally elected officials from 13 northern Virginia jurisdictions and the Virginia General Assembly that serves as a caucus on recommending regional transportation priorities and funding allocations. The recommendations in the Plan, endorsed by resolutions from 13 localities within the region, call for 10 general-purpose lanes and 2 HOV lanes on the Beltway and reconstruction of all 10 interchanges within the project limits.

System Connectivity

22. How will the project connect to Maryland, where rail is planned for the Maryland section of the beltway? Will there be a transfer? (1 commentor)

In order to maintain lane continuity and achieve proper lane balance between the improvement alternatives and the existing American Legion Bridge, the improvement alternatives begin the transition north of Route 267/I-495 Interchange. Transitions are designed such that lane drops and or pickups meet current AASHTO and VDOT geometric design guidelines and traffic operation requirements.

The Maryland State Highway Administration (MSHA) is currently studying transportation improvements to the Beltway in Maryland. Potential improvement options include the addition of HOV or express toll lanes to the Beltway, new transit alignments, and transportation system management/transportation demand management (TSM/TDM) strategies. Representatives from VDOT and MSHA continue to maintain close coordination to ensure compatible studies and designs. MSHA is currently in the alternatives analysis phase of the study. A Draft EIS may be issued in 2005.

23. The project does not consider the connection to the "mixing bowl" (Springfield Interchange). (1 commentor)

Connection to the Springfield Interchange, the logical terminus for this project, was considered during this study. The purpose and need for the Capital Beltway Study included improving system linkage, primarily by improving regional HOV connectivity. All of the build alternatives for the Capital Beltway would connect to HOV elements proposed as part of Phase VIII of the Springfield Interchange. Upon the completion of the Springfield Interchange project, all the merges will have been finished and the new interchange would meet or exceed current minimum AASHTO and VDOT standards.

B.6 ENVIRONMENTAL IMPACTS

General Environmental

1. The project should minimize environmental impacts. (8 commentors and 1 petition with 282 signatures)

In response to the comments from the public and local governments, VDOT conducted additional study of the build alternatives presented in the Draft EIS to minimize impacts and reduce costs. As shown in Table 2-5 in the Final EIS, implementation of the Preferred Alternative would result in far fewer environmental effects than the Candidate Build Alternatives studied in the Draft EIS.

2. Will the expansion of the Beltway lead to increased air pollution and negative health effects? (5 commentors)

Expansion of the Beltway will not lead to increased air pollution or negative health effects. As illustrated in Section 4.6 of the Final EIS, overall air quality will be improved under any of the build alternatives in comparison with a no-build scenario. Likewise, the project cannot be approved by FHWA until it is part of a CLRP that has been found to conform to the State Implementation Plan for the region, which has been developed to address the regional air quality problems.

Land Use

4. Changes to existing land use at transit stops, which include higher density mixed-use land use concentrated around transit stations with pedestrian and bicycle design elements are needed to solve regional transportation problems. (8 commentors)

Fairfax County implemented such changes to its Comprehensive Plan in support of the planned transit stations in Tysons Corner and along the Dulles Toll Road for Dulles Corridor Rapid Transit Project.

5. Secondary development or "sprawl" needs to be contained by local jurisdictions through control of land use development that is better coordinated with transportation decisions (e.g. forcing developers to provide transportation infrastructure with developments and selectively prohibiting new development). (5 commentors)

Control of land development is within the authority of local governments and generally is accomplished through land use planning and zoning functions. Local governments have authority over development approval and in some cases may require developers to provide additional infrastructure or funding for improvements as a condition of approval for new development.

6. Widening the Beltway will lead to more "sprawl" (low-density, single use) development. (4 commentors)

The Beltway Corridor is already very heavily developed. In fact, complete build out is expected by 2020 with or without the project. Because most Beltway traffic is locally generated, improvements to the Capital Beltway would likely promote reinvestment in already developed areas currently planned for growth, such as Merrifield and Tysons Corner.

7. Aerial photography of the study area is not current. Recent developments are not shown in the photography and were not considered due to the date of the photography. (2 commentors)

Aerial photography for the study area reflects conditions in the Fall of 1998 when the study initiated. Additional development that occurred after the aerial photographs were prepared was accounted for in the analysis presented in the Draft EIS.

Recent developments were identified and considered based on review of approved developments available from Fairfax County. These developments were verified by field inspections to fully assess the existing development status. These updates were included in the project plan sheets which were used for the engineering design and impact assessment. Plans for future development in the study area were also considered through a review of the County's comprehensive plans, as well as meetings with local property owners and developers.

8. Each of the build alternatives in the Draft EIS would diminish the prospects for achieving the mixed-use environment near the potential Tysons Central Rail Station by taking away some of the areas closest to that station that are available for pedestrian friendly development and redevelopment. (1 commentor)

The proposed site for the Tysons Central Rail Station is located on the north side of Route 123, between Tysons Corner and Tysons Galleria malls. It would be located on parcels that are currently undeveloped. The area that would be required for Beltway improvements from these parcels is very small and would have a minor effect on the proposed station design.

9. The EIS needs to include an analysis of the interrelated effects of combining road improvement scenarios with alternative transportation modes and alternative land use patterns. (1 commentor)

The Draft EIS was prepared using the best analysis of existing and future land use patterns available. Local comprehensive plans and projections for future population and employment growth, based on data produced by Fairfax County and the Metropolitan Washington Council of Governments (MWCOG), was used to predict future land use. To avoid limitless future land use alternatives, VDOT has only considered the approved land use plans provided by MWCOG and Fairfax County. Alternatives involving alternate land use patterns are beyond the ability of FHWA and VDOT to implement and as such are not considered reasonable.

The Transportation Coordinating Council (TCC) of Northern Virginia and the Virginia Department of Transportation (VDOT) published a study entitled, "Alternative Transportation and Land Use Activity Strategies Study" in March 2001. That study includes an analysis of the relationship between land use and transportation in northern Virginia and discusses several methods for coordinating land use and transportation decisions.

Right-of-way / Displacements / Property Values

10. The Draft EIS involves the replacement of the Barbour Road bridge at a new location that would displace several homes. Please explain why the bridge is proposed on a new location and cannot be built in the same location. (8 commentors + 1 petition with 282 signatures)

Since publication of the Draft EIS, design revisions have been made to each of the I-66 interchange concepts. Under the original design concepts, the Barbour Road bridge was to be replaced to accommodate the widening of I-66 beneath it. As a result, five residences on Barbour Road would be displaced. Under the interchange design selected as part of the Preferred Alternative, widening of I-66 transitions down to the existing roadway width before reaching the Barbour Road bridge alleviating the need for widening of the bridge structure. Under the Preferred Alternative the residences along Barbour Road would no longer be displaced.

11. The Draft EIS specifically identifies the Gannett headquarters property on page 4-77 and states that new development is not expected to contribute to the cumulative effects of the project. The project, specifically concepts B and E result in additional ROW requirements that have a number of negative impacts, including impacting the existing service drive between the parking structure and Dulles Toll Road, the fire lane, existing landscaping that provides a barrier to the beltway, and a storm water management pond owned by the West Group. (3 commentors)

The Preferred Alternative does not impact the service drive, the fire lane, or the storm water management pond and the impact on the landscaping has been significantly reduced. However, a small sliver of the property will need to be acquired (less than 500 square feet).

12. The Capital One Corporation's headquarters is currently under development and under construction. The building is worth approximately 150 million dollars. Interchanges, which affect these buildings, would drive up Beltway project acquisition costs considerably. (2 commentors)

The Preferred Alternative will not affect this building or the parcel it sits on.

13. If the project negatively impacts my property, through increased noise or visual impact and doesn't involve a taking will I be compensated in some way? (2 commentors)

The noise and visual effects of the Preferred Alternative and any necessary mitigation measures are identified in Sections 4.7 and 4.8 of the Final EIS. If it is determined that noise or visual impacts will result from implementation of a specific alternative, mitigation or enhancement measures such as sound barriers ("noise walls") will be considered to reduce or avoid adverse environmental impacts.

14. Has the study team considered the effect of the project on removing low cost housing and how those people displaced will find affordable housing? (2 commentors)

In response to the comments from the public and local governments, VDOT conducted additional study of the build alternatives presented in the Draft EIS to minimize impacts and reduce costs. As a result, several apartment buildings with moderately priced rents will no longer be impacted by the project.

VDOT tries to minimize any inconveniences caused by relocation. VDOT's goal is to offer displaced people the opportunity to relocate to a comparable replacement home. The replacement house must meet certain standards—including state and local building, plumbing, electric, housing, and occupancy codes. VDOT appraises the property to be acquired at market value. If replacement housing cannot be found for that value, then additional money (a Relocation Housing Payment) is made available, provided it is spent in the acquisition of replacement housing.

Based on a review of real estate advertisements, observation of for-sale signs, and the ongoing construction of new homes in the area, replacement housing is available that is similar to the housing stock which would be displaced if the Preferred Alternative is implemented.

15. The proposed connection and exit ramps from I-495 to I-66 would take property affecting the Iliff Nursing and Rehab Center and the Renaissance Pediatric Unit. Have access and egress for emergency vehicles and County school buses, both of which come into the facility on a daily basis been considered? (1 commentor)

Access to the property is provided by Iliff Drive to Ithaca or Sanburg Street, all of which are located north or west of the property. Access and egress to the Iliff Nursing and Rehabilitation Center and Renaissance Pediatric Unit will not be affected under the Preferred Alternative. The impacts to this property were eliminated as a result of public comments regarding the degree of impacts to the social environment.

16. Table 4.2 of the Draft EIS shows 39 residences being lost in the Tysons Corner area. It is not clear where the affected residences are. The EIS should state the location of these residences. (1 commentor)

The Draft EIS consisted of two volumes. The second volume contained plan sheets (on aerial photographs) which reflected the engineering designs for each alternative. The Volume II sheets indicated the proposed right-of-way lines for each of the Candidate Build Alternatives and thus provided the reader with an indication of which properties are directly affected. The actual calculation of direct impacts such as residences lost were determined from the detailed engineering plans and reported in the Draft EIS. Detailed right-of-way plans with potentially displaced residences indicated were available at the public hearings. These plans were accompanied by an index of actual street addresses. Following the public hearings, these large scale maps were available for review at VDOT's Northern Virginia District Right-of-Way office.

17. If my house is condemned, will I be able to stay in that area so my kids can attend the same school? (1 commentor)

VDOT tries to minimize any inconveniences caused by relocation. VDOT's goal is to offer displaced people the opportunity to relocate to a comparable replacement home. The replacement house must meet certain standards—including state and local building, plumbing, electric, housing, and occupancy codes. VDOT appraises the property to be acquired at market value. If replacement housing cannot be found for that value, then additional money (a Relocation Housing Payment) is made available, provided it is spent in the acquisition of replacement housing. Since the Draft EIS, relocation impacts have been substantially reduced.

18. What will happen to the power station and power lines off Gallows Road if 495 is widened? (1 commentor)

The substation and towers at the Gallows Road Interchange will not be affected under the Preferred Alternative.

Air Quality

19. The Draft EIS claims that the build alternatives will not worsen air quality. How is this possible, if capacity is increased while congestion remains the same? (5 commentors)

In general terms, while a widened Beltway will have a higher volume of vehicles, it will not necessarily lead to more overall vehicles on the roadway network in the northern Virginia area. When widened, the Beltway will allow for shorter overall commutes for vehicles and a reduction in the number of vehicles accessing side streets to cut through neighborhoods. A wider Beltway would allow vehicles to reach destinations in a shorter amount of time, translating to lesser amounts of pollution. Likewise, an increase in vehicles in the corridor doesn't necessarily translate to more pollutants. With improvements in technology and increases in vehicle control the amount of pollutants being emitted by mobile sources is decreasing.

More specifically, the project-specific atmospheric concentrations of carbon monoxide (CO), the predominant pollutant emitted from gasoline-powered motor vehicles, were determined for the ten closest worst-case roadside sites in the Beltway Corridor for the base (existing year) conditions, the No-Build Alternative, the three Candidate Build Alternatives, and the Preferred Alternative. Worst-case assumptions and inputs were used in the analysis, including peak hour traffic volumes. The estimated CO concentrations were found to be well below the National Ambient Air Quality Standards (NAAQS) 35 parts per million (ppm) for one-hour concentrations and 9 ppm for eight-hour concentrations. As demonstrated in Table 4-6b in the Final EIS, CO concentrations for the Preferred Alternative will improve at 9 of the 10 sites when compared to existing conditions. Future congestion under the Preferred Alternative (or any of the Candidate Build Alternatives studied as part of the Draft EIS) would be much less than in the No-Build Alternative although, as acknowledged, it would be similar when compared to existing conditions. Therefore, while "congestion will remain the same" and as such "not worsen air quality", under the No-Build Alternative, congestion will be worse than existing conditions in the design year leading to worse air quality.

20. All three of the build alternatives would have enormous effects on air pollution with minimal improvement to capacity. (1 commentor)

See the previous response.

The vehicle and person-carrying capacity of the Beltway will increase substantially with the implementation of the Preferred Alternative. Although a wider Beltway will have a higher volume of vehicles, it will not necessarily lead to more overall vehicles on the roadway network in the northern Virginia area. When widened, the Beltway will allow for shorter overall commutes for vehicles and a reduction in the number of vehicles accessing side streets to cut through neighborhoods. A wider Beltway would allow vehicles to reach destinations in a shorter amount of time, translating to lesser amounts of pollution.

21. The project does not conform to the SIP – particularly the new 8-hour ozone and $PM_{2.5}$ SIP. Which configuration is included in which conforming air quality control plan? (1 commentor)

The Preferred Alternative (the addition of two lanes in each direction on the Capital Beltway for HOT and HOV use) has been included in the current CLRP (FY 2005) and TIP (FY 2006-2011) and the Capital Region's Transportation Planning Board (the MPO for the Washington, D.C. Metropolitan Area) conducted a conformity assessment for the 8-hour ozone standard. TPB's conformity determination was reviewed by the EPA in accordance with the procedures and criteria of the Transportation Conformity Rule. Based on their review, EPA determined that TPB's 8-hour ozone conformity assessment meets the requirements of the Clean Air Act and the applicable regulations promulgated under 40 CFR Part 93. On December 21, 2005, FHWA and FTA jointly found the 2005 CLRP and FY 2006-2011 TIP for the Washington, D.C. Metropolitan Area to be in conformance with the Transportation Conformity Rule for the 8-hour ozone standard. The TPB also recently completed a conformity assessment of the 2005 CLRP and FY 2006 -2011 for fine particles ($PM_{2.5}$ direct and precursor NOx emissions). Their assessment demonstrates that the estimated levels of fine particles for the 2010, 2020, and 2030 analysis years of the CLRP and TIP will be well below the 2002 base year levels of $PM_{2.5}$ and NOx emissions. EPA has determined that TPB's $PM_{2.5}$ conformity assessment meets the requirements of the Clean Air Act and the applicable regulations promulgated under 40 CFR Part 93. On February 21, 2006, FHWA and FTA jointly found the 2005 CLRP and FY 2006-2011 TIP for the Washington, D.C. Metropolitan Area to be in conformance with the Transportation Conformity Rule for the $PM_{2.5}$ standard.

On February 23, 2006, EPA signed the *Final Rule on $PM_{2.5}$ and PM_{10} Hot-Spot Analyses in Project-level Transportation Conformity Determinations for the New $PM_{2.5}$ and Existing PM_{10} National Ambient Air Quality Standards* and submitted it for publication in the Federal Register. The new rule requires a hot-spot analysis for projects in $PM_{2.5}$ nonattainment areas that are "of air quality concern," effective April 5, 2006. Quantitative analyses are not required for projects "of air quality concern" until EPA releases the next version of their motor vehicle emissions factor model, MOVES, which will provide the level of detail needed for credible and meaningful hot-spot analysis. However, in the interim, qualitative analyses will be required. A $PM_{2.5}$ qualitative analysis will be prepared for this project pending the release of guidance on $PM_{2.5}$ qualitative analyses and the opportunity to review and incorporate those requirements into the project development process. Since a Record of Decision will not be issued by April 5, 2006 for this project, a hot-spot analysis will need to be prepared and a project-level conformity determination made before FHWA can take any approval action on the project.

The proposed improvements are not expected to interfere with attainment or maintenance of the NAAQS. Additional details on the air quality analysis are provided in the *Air Quality Technical Report*.

22. Contrary to the statement on page 4-78 of the Draft EIS, air quality is not improving. Since 1990, the Washington metropolitan region has exceeded the one-hour ozone standard six days every summer. Federal law permits an average of one exceedance per summer at a monitor location. The EPA's Air Quality Index (AQI) reports that the region's air quality has degraded as measured by the number of unhealthful air days. The fluctuations of the AQI can hardly be shown as a trend. The study does not discuss how any options will move the metropolitan area into attainment status and achieve cleaner air. (1 commentor)

Nationwide, atmospheric levels of all four pollutants to which motor vehicles contribute significantly—ozone, carbon monoxide, airborne Pb, and nitrous oxides—have declined consistently for almost two decades, and violations of the NAAQS for airborne lead, carbon monoxide, and nitrogen dioxide have been virtually eliminated. Controlling ground-level ozone has proven more challenging, but violations of the federal ozone standard have also been sharply reduced. Most of the reduction in atmospheric concentrations of these pollutants can be attributed to tighter emissions standards for cars and trucks, point source controls, federal programs to reduce pollution such as Tier I and II controls, the use of reformulated gasoline and other cleaner burning fuels, etc. These reductions have occurred despite the increasing population, gross domestic product, and vehicle miles traveled.

A similar trend has occurred at the regional level. Air quality in the metropolitan Washington region is improving for each of the criteria pollutants listed above. Today, the region is meeting five of the six standards with ample margins. Ground-level ozone is the one pollutant for which the region has not yet reached the federal health standard, although the number of days exceeding the standard each year has been decreasing over the past two decades. This trend reflects the underlying direction of improving ozone air quality and is not due only to some favorable change in weather conditions that can also influence ozone levels.

Although a wider Beltway will have a higher volume of vehicles, it will not necessarily lead to more overall vehicles on the roadway network in the northern Virginia area. When widened, the Beltway will allow for shorter overall commutes for vehicles and a reduction in the number of vehicles accessing side streets to cut through neighborhoods. A wider Beltway would allow vehicles to reach destinations in a shorter amount of time, translating to lesser amounts of pollution.

23. The effects of hazardous air toxics were not considered, and are likely to expose children at Stenwood Elementary School to unhealthy air quality, due to the removal of 120 feet of buffer. (1 commentor)

Under the revised designs for the Preferred Alternative, no land will be taken from Stenwood Elementary School. However, to address the larger issue of exposure to hazardous air toxics, the following is provided—the reader should note that most of this information is extracted directly from Chapters 3 and 4 of the Final EIS. The discussion is applicable to all developed sections along the existing Beltway, as well as adjoining roadways (I-66 in the case of Stenwood Elementary) where sensitive receptors are present. As described in Sections 3.6.3 and 4.6.3, motor vehicles emit several pollutants that the EPA classifies as probable human carcinogens. Some toxic compounds are present in gasoline and are emitted to the air when gasoline evaporates or passes through the engine unburned. Other toxic compounds are formed as a by-product of incomplete combustion or through secondary reactions in the atmosphere.

The emissions that come from mobile sources (e.g., cars, trucks, buses) are highly dependent on the fuel that powers them. Therefore, the EPA implemented regulations for mobile sources that are aimed at controlling the emissions of air toxics through changes to fuel compositions and improving vehicle technology and performance. Examples of such changes include: reformulated gasoline and anti-dumping standards; national low emission vehicle (NLEV) program; Tier 2 motor vehicle emissions and gasoline sulfur control requirements; inspection and maintenance programs, on-board diagnostics, and heavy-duty engine and vehicle standards; and on-highway diesel fuel sulfur control requirements. In developing the March 29, 2001 final rule, *Control of Emissions of Hazardous Air Pollutants from Mobile Sources*, EPA found that refineries were producing gasolines that were cleaner than required by prior gasoline toxic emissions standards (i.e., they were "overcomplying"). EPA issued new gasoline toxic emissions standards designed to perpetuate this overcompliance. Now, the annual average toxics performance level of gasoline produced or imported beginning in 2002 must be at least as clean as the average performance level of the gasoline produced during the baseline period 1998 - 2000.

Since the draft Environmental Impact Statement was approved for public availability in 2002, FHWA, through consultation with the EPA, has issued interim guidance on addressing mobile source air toxics in NEPA documents. This guidance, released on February 3, 2006, establishes a three-tiered approach to addressing mobile source air toxics in NEPA documents depending upon the scope of the project and its stage of development. In accordance with this guidance, this EIS includes a basic qualitative analysis of the likely mobile source air toxic emission impacts of the alternatives compared to the no-build scenario. However, available technical tools do not enable us to predict the project-specific health impacts of the emissions associated with each alternative in this EIS. Although EPA has established a list of mobile source air toxics, it has not established that emissions of these compounds present health risks, nor has it established standards or measures of concentrations of these compounds such that one could conclude that a particular project will have an adverse health effect on the public. Due to these limitations, the following discussion is included in the EIS while acknowledging CEQ's regulations (40 CFR 1502.22(b)) regarding incomplete or unavailable information.

There are six air toxics that are of primary concern when it comes to mobile source air toxic emissions, and they are commonly referred to as the six priority mobile source air toxics. These six priority mobile source air toxics include acetaldehyde, acrolein, benzene, 1,3-butadiene, diesel particulate matter, and formaldehyde. Effectively evaluating the environmental and health impacts from the six priority mobile source air toxics on a highway project such that the information could be used to make an informed decision would involve several key elements, including emissions modeling, dispersion modeling in order to estimate ambient concentrations resulting from the estimated emissions, exposure modeling in order to estimate human exposure to the estimated concentrations, and then final determination of health impacts based on the estimated exposure. Each of these steps is encumbered by technical shortcomings or uncertain science that prevents a more complete determination of the mobile source air toxic health impacts of this project and in turn, prevents FHWA from considering this information with any degree of confidence when making a decision on the project.

Emissions. The EPA tools to estimate mobile source air toxic emissions from motor vehicles are not sensitive to key variables determining emissions of mobile source air toxics in the context of highway projects. While MOBILE 6.2 is used to predict emissions at a regional level, it has limited applicability at the project level. MOBILE 6.2 is a trip-based model--emission factors are projected based on a typical trip of 7.5 miles, and on average speeds for this typical trip. This means that MOBILE 6.2 does not have the ability to predict emission factors for a specific vehicle operating condition at a specific location at a specific time. For particulate matter, the model results are not sensitive to average trip speed, although the other mobile source air toxic emission rates do change with changes in trip speed. Also, the emissions rates used in MOBILE 6.2 for both particulate matter and mobile source air toxics are based on a limited number of tests of mostly older-technology vehicles. Lastly, in its discussions of particulate matter under the conformity rule, EPA has identified problems with MOBILE6.2 as an obstacle to quantitative analysis. Consequently, these deficiencies compromise the capability of MOBILE 6.2 to estimate mobile source air toxic emissions.

Dispersion. The tools to predict how mobile source air toxics disperse are also limited. The EPA's current regulatory models, CALINE3 and CAL3QHC, were developed and validated more than a decade ago for the purpose of predicting episodic concentrations of carbon monoxide to determine compliance with the NAAQS. The performance of dispersion models is more accurate for predicting maximum concentrations that can occur at some time at some location within a geographic area. This limitation makes it difficult to predict accurate exposure patterns at specific times at specific highway project locations across an urban area to assess potential health risk. The NCHRP is conducting research on best practices in applying models and other technical methods in the analysis of mobile source air toxics. This work also will focus on identifying appropriate and more effective methods of documenting and communicating mobile source air toxic impacts in the NEPA process and to the general public. Along with these general limitations of dispersion models, FHWA is also faced with a lack of monitoring data in most areas for use in establishing project-specific mobile source air toxic background concentrations.

Exposure Levels and Health Effects. Finally and probably most important, even if emission levels and concentrations of mobile source air toxics could be accurately predicted, shortcomings in current techniques for exposure assessment and risk analysis preclude us from reaching meaningful conclusions about project-specific health impacts. Exposure assessments are difficult because it is difficult to accurately calculate annual concentrations of mobile source air toxics near roadways, and to determine the portion of a year that people are actually exposed to those concentrations at a specific location. These difficulties are magnified for 70-year cancer assessments, particularly because unsupportable assumptions would have to be made regarding changes in travel patterns and vehicle technology (which affects emissions rates) over a 70-year period. There are also considerable uncertainties associated with the existing estimates of toxicity of the various mobile source air toxics, because of factors such as low-dose extrapolation and translation of occupational exposure data to the general population. Because of these shortcomings, any calculated difference in health impacts between alternatives is likely to be much smaller than the uncertainties associated with calculating the impacts. Consequently, the results of such assessments would not be useful to decision makers, who would need to weigh this information against other project impacts that are better suited for quantitative analysis.

Research into the health impacts of mobile source air toxics is ongoing. For different emission types, there are a variety of studies that show that some either are statistically associated with adverse health outcomes through epidemiological studies (frequently based on emissions levels found in occupational settings) or that animals demonstrate adverse health outcomes when exposed to large doses.

Exposure to toxics has been a focus of a number of EPA efforts. Most notably, the agency conducted the National Air Toxics Assessment (NATA) in 1999 to evaluate modeled estimates of human exposure applicable to the county level. While not intended for use as a measure of or benchmark for local exposure, the modeled estimates in the NATA database best illustrate the levels of various toxics when aggregated to a national or State level.

The EPA is in the process of assessing the risks of various kinds of exposures to these pollutants. The EPA Integrated Risk Information System (IRIS) is a database of human health effects that may result from exposure to various substances found in the environment. The IRIS database is located at http://www.epa.gov/iris. The following toxicity information for the six priority mobile source air toxics was taken from the IRIS database *Weight of Evidence Characterization* summaries. This information is taken verbatim from EPA's IRIS database and represents the Agency's most current evaluations of the potential hazards and toxicology of these chemicals or mixtures.

- **Benzene** is characterized as a known human carcinogen.
- The potential carcinogenicity of **acrolein** cannot be determined because the existing data are inadequate for an assessment of human carcinogenic potential for either the oral or inhalation route of exposure.
- **Formaldehyde** is a probable human carcinogen, based on limited evidence in humans, and sufficient evidence in animals.
- **1,3-butadiene** is characterized as carcinogenic to humans by inhalation.
- **Acetaldehyde** is a probable human carcinogen based on increased incidence of nasal tumors in male and female rats and laryngeal tumors in male and female hamsters after inhalation exposure.
- **Diesel exhaust** (DE) is likely to be carcinogenic to humans by inhalation from environmental exposures. Diesel exhaust as reviewed in this document is the combination of diesel particulate matter and diesel exhaust organic gases.
- **Diesel exhaust** also represents chronic respiratory effects, possibly the primary noncancer hazard from mobile source air toxics. Prolonged exposures may impair pulmonary function and could produce symptoms, such as cough, phlegm, and chronic bronchitis. Exposure relationships have not been developed from these studies.

There have been other studies that address mobile source air toxic health impacts in proximity to roadways. The Health Effects Institute, a non-profit organization funded by EPA, FHWA, and industry, has undertaken a major series of studies to research near-roadway mobile source air toxics hot spots, the health implications of the entire mix of mobile source pollutants, and other topics. The final summary of this series is not expected for several years and as such, will not be available for use on this project.

Some recent studies have reported that proximity to roadways is related to adverse health outcomes -- particularly respiratory problems. Much of this research is not specific to mobile source air toxics, instead surveying the full spectrum of both criteria and other pollutants. The FHWA cannot evaluate the validity of these studies, but more importantly, they do not provide information that would be useful to alleviate the uncertainties listed above and enable us to perform a more comprehensive evaluation of the health impacts specific to this project.

Because of the uncertainties outlined above, a quantitative assessment of the effects of air toxic emissions impacts on human health has not been made for the project. While available tools do allow us to reasonably predict relative emissions changes between alternatives for large projects, the amount of mobile source air toxic emissions from each of the project alternatives and mobile source air toxic concentrations or exposures created by each of the project alternatives cannot be predicted with enough accuracy to be useful in estimating health impacts. Therefore, the relevance of the unavailable or incomplete information is that it is not possible to make a determination with any certainty whether any of the alternatives would have "significant adverse impacts on the human environment." In lieu of a quantitative assessment, a qualitative assessment of mobile source air toxic emissions relative to the various alternatives has been prepared. While FHWA acknowledges that the project alternatives may result in increased exposure to mobile source air toxic emissions in certain locations, the concentrations and duration of exposures are uncertain, and because of this uncertainty, the health effects from these emissions cannot be estimated.

This qualitative mobile source air toxic analysis focuses on the differences between the two build alternatives for the Capital Beltway and the impact that these differences may have on mobile source air toxic levels in the vicinity of the Capital Beltway. The Final EIS addresses two alternatives, a 10-lane and a 12-lane alternative, which have been reduced substantially in scope in response to comments from the public and Fairfax County following the Location Public Hearings. With the exception of the number of lanes, both of these alternatives are very similar. Both involve widening the existing Capital Beltway for 14 miles in the median, are located on the same alignment, and have the same termini (Interstate I-495 between the Springfield Interchange and the American Legion Bridge). Because of these similarities, the factors that may effect mobile source air toxic emissions and allow one to differentiate between alternatives will be operational characteristics such as vehicle miles traveled (VMT), average daily traffic (ADT) and the level of service which is a reflection of the congestion that each alternative will experience.

In the Final EIS, Table 2-7, which shows the range of daily (peak) demand volumes (vehicles in one direction) in 2020, demonstrates that the daily demand volume for the 10-lane and 12-lane alternatives in the Final EIS will only be 6% and 8% higher, respectively, when compared to the No-Build Alternative while the difference in daily demand volume between the build alternatives themselves will be less than 2%. The increase in daily demand volume over the No-Build Alternative can be expected since the project would increase capacity on the Beltway and attract traffic from the adjacent and parallel arterial routes. This is also desirable since one of the components of the purpose and need for this project is to reduce congestion and increase throughput not only on the Beltway but the adjacent and parallel arterial routes as well, which are currently experiencing congestion due to cut-through traffic trying to avoid congestion on the Beltway. Therefore, to understand the total impact that the build alternatives may have on traffic and air toxics, one has to consider the adjacent road network as well as the mainline. In this case, the 12-lane alternative is the most effective at removing vehicles from the adjacent road network when compared to the 10-lane alternative. Likewise, the preferred alternative would intuitively be more effective than alternatives that would convert a general-purpose lane for use as a HOV or HOT lane. General speaking, alternatives that provide more capacity on the Beltway will be more effective at reducing congestion and increasing throughput on the Capital Beltway as well as the adjacent road network.

When it comes to vehicle throughput, the mainline throughput of the 12-lane alternative is the greatest, accommodating over 20% more when compared to the No-Build Alternative. The 10-lane alternative will have a 13% increase in throughput when compared to the No-Build Alternative. At the on-ramps as well, the 12-lane alternative will have higher throughput since the additional capacity on the mainline will allow vehicles to gain faster entry onto the Beltway and minimize the backups that will form on the ramps and the queues that will form on adjacent streets. The capacity of both the 10-lane and 12-lane alternatives can handle the forecast demand on a daily basis with congestion limited to peak periods of between two and four hours each for the AM and PM peak periods. In contrast, the No-Build Alternative is unable to handle the forecast demand with congestion being experienced throughout the day. Approximately 10,000 vehicles that desire to use the Beltway under the no-build scenario would be forced to find other routes, increasing the amount of cut-through traffic on adjacent streets. This congestion, in turn, will be reflected in the peak hour travel speeds on the Beltway. According to Figure 2-7 in the Final EIS, both the 10-lane and 12-lane alternatives will allow for better travel speeds during peak periods than the No-Build Alternative; there are limited differences in travel speeds between the build alternatives themselves.

In developing the Draft EIS, it was determined that 14 general-purpose lanes would be needed on the Beltway to reduce congestion (defined as non-free flow travel) and achieve an acceptable level of service throughout the day. However, this would have resulted in unacceptable impacts to the natural and human environment in the corridor. Therefore, it was decided that in order to achieve a tradeoff between impacts and benefits, the maximum number of lanes that would be considered for the build alternatives would be 12. Consequently, all of the alternatives that have been considered throughout the course of the EIS, including the two alternatives in the Final EIS, will experience several hours of congestion (see Figure 2-5 in the Final EIS). Compared to the No-Build Alternative, the 10-lane and 12-lane alternatives will have 3 and 5 hours of severe and moderate congestion less than the No-Build Alternative, respectively.

Both the 10-lane and 12-lane alternatives will increase VMT on the Beltway compared to the No-Build Alternative. For example, there will be an 8% and 18% increase in AM peak hour VMT compared to the No-Build Alternative if the 10-lane and 12-lane alternatives are implemented, respectively. Likewise, there will be a 17% and 22% increase in PM peak hour VMT compared to the No-Build Alternative if the 10-lane and 12-lane alternatives are implemented, respectively. In comparing the 10 lane and the 12-lane alternatives, the VMT will be 11% higher for the 12-lane alternative compared to the 10-lane alternative for AM peak hour VMT and 6%

higher for PM peak hour VMT. Although the additional lanes proposed under each of the build alternatives result in an increase in VMT, this increase would be offset by the reduction in VMT on adjacent roadways (see section 2.4.3).

In determining the relevance of these operational characteristics with respect to mobile source air toxics, one must consider a few basic conclusions that a sensitivity analysis of EPA's Mobile6.2 model allows one to make. For example, the highest mobile source air toxic emission factors are associated with lower speeds while the emission factors associated with higher speeds decrease substantially, in comparison, before leveling out at 55 to 65 mph. Closely related to vehicle speed is the type of facility involved. All things being equal, higher emission factors are associated with local streets while lower emission factors are associated with arterial facilities and the lowest emission factors are associated with freeway facilities. The higher the vehicle miles traveled on a freeway, the lower the mobile source air toxic emission factors on a per vehicle mile traveled basis. When VMT is compared between a local road and an arterial facility, mobile source air toxic emission factors from local roads are significantly higher than those from an arterial facility. Finally, the further one goes into the future, the greater the reduction in mobile source air toxic levels that will be realized due to various control programs and improvements in technology. This is reflected in the fact that the highest emission factors in EPA's Mobile6.2 model are associated with the current year while the lowest emission factors are associated with years extending into the future.

Applying these concepts to the Beltway improvements, alternatives that are more effective at reducing congestion and reducing the time that vehicles sit in traffic at lower speeds will produce lower levels of mobile source air toxic emissions than those alternatives that don't. Freeway alternatives that reduce congestion better than other freeway alternatives will produce less mobile source air toxic emissions. Likewise, those alternatives that are more effective at reducing congestion on local streets and the adjacent arterial network by redirecting that traffic to the freeway will produce lower levels of mobile source air toxic emissions. Finally, a forecasted increase in VMT in the design year does not translate to an overall increase in mobile source air toxic levels in the project corridor because it is expected that substantial reductions in air toxics will be achieved over time even with increases in VMT. This is reinforced by EPA's final rule on mobile source air toxics, which concluded that on-highway emissions of benzene, formaldehyde, 1,3-butadiene, and acetaldehyde will be reduced by 67 to 76 percent and on-highway emissions of diesel particulate matter will be reduced by 90 percent between 1990 and 2020 due to existing and proposed control programs. Because EPA has regulated heavy-duty truck emission standards, emissions for heavy-duty on-road trucks are expected to be reduced dramatically between 1998 and 2010 with allowable particulate matter being reduced 98 percent and allowable nitrogen oxide emissions being reduced 97 percent. Applying these trends to the Washington, D.C. region, one could reasonably conclude that if no improvements were made to the capital Beltway and congestion was allowed to worsen while VMT increased at the rate forecasted, it is expected that the region would still realize reductions in air toxics over time.

While the potential exists for there to be localized areas where ambient concentrations of mobile source air toxics could be higher under certain conditions under the build alternatives when compared to the No-Build Alternative, this potential is considered low since the majority of the improvements will occur within the median. While the addition of two lanes in the median to the outer loop, for example, will have the effect of moving traffic closer to the receptors located adjacent to the inner loop, it will also have the converse effect of moving that same traffic further away from the receptors located along the outer loop. Therefore, the resulting effect is one where the potential for increases in mobile source air toxics is offset by potential reductions. The potential for localized impacts has also been made low by the decision to significantly reduce the scope of the project and limit the majority of construction to the existing right-of-way limits. As a result, the relocation impacts associated with the alternatives in the Draft EIS have been reduced from a maximum of 326 homes and businesses to a maximum of 3 homes and businesses for the alternatives in the Final EIS. Likewise, the amount of right-of-way needed has been reduced from a maximum 168 acres to a maximum of 10 acres.

In conclusion and summary, the mobile source air toxic issue is a continuing area of research and a developing issue which at present, is not fully understood to the point that it would allow one to quantify the health effects that the proposed project would have on the surrounding environment. As documented above, the technical capability of quantifying such effects with any degree of confidence are years off. Consequently, the mobile source air toxic issue will not inform the decision makers for this project as it relates to the significance of this issue. Likewise, there are limited differences between the build alternatives included in the Final EIS based on the operational characteristics addressed above. Since mobile source air toxic emissions are sensitive to these operational issues, this limited difference and its impact on air toxics is not expected to have any influence on the selection of an alternative by FHWA. Despite the increase in VMT associated with the preferred alternative, the preferred alternative provides greater benefits in reducing congestion, increasing travel speeds during peak periods, and removing traffic from local streets. When these benefits are taken into account with the reductions in air toxics that are expected over time due to EPA's vehicle and fuel regulations coupled with fleet turnover, the potential of the project to increase mobile source air toxic emissions is low.

24. The Draft EIS does not include information comparing emissions generated by gridlock at peak hours, nor is there a comparison of emissions with that of a rail transit option. (1 commentor)

Carbon monoxide is the only automotive-related pollutant emission that is modeled on a project-specific basis. The other pollutants, considered as regional pollutants, are studied by the Metropolitan Washington Council of Governments (MWCOG) for all regionally significant transportation projects included in the Constrained Long Range Plan (CLRP) for the Washington, DC-MD-VA air quality region. This plan includes improvements to the Capital Beltway and the various rail transit improvements programmed throughout the region. Both levels of analyses are based on worst-case conditions.

25. The Draft EIS only presents the results of the air quality modeling analysis without any explanation of the methodology or causes. The EIS should discuss the results and explain why the results come out the way they do. (1 commentor)

The air quality modeling analysis methodology is summarized in the Draft EIS and described in more detail in the Air Quality Technical Report. As noted above, carbon monoxide is the only automotive-related pollutant that is modeled on a project-specific basis. The other pollutants are addressed on a regional level by the Metropolitan Washington Council of Governments. Section 4.6 of the Final EIS was revised to describe in more detail how an air quality analysis is conducted for transportation projects.

Water Quality

26. The Draft EIS mentions the loss of wetlands, floodplains, and streambeds, but does not attempt to assess the magnitude of those impacts, particularly to water quality. The EIS should include a quantitative analysis of impacts to water quality so that water quality impacts can be considered in choosing an alternative, not just to help the Army Corps of Engineers levy compensation requirements. (1 commentor)

Implementation of currently required quantitative and qualitative treatment techniques prescribed by the VDOT Drainage Manual and VDOT Erosion and Sedimentation Control and Stormwater Management (ESC & SWM) Manual will ensure that the proposed project meets the requirements established by both state and Federal water pollution prevention regulations. These features are designed and analyzed for effectiveness during the development of final roadway design plans. It is expected that quality and quantity treatment of runoff associated with the Preferred Alternative will result in an overall improvement in quantity management and more effective pollutant removal capabilities beyond what is presently occurring in the local watershed. The Natural Resources Technical Report provided a summary of the existing water quality in the project area from available sources.

Existing water quality in most of the project area has been negatively affected by past discharges to receiving waters. Much of the proposed impacts to surface waters occur from currently untreated road runoff. With the required construction of both temporary and permanent stormwater controls in accordance with current BMPs, it is likely that water quality would actually improve over existing conditions. This is primarily due to the fact that much of the Beltway infrastructure was in place prior to enactment of the Chesapeake Bay Protection Act in 1988.

27. The EIS does not discuss stormwater management from Beltway runoff. The EIS should be revised to discuss how stormwater runoff will change under the build alternatives and how stormwater will be managed. (1 commentor)

See the response to Comment #26.

In addition, stormwater management plans will be developed when roadway construction designs are refined and finalized. The Natural Resources Technical Report for the Draft EIS included reported existing water quality to serve as a reasonable assessment for stormwater runoff in existing receiving waters.

28. Concerned about the taking of a portion of the Scott's Run floodplain between Lewinsville Road and Old Dominion Drive. The EIS should describe mitigating designs that could reduce or eliminate this impact or mitigating measures. The EIS should discuss the effect of the build alternatives on flood height. If increased, the EIS should describe the impacts. (1 commentor)

Figure 3-13 of the Final EIS depicts the 100 year floodplains as delineated by the Federal Emergency Management Agency (FEMA) as part of the National Flood Insurance Program. Approximately 5.5 acres of the Scotts Run floodplain would occur between Lewinsville Road and Old Dominion Drive. (A total of 10.42 acres of the floodplain associated with Scotts Run would be affected by the project. See Section 4.11 in the Final EIS.) Most of this longitudinal encroachment is attributed to the fill outside the actual pavement area. These longitudinal encroachments cannot be minimized by bridging because the majority of the encroachment occurs where the floodplains run parallel to the existing roadway and the encroachment is the result of extending the roadbed fill.

Sections 107 and 303 of VDOT's Road and Bridge Specifications require the use of stormwater management practices to address concerns such as post-development stormflows and downstream channel capacity and stability. By adhering to these specifications, changes in pre-existing flood elevations and velocity increases should be nonexistent or minimal. During final design, a detailed floodplain survey and study will be conducted to ensure that the Preferred Alternative poses no downstream flood effects in accordance with state law.

Historic and Archaeological

29. Holmes Run Acres is eligible for the National Register of Historic Places as a Historic District. The Gallows Road improvements are opposed because they represent an adverse affect to this Historic District. The study should properly consider alternatives to adversely affecting this resource. (6 commentors)

The Holmes Run Acres Historic District was surveyed and determined eligible for the National Register of Historic Places (NRHP) for the Capital Beltway Project. Under the Preferred Alternative, the impacts to this historic district were eliminated.

Following the publication of the Draft EIS, revised concepts were studied which would avoid adverse effects to the properties along Gallows Road. The study concluded that encroachment on the Gallows Road historic district could be avoided by eliminating two elements of the proposed widening of Gallows Road. One of these elements is the proposed extension of the exit lane to serve westbound Beltway traffic along the edge of the district. The other is the right-of-way increase, also along the edge of the district. By eliminating these elements from the interchange improvements that are part of the Preferred Alternative, there would be no increase in the shoulder edge or the right-of-way along the district boundary. Likewise, no sound wall would be constructed along the edge of the historic district. Each of these recommendations has been included in the Preferred Alternative.

Hazardous Materials

30. Any decision should consider the possible use of the Beltway for nuclear waste transport to the federal repository at Yucca Mountain that is under consideration. (1 commentor)

The total number of shipments of nuclear waste nationally, of which a small percentage would travel through Virginia, is expected to increase from less than 100 shipments per year to between 300 and 400 shipments per year when the Yucca Mountain storage repository site becomes available. The EIS for the Yucca Mountain repository identified several possible routes for the transport of nuclear waste to Yucca Mountain. The northern Virginia section of the Beltway was not identified as a possible route in the Yucca Mountain EIS.

Since 1964 there have been more than 3,000 shipments of nuclear waste with no injuries, fatalities, or environmental damage attributed to the radioactive nature of the cargo. Transport of materials with a high level of radioactivity, such as nuclear waste shipments, are identified as Highway Route Controlled Quantity and are required to use "preferred routing." Preferred routes are interstate highways that take into account such factors as population density, transit time, time of day, and day of week. Densely populated areas, with high levels of congestion do not meet the criteria for designation as a preferred route.

Noise

31. Concerns about the effectiveness of noise abatement recommendations for Holmes Run Acres. (4 commentors)

Since publication of the Draft EIS, the property acquisitions in the Holmes Run Acres neighborhood have been eliminated. Holmes Run Acres has been determined to be eligible for the National Register of Historic Places. Minimal improvements to Gallows Road are included in the Preferred Alternative. As a result the replacement noise barrier would end before the first house along Gallows Road and it will not restrict access to any driveways.

VDOT will conduct more detailed analysis of all of the proposed noise barriers during the project's final design phase. The final design of each noise wall will take into account both safety and engineering issues. Once the design of a noise wall has been finalized, the affected homeowners will be shown the results and have a chance to vote on whether they favor construction of the noise wall.

32. The Draft EIS contained no separate analysis of the noise impact due to the increase in projected traffic volumes on Gallows Road; the Draft EIS significantly underestimates the impact of noise on the neighborhood; the proposed widening will produce more noise in the neighborhood than the Draft EIS indicates; skeptical about how much protection such a barrier will give to Holmes Run Acres. (4 commentors)

The effects on traffic noise levels due to the proposed improvements to Gallows Road east of the Beltway were evaluated in the noise analysis. The projected noise levels and the potential noise impact in the Holmes Run Acres community reflect the combined effects of the proposed improvements to the Beltway and Gallows Road.

As summarized in Section 4.7 of the Final EIS, the potential noise impact of the proposed improvements for the Capital Beltway Project was assessed in accordance with FHWA and VDOT noise assessment guidelines. All traffic-noise computations for this study were conducted using the latest version of the FHWA Traffic Noise Model (FHWA TNM 1.1), which incorporates state-of-the-art sound emissions and sound-propagation algorithms.

To determine the degree of impact from highway traffic noise on human activity, the Noise Abatement Criteria (NAC) established by the FHWA (23 CFR Part 772) were used. Chapter 2 of the Noise Technical Report provides a detailed summary of the impact criteria that were used, as well as a discussion of terminology used in the noise analysis.

In the Holmes Run Acres neighborhood, traffic noise levels due to the Preferred Alternative approach or exceed the FHWA NAC at distances up to 170 meters (560 feet) from the centerline of the Beltway. Although traffic on the Beltway is now and would be noticeable at locations within the neighborhood that are at greater distances from the highway, noise impact is not expected to occur at these farther distances.

Table 4-11 in the Final EIS indicates that 5 residences in Holmes Run Acres would be “protected” by Barrier 8A under the Preferred Alternative. In addition to these protected properties, another 50 residences would be “benefited” by the proposed noise barrier under the Preferred Alternative. As described in Section 4.7.4 of the Final EIS, a residence is “protected” if it is exposed to design-year noise impact (without a barrier) and would receive at least 5 decibels of noise reduction from a barrier. A residence is “benefited” if it is not exposed to design-year noise impact, but still receives at least 5 decibels of noise reduction from a barrier designed to protect other homes. As shown in Appendix C of the Noise Technical Report, Barrier 8A provides 5 to 12 decibels of noise reduction at protected and benefited homes throughout the neighborhood. To understand the effects of noise reduction, a person with normal hearing would perceive a 5-decibel decrease in sound level as noticeable, while a 10-decibel decrease in sound level would be perceived as half as loud, and a 15-decibel decrease would be perceived as one-third as loud.

33. Opposed to project because there are no firm commitments to construct adequate noise barriers; construction of proper sound barriers for all affected dwellings is not assured (3 commentors)

VDOT’s State Noise Abatement Policy stated that when the abatement criteria contained within that document are satisfied, noise abatement must be provided in conjunction with a Type I highway project. The Capital Beltway Study is a Type I highway project.

VDOT’s policy is consistent with and based upon the Federal regulations, and includes criteria for evaluating the feasibility and reasonableness, or cost-effectiveness, of noise abatement measures. After a project’s final design, but before the submittal of the project’s the Plans, Specifications, and Estimates (P,S&E), any noise barriers that still exceed VDOT’s cost-effectiveness criterion will receive further consideration only if a third party commits to funding the amount in excess of $30,000 per protected home.

A firm commitment cannot be granted at this time because final design activities cannot commence until the Final EIS is completed and traffic will need to be updated in conjuction with final design.

34. Concerns about the design, appearance, and aesthetics of noise barrier walls (3 commentors)

Decisions regarding the construction of noise barriers are made during the final design of the project, once the final roadway location has been determined. During the final design stage of the project, VDOT will hold design public hearings at which the details of the noise barrier design, appearance, and aesthetics will be communicated to the affected citizens. The final decision on potential noise barriers will take into account the opinions of the affected citizens.

In regard to the design of noise barriers, VDOT utilizes a specially designed sound absorptive concrete material for ground-mounted noise walls and a lightweight material (typically perforated metal panels with sound absorptive filler) for structure-mounted noise walls, such as those mounted on bridges and retaining walls. VDOT specifications (*Metric Road and Bridge Specifications*, Section 519.02, January 1997) require that sound barrier panels provide a minimum transmission loss of 23 dB(A) when tested in accordance with ASTM E90. This minimum requirement for the transmission loss, along with other requirements contained in the VDOT specifications, ensure that noise barrier walls are constructed in such a manner and with materials of sufficient quality, such that sound does not “leak” through the barrier.

VDOT utilizes a standard aesthetic finish for noise barrier walls consisting of a raked finish on the residential side and a fluted finish on the highway side of the barrier. Very often, the residential side and highway side of the barrier are different in color. Specific colors used in the noise barrier wall are chosen in conjunction with the affected citizens and the locality during various citizen information meetings. If the affected citizens or the locality requests an aesthetic finish that varies significantly from the cost of the standard finish, VDOT allows these parties to fund the difference. Decisions about barrier aesthetics are made during the final design stage of the project.

35. Concerns about the number of trees that will be cut down to accommodate additional lanes and replacement noise barriers. (2 commentors)

In response to the comments from the public and local governments, VDOT conducted additional study of the build alternatives presented in the Draft EIS to minimize impacts and reduce costs. The Preferred Alternative will result in much less right-of-way acquisition (10 acres versus up to 168 acres) and fewer effects to the surrounding vegetation.

During construction, VDOT encourages contractors to minimize the number of trees that need to be removed to accommodate the improved highway, wherever possible. In general, any trees that need to be removed to accommodate the highway improvements would be limited to those trees that would be within the future right-of-way.

Trees and other types of ground vegetation do have an effect on sound propagation, and in some circumstances may provide noticeable noise reductions. However, for a band of trees to provide a noticeable noise reduction, it would have to be at least 5 meters (15 feet) in height and at least 30 meters (100 feet) in depth. The band of trees also would have to be sufficiently dense such that the highway would not be visible through them from the receiver position. A band of trees such as this would provide approximately 5 decibels of noise reduction, which would be noticeable.

People living near a highway often perceive a noise reduction benefit attributed to trees and foliage. This perception, however, may be more psychological than acoustical. Because trees often provide a visual barrier to a highway, they are perceived as providing an acoustical barrier as well, even when this may not be the case. As described above, a wide band of trees, approximately 30 meters (100 feet) deep, is required to provide a noticeable noise reduction. Although smaller bands of trees also reduce the level of the sound that propagates through them, the reduction is barely noticeable. The acoustical phenomenon that many people experience with smaller bands of trees is that the frequency characteristics of traffic noise are changed as sound propagates through the trees. The higher frequency components of traffic noise are scattered and absorbed by leaves, trunks, and branches, while the low frequency components of the traffic noise propagates nearly unimpeded. This scattering and absorption of the higher frequency components has the effect of making traffic noise seem less “harsh,” and therefore seemingly lower in level.

36. The impact is not sufficiently explained for Timberly and Timberly South communities and no noise barrier is provided for my neighborhood. (2 commentors)

Noise measurements were conducted at a total of 39 sites throughout the entire study area. For the Timberly and Timberly South communities west of the Beltway, a representative noise measurement was conducted at a location referred to as Site No. M28 (see Figure 3-10b and Table 3-14 in the Final EIS).

The noise measurements provide valuable information on existing noise conditions and the effects of terrain and shielding on sound propagation from the highway to noise-sensitive locations. However, they are not the only input to the model used to predict the noise levels. Because existing noise levels are not always measured during the loudest hour of the day, estimates of the existing loudest-hour noise levels were computed with an FHWA-approved noise prediction model using the appropriate traffic data as inputs. These *computed* existing noise levels are then used as the baseline against which probable future noise impact is assessed.

Many additional receivers were added to the 39 measurement sites for the purposes of predicting future noise levels throughout the study area. These prediction sites provide a comprehensive basis for comparing the noise impact due to the three build alternatives. Following VDOT and FHWA-approved procedures, the FHWA’s Traffic Noise Model® (FHWA-TNM) was used for all noise level computations. The FHWA-TNM is a three-dimensional computer model that incorporates state-of-the-art, reality based, sound emissions and sound propagation algorithms, which are based on well-established theory or accepted international standards. The noise modeling takes into account the design of the road, the topography of the surrounding area, the distance between the road and nearby properties, the acoustical shielding provided by rows of buildings and other structures, sound propagation over different types of ground, traffic volumes and speeds, and vehicle mix including the percent of medium and heavy trucks. Traffic noise levels were computed for the loudest hour of the day for existing conditions as well as the design-year No-Build and build alternatives.

The numbers of residences exposed to noise impact along the Beltway between the Dulles Toll Road and Georgetown Pike are summarized in Table 4-9 in the Final EIS. Following VDOT and FHWA procedures, the feasibility and reasonableness of noise barriers was evaluated everywhere noise impact is expected to occur. Because noise impact is expected to occur in Timberly and Timberly South under the Preferred Alternative, Noise Barrier 13B was evaluated for this neighborhood.

As described in Section 4.7.4 of the Final EIS, the estimated cost per home for Barrier 13B exceeds VDOT's cost criterion. However, it should be noted that the results of this noise barrier evaluation are preliminary and are intended to indicate the need for abatement and the potential for constructing noise barriers for impacted properties. During the project's final design phase, this barrier area will be re-evaluated based on the latest roadway design and traffic data, and the barrier dimensions will be fine-tuned and finalized. Upon the completion of the final design, should the cost of Noise Barrier 13B still exceed VDOT's cost-effectiveness criterion, it will receive further consideration only if a third party funds the amount in excess of $30,000 per home protected.

37. Concerns that potential barriers cost more than VDOT limit (2 commentors)

As described in the Federal regulations (FHWA, "23 CFR Part 772: Procedures for Abatement of Highway Traffic Noise and Construction Noise Final Rule," Federal Register, Vol. 47, No. 131, 8 July 1982), before the adoption of an Final EIS or a Finding of No Significant Impact (FONSI), noise abatement measures that are found to be reasonable and feasible and that are likely to be incorporated in the project must be identified. Federal funding is available for noise abatement provided a traffic noise impact has been identified; the noise abatement measures will reduce the traffic noise impact, and "the overall noise abatement benefits are determined to outweigh the overall adverse social, economic, and environmental effects and the costs of the noise abatement measures."

Reasonableness takes into account the cost of the noise abatement measure. If a noise abatement measure is found to meet VDOT's cost-effectiveness criterion of $30,000 per dwelling unit protected, project funds will be used for its construction. During the project's final design phase, this barrier area will be re-evaluated based on the latest roadway design and traffic data, and the barrier dimensions will be fine-tuned and finalized. Upon the completion of the final design, should the cost of Noise Barrier 13A still exceed VDOT's cost-effectiveness criterion, it will receive further consideration only if a third party funds the amount in excess of $30,000 per home protected.

38. Noise barriers should be built anywhere they have not been built (1 commentor)

Section 4.7.4 of the Final EIS describes the procedures which were used to identify the locations of potential noise barriers throughout the study area. FHWA and VDOT procedures require the evaluation of noise abatement measures wherever noise impact is expected to occur. Due to the extent of future noise impact along the Beltway, noise barriers were evaluated to mitigate these impacts. As shown in Figures 4-3a through 4-3d of the Final EIS, these barriers extend along nearly the entire length of the study area along both sides of the Beltway. These potential noise barriers, including barriers that exceed the cost-effectiveness criterion, would benefit over 5,000 residences and other noise-sensitive land uses. Note that during final design, any noise barriers that still exceed VDOT's cost-effectiveness criterion would receive further consideration only if a third party funds the amount above $30,000 per home protected. In addition, noise barriers were found to be infeasible at several locations (see Section 4.7.4 of the Final EIS). No apparent solutions are available to mitigate these impacts.

39. Concerns about Noise Barrier 9A for the Merrifield area (1 commentor)

Traffic noise impact is expected to extend as much as 150 meters (500 feet) into the area of Merrifield known as Dunn Loring Village, as a result of the proposed improvements to I-66 that are included as part of the Beltway study. Following FHWA and VDOT guidelines, noise abatement measures must be evaluated wherever noise impact is expected to occur. Consequently, Barrier 9A was evaluated to mitigate the potential noise impact in Dunn Loring Village. This new barrier would have a uniform height of approximately 3 meters (10 feet), would be approximately 712 meters (2,235 feet) long, and would protect 116 residences exposed to noise impact with each of the proposed build alternatives.

Barrier 9A would be located within VDOT's proposed right-of-way for the Capital Beltway Study, which generally follows the existing right-of-way in this area. The existing right-of-way is approximately 10 to 35 meters (33 to 115 feet) from the first row of townhouses in Dunn Loring Village.

40. Why there is no noise abatement along the south side of the Beltway from Telegraph Road to the Richmond Highway. (1 commentor)

The project limits for the Capital Beltway Study extend from Backlick Road in the south to the American Legion Bridge in the north. The Huntington community lies outside the project limits, and was not considered in this study.

41. Noise level now is great; can't imagine what it would be like with more lanes of traffic. (1 commentor)

In general, traffic noise levels are expected to increase under the Preferred Alternative. Table 4-7 in the Final EIS summarizes the computed traffic noise levels at representative noise prediction sites. Design-year traffic-noise levels are expected to increase by 1 to 13 decibels with the Preferred Alternative. Appendix A in the Nose Technical Report includes a discussion of the fundamentals of acoustics, including a brief discussion on how human beings perceive changes in sound pressure levels. Human beings perceive a 3-decibel increase in sound level as *barely perceptible*, a 5-decibel increase as *noticeable*, and a 10-decibel increase as *twice as loud*.

42. Noise impact on surrounding areas will increase with additional lanes; light rail would have overall lower noise level (1 commentor)

Design-year noise levels in areas surrounding the Beltway are expected to increase over existing noise levels as a result of the project. The amount of the sound level increase varies with location along the Beltway Corridor. Along the Corridor, different neighborhoods would experience different noise level increases because some neighborhoods have existing noise barriers that would be removed (and then replaced) as a result of the widening while other neighborhoods do not. Distance from the highway also affects the amount of increase a neighborhood would experience. In general, neighborhoods close to the highway, where noise from the Beltway is clearly the dominant source, would experience greater increases in noise levels than neighborhoods farther from the highway, where noise from sources other than the Beltway may dominate. Other factors that affect the amount of noise level increase that an area would experience include variations in the projected traffic volumes between alternatives, as well as variations in highway geometry and lane configuration between alternatives.

The noise effects of light rail transit alternatives were not evaluated in this study; such an assessment was beyond the scope of the project as defined at the outset. Although not considered in this study, the addition of a light rail transit line in lieu of more highway lanes could result in lower noise levels along the project corridor. Note that this general statement includes an assumption that the light rail alternative would be located along the median of the highway. Based on this assumption and depending upon the projected operations data for the peak hour, light rail transit could have a negligible effect on hourly noise levels. Under certain circumstances, however, projected noise levels from a light rail alternative could have a greater effect on hourly noise levels, particularly if the light rail alternative were located outside the highway right-of-way.

43. Concerns about noise barrier for Falls Hill area (1 commentor)

Existing barriers along I-66 east of the Beltway would not be removed under the Preferred Alternative. Noise barriers 9F, 10E, and 10F were evaluated to mitigate the projected noise impacts in neighborhoods along I-66 from Virginia Lane to Barbour Road that would result from several of the Candidate Build Alternatives considered in the Draft EIS. However, these homes are outside the project improvement area for the Preferred Alternative.

44. Adequate mitigation to extend down exit ramps (1 commentor)

Following FHWA and VDOT guidelines, noise barriers were evaluated everywhere noise impact is expected to occur as a result of the proposed improvements to the Capital Beltway. Due to the extent of future noise impact along the Beltway, noise barriers were evaluated to mitigate these impacts. In some cases, noise barriers would extend down exit ramps, and in other cases noise barriers would be located on fly-over ramps and bridges. The height, length, and location of all potential noise barrier walls were determined with the goal of providing substantial noise reductions at noise-sensitive properties exposed to noise impact.

45. The $30,000 per dwelling is artificially low; the height of the sound barrier for the Timberly South neighborhood is inadequate. (1 commentor)

FHWA regulations allow State highway agencies some flexibility in determining the reasonableness, or cost-effectiveness, of noise abatement measures. FHWA suggests that an acceptable cost per residence expenditure should be within the range of $15,000 to $50,000 per residence [*Highway Traffic Noise Analysis and Abatement; Policy and Guidance,* U.S. Department of Transportation, Federal Highway Administration, Office of Environment and Planning, Noise and Air Quality Branch, Washington, D.C., June 1995]. VDOT's cost-effectiveness criterion falls near the middle of the suggested range, and is based on VDOT's experience with noise barrier construction trends across the Commonwealth over the past 20 years. As a result of VDOT's policy, Virginia has historically ranked among the top five states in the country for the number of barriers constructed.

As summarized in Section 4.7.4 of the Final EIS, Barrier 13B was evaluated to mitigate the potential noise impact in the Timberly South neighborhood. Barrier 13B would range in height from 5 to 8 meters (16 to 26 feet), and would provide 5 to 13 decibels of noise reduction at 37 residences exposed to noise impact in this neighborhood. The heights, length and location of Barrier 13B were determined using the FHWA-TNM, which incorporates state-of-the-art sound emissions and sound-propagation algorithms. The noise modeling takes into account the design of the road, the topography of the surrounding area, the distance between the road and nearby properties, the acoustical shielding provided by rows of buildings and other structures, sound propagation over different types of ground, traffic volumes and speeds, and vehicle mix including the percent of medium and heavy trucks.

46. Have noise barriers been taken into consideration for the Iliff Rehabilitation Center? (1 commentor)

Because several residences in the vicinity would be exposed to noise impact along with the Iliff Rehabilitation Center, a noise barrier was evaluated for the northwest quadrant of the I-66 interchange. As shown in Figure 4-3c of the Final EIS, Barrier 10C would extend along the west side of the Beltway from Idylwood Road to Gallows Road, replacing a wall between Gallows Road and the vicinity of Sandburg Court. Under the Preferred Alternative this barrier would range in height from 3 to 5 meters (10 feet), would be approximately 1,562 meters (5,120 feet) long, and would protect 48 residences exposed to noise. Details of the preliminary design for Barrier 10C are summarized in Section 4.7.4 of the Final EIS. Wherever possible, noise barriers will be constructed as soon as possible to allow the barriers to protect noise-sensitive areas from construction noise.

47. Construct noise barrier between Georgetown Pike and the Toll Road (1 commentor)

In the Final EIS, a total of five noise barriers (13A, 13B, 13C, 13D, and 13E) were evaluated along the Beltway between the Dulles Toll Road and Georgetown Pike. Between Lewinsville Road and Georgetown Pike, two noise barriers would be located along the northbound side of I-495, and two noise barriers would be located along the southbound side. One barrier would extend from Lewinsville Road along the northwest quadrant of the Dulles Toll Road interchange to the west along the Dulles Toll Road. These five potential noise barriers would protect 188 residences (net) plus four parks and two churches. While two of the potential barriers meet VDOT's cost-effectiveness criterion, three of the noise barriers exceed VDOT's criterion of $30,000 per home protected (See Section 4.7.4 of the Final EIS for a more detailed discussion).

48. Concerned that with increased traffic because of expansion, noise level will increase and make sleeping with windows open or even closed perhaps impossible or difficult and to have outdoor leisure activities will become difficult (1 commentor)

As described in the Final EIS, design-year noise levels in areas surrounding the Beltway are expected to increase over existing noise levels as a result of the project. The amount of the sound level increase would vary with location along the project corridor, and would vary according to differences in roadway geometry and projected traffic volumes.

Following FHWA and VDOT noise assessment guidelines, traffic noise levels and potential noise impact were evaluated with respect to the FHWA Noise Abatement Criteria (NAC). The FHWA NAC are based on levels of noise associated with interference with speech communication, and represent "a compromise between noise levels that are desirable and those that are achievable." The NAC are not intended to address the potential for sleep disturbance that might occur along a highway corridor. As described in Chapter 2 of the Noise Technical Report, noise impact occurs when project noise levels approach or exceed the NAC during the loudest hour of the day.

Noise abatement measures must be considered wherever noise impact is expected to occur. Due to the extent of noise impact that would occur as a result of the project, noise barriers were evaluated along much of the project corridor.

49. No policy for making noise levels acceptable – only for reducing noise levels (1 commentor)

FHWA policy requires that every reasonable effort be made to obtain substantial noise reductions when noise abatement measures are being considered. FHWA encourages that an attempt should be made to achieve the greatest noise reduction possible. In general, a substantial noise reduction is considered to fall within the range of 5 to 10 decibels, while a practical upper limit for the noise reduction provided by an outdoor noise wall is approximately 15 decibels. A noise reduction of 20 decibels is nearly impossible to achieve with an outdoor noise barrier. To understand the effects of noise reduction, a person with normal hearing would perceive a sound level decreased by 5 decibels as noticeable, while a sound level decreased by 10 decibels would be perceived as half as loud, and a sound level decreased by 15 decibels would be perceived as one-third as loud.

The minimum noise reduction goal of 5 decibels, as stated in VDOT's Noise Abatement Policy, is the minimum noise reduction at which an impacted property is considered "protected" by a noise barrier. Affected properties that receive at least 5 decibels of noise reduction are included in the calculation of the barrier's cost per home to determine the reasonableness, or cost-effectiveness, of the barrier.

50. Concerns about the cost-effectiveness of Barrier 13A, as related to the number of homes protected by the barrier (3 commentors)

The feasibility and reasonableness of Barrier 13A will be re-evaluated during project final design. If additional noise-sensitive land uses were constructed prior to the Commonwealth Transportation Board's approval of a final design, those noise-sensitive land uses are eligible for noise abatement considerations and would be included in the noise analysis during project final design.

Note that the results of the noise barrier evaluation in the Final EIS are preliminary, and are intended to indicate the need for abatement and the potential for constructing noise barriers for all impacted properties throughout the study area. Final decisions on the noise barrier walls will be based on more detailed modeling during project final design; a re-evaluation of barrier cost-effectiveness or reasonableness, which will be based on up-to-date land use information; and the views of the affected property owners.

51. Noise protection technology has moved far beyond where it was in the past, in pursuit of this project would hope that such technology would be used. (1 commentor)

Although it is difficult to predict what noise abatement technologies will be available 20 years into the future, VDOT is committed to the construction of high quality noise barrier walls making use of the latest sound absorptive treatments and materials. VDOT specifications (*Metric Road and Bridge Specifications*, Section 519.02, January 1997) place stringent requirements on the materials that can be used for noise barrier construction.

While alternative methods of noise barrier construction can provide a desired noise reduction effect, this effect is usually minimal, as in the case of a special barrier top or cap, or the desired effect can be achieved just as well with sound absorptive treatments, as in the case of tilting the noise barrier in the vertical plane to minimize reflections. Some research has shown that a special barrier top, such as a T-profile top or a Y-profile top, can increase the noise reduction provided by a noise barrier of the same height with a standard top. Usually this increase is small (approximately 1 to 3 decibels), and can be achieved just as easily and at a lower cost by increasing the height of the barrier by approximately 1 meter (3 feet). The method of tilting the noise barrier away from the highway (in the vertical plane, by roughly 10 degrees) has been shown to help minimize the effect of multiple reflections between parallel noise barriers along both sides of a highway. However, because tilted barriers can sometimes have a negative visual impact due to the perception that the tilted wall is "falling down." The application of sound absorptive materials on the highway side of the barrier(s) is more oftentimes used to minimize the effect of multiple reflections.

52. How does VDOT compensate homeowners for potential devaluation of property due to huge walls? How does VDOT prevent hearing damage to residents during construction, and how is the situation remedied if construction noise exceeds acceptable limits? (1 commentor)

VDOT policy does not allow for compensation paid to homeowners for potential devaluation of property due to the construction of noise barriers. Limited research on the subject has yielded no conclusive findings on the relationship between property values and noise barrier construction.

Following VDOT and FHWA procedures, the FHWA Noise Abatement Criteria (NAC) were used to determine the extent of traffic noise impact due to the Preferred Alternative. The NAC are based upon traffic noise levels associated with speech interference and represent a balance between noise levels that are desirable and those that are achievable. In contrast, the OSHA standards are based on allowable limits for noise exposure in the workplace. Note that in general, the OSHA limits allow for higher noise levels than the FHWA NAC.

Typically, individual pieces of heavy equipment used in highway construction have reference A-weighted noise levels that range from the low 80's (dB) to the mid 90's (dB) – at a reference distance of 15 meters (50 feet). Based on these reference noise levels at the reference distance and the fact that sound levels decrease with distance from the source, it is unlikely that residents in the communities surrounding the Beltway would be exposed to highway construction noise levels in excess of 96 dBA, because most of the loudest construction operations would generally take place at distances greater than 15 meters (50 feet) from nearby homes.

To minimize the effects of construction noise, VDOT's *Road and Bridge Specifications* contain noise control provisions, which include a noise limit of 80 dBA for contractor operations when measured at an exterior location of a noise-sensitive area. These provisions also state that VDOT reserves the right to prohibit or restrict to certain portions of the project any work that produces objectionable noise during normal sleeping hours.

53. Have been trying to get a noise barrier, but it is also needed to keep deer from running out onto the Beltway. (1 commentor)

Thirty-four noise barriers were evaluated along nearly the entire length of the study area, including eleven noise barriers that were evaluated to mitigate the potential impact at noise-sensitive land uses. Section 4.7.4 of the Final EIS summarizes all of the potential noise barriers that were evaluated in the study.

While the effect of the proposed noise barriers on deer movements and migration were not addressed explicitly, Section 4.12 of the Final EIS states that since the existing Beltway already constitutes a barrier to wildlife movements and a constant threat of mortality to wildlife wandering onto the highway, the proposed improvements would not substantially change this condition.

54. Has VDOT considered new technologies as far as road building techniques are concerned - such as the use of rubberized asphalt concrete (ROC) to reduce noise? This material has been used in sound barriers (2 commentors)

Extensive research in the United States and Europe has shown a benefit in the use of noise-reducing pavements such as open-graded asphaltic concrete (OGAC) and rubberized asphalt. A number of studies have demonstrated that OGAC can reduce tire-pavement noise by approximately 5 decibels (on average) when compared to vehicle noise emissions on dense-graded asphaltic concrete (DGAC). However, over a period of just a few years, the noise reducing capabilities of OGAC diminish to the point where vehicle noise emissions on OGAC are not much improved over DGAC. This degradation in the noise-reducing benefits of OGAC occurs over time as the voids in the porous sound-absorbing surface become clogged with debris. Although rubberized asphalt performs fairly well, OGAC has been found to provide somewhat better results.

VDOT has not identified noise-reducing pavements as a noise abatement measure because federal funding is not currently available for the use of these pavements as a mitigation measure. FHWA would like to see more research into the effects of aging on the noise-reducing capabilities of various pavements before these pavements can be accepted as a feasible noise abatement measure.

While recycled rubber has been used in the manufacture of some sound absorptive noise barrier panels, VDOT utilizes a specially designed sound absorptive concrete material for ground-mounted noise walls and a lightweight material (typically perforated metal panels with sound absorptive filler) for structure-mounted noise walls.

55. To live near the Beltway, as unbearable as it is, and then increase the Beltway would make it even more horrible. (1 commentor)

As described in the Final EIS, design-year noise levels in areas surrounding the Beltway are expected to increase over existing noise levels as a result of the project. The amount of the sound level increase would vary with location along the project corridor, and would vary between the three build alternatives depending on factors such as differences in roadway geometry and projected traffic volumes. Due to the extent of future noise impact along the Beltway, a total of 34 noise barriers were evaluated to mitigate these impacts. Section 4.7.4 of the Final EIS provides the locations of the potential noise barriers throughout the study area.

B.7 FUNDING AND IMPLEMENTATION

Project Costs and Funding

1. Is there any money earmarked to increase parking at any of the Metro stations that fill up before 8 AM? (1 commentor)

The provision of parking at the Metrorail stations is the responsibility of the Washington Metropolitan Area Transit Authority (WMATA). Planned improvements to the Metrorail system are programmed by WMATA according to their Transit Service Expansion Plan.

2. Supports higher gasoline taxes. (3 commentors)

Comment noted.

Construction Schedule and Phasing

3. Segment corridor into prioritized discreet projects to expedite work. (1 commentor)

Due to the size (14 miles), complexity (ten interchanges) and cost (more than $890 million), both the design and construction of the proposed improvements would be conducted in phases. Dividing the project into smaller, discreet projects would shorten the design and right-of-way acquisition phase, increase competitive bidding, and minimize traffic disruption to a localized area (such as one interchange) during construction. A schedule for the design and construction phases has not been developed.

4. Construction impacts on traffic are not analyzed. (1 commentor)

If improvements to the Beltway are recommended and approved for construction, a traffic management plan would be developed to address construction-related traffic issues. This plan would deal with issues such as: maintaining traffic on the Beltway, alternative routes through or around the construction zone, and the availability of alternative transportation modes. Temporary restrictions on local streets (i.e., no through traffic during certain hours) and increased prohibition of cut-through traffic could also be implemented during the construction period.

Tolls / HOT Lanes

5. Supports Tolls or HOT lanes. (16 commentors)

Comment noted. The Preferred Alternative includes HOT lanes.

B.8 PUBLIC INVOLVEMENT

1. The public meetings should have been held in public buildings rather than at privately owned hotels. (5 commentors)

When making arrangements to hold a public hearing, VDOT secures facilities that will accommodate the necessary equipment and have the amount of space needed to meet the needs of the attending citizens. Citizen groups who requested an opportunity to present their own materials at the hearings were given prior access to the formal presentation area, were able to place materials on the chairs where the public was seated, and were allowed to hold signs in the meeting room as long as they did not disrupt the view of others.

2. VDOT did not provide adequate notice for public meetings. (4 commentors)

The National Environmental Policy Act (NEPA) requires "reasonable notice to the public" of a public hearing and the Federal Highway Administration (FHWA) requires each state highway agency to have approved procedures for carrying out a public involvement program. VDOT's procedures are in the *Policy Manual for Public Participation In Transportation Projects*, which was approved by FHWA on March 15, 1999. These procedures define adequate notice in terms of time and method of notice, and have been followed for all public meetings for this project.

For the public hearings held for the Draft EIS, more than 3,900 newsletters were mailed to the individuals, businesses, associations, and interest groups on the project mailing list. These newsletters, which were mailed approximately one month prior to the hearings, contained the dates, time, and locations of the three public hearings. At the same time, to reach stakeholders who had not previously expressed interest in the project, postcards were mailed to all addresses in the zip codes adjacent to the Beltway Corridor, comprising more than 250,000 residences and businesses. Formal advertisements announcing the hearings were placed in the *Washington Post* and *Washington Times*, as well as local newspapers, such as the *Journal* and *Times Connection* newspapers, that are distributed throughout Fairfax County. These advertisements were published twice -- approximately 30 and 15 days prior to the hearings. In addition, letters announcing the public hearings were mailed to each of the groups VDOT met with during the course of the study to help ensure that their members were notified. Finally, to generate more interest in the hearings and ensure that a consistent message was conveyed to the public, press releases were mailed to the local media before the hearings and a press briefing was held on May 28, 2002, immediately prior to the first hearing.

3. Deadline for comments should be extended 90 days. (1 post card campaign with 53 submissions)

VDOT typically provides a minimum of 45 days for the receipt of comments on a Draft EIS. This comment period generally starts with the publication of the Draft EIS and closes ten days after the public hearing. Due to the complex and controversial nature of the Beltway Study, VDOT extended the comment period to 117 days (March 15 through July 10). This decision was made to ensure the full participation and feedback of the public.

4. Meetings should not have been scheduled during a holiday week (1 commentor)

The meetings were scheduled as early as possible. Waiting until after the holiday week would have placed the date farther into the summer season when more people are vacationing. In addition, the Draft EIS was available for review at Fairfax County government offices, VDOT's Northern District office, and local area libraries and at the study consultant's office for forty-five days prior to the hearing. Following the public hearings, all informational materials available at the hearing were made available for review at VDOT's Northern District office and the study consultant's office until the comment period ended.

C

REEVALUATION

RECEIVED
SEP 12 2005
ENVIRONMENTAL DIV.

COMMONWEALTH of VIRGINIA

DEPARTMENT OF TRANSPORTATION
1401 EAST BROAD STREET
RICHMOND, VIRGINIA 23219-2000

GREGORY A. WHIRLEY
ACTING COMMISSIONER

September 6, 2005

Mr. Roberto Fonseca-Martinez
Federal Highway Administration
Virginia Division
400 North 8th Street
Richmond, Virginia 23240

Re: Reevaluation for the Capital Beltway Study
State Project Number: 0495-029-F29, PE101; 0495-029-F31, PE101
Federal Project Numbers: IM-495-5(079); IM-495-5(080); IM-495-5(082)
FHWA EIS Number: FHWA-VA-EIS-02-02-D
DEIS Date: March 15, 2002

Dear Mr. Fonseca-Martinez:

The Virginia Department of Transportation (VDOT) has concluded its reevaluation of the above referenced Draft Environmental Impact Statement (DEIS). Due to the extensive amount of coordination conducted with local government and the general public and the consideration of the High Occupancy Toll (HOT) lane concept, the Final Environmental Impact Statement (FEIS) will not be completed within three years of the DEIS approval date. Therefore, in accordance with 23 CFR 771.129, a reevaluation was conducted to determine whether there have been changes in the project or its surroundings or new information, which would require a supplement to the DEIS or a new DEIS. As part of the reevaluation the entire project was revisited to assess all changes that have occurred and their effect on the adequacy of the original DEIS.

The Candidate Build Alternatives currently being considered are scaled-back versions of those alternatives considered in the DEIS. Although the revised alternatives are comparable in length as well in the number of lanes, the sizeable reductions to the mainline width and the interchange configurations have resulted in major reductions in right-of-way requirements. And as a result there have been major reductions in potential impacts to the natural, cultural and socio-economic resources in the corridor as well as reductions in total costs. Table 1 is a checklist presenting the findings of the reevaluation. A comparative summary of the impacts associated with each of the Candidate Build Alternatives is presented in Table 2.

The heavily developed corridor has changed little over the three-year period and, as a result, newly identified impacts are limited to only one caused by the expansion of the Accotink Stream Valley Park. This unavoidable impact on this property, resulting from a changed condition within the study corridor, is considered minor. Notwithstanding, this impact will be addressed in the FEIS and Final Section 4(f) Evaluation.

A review of NEPA-related laws and regulations determined that no major regulatory changes have occurred since the DEIS approved that would alter the findings or validity of the document.

Finally, the application of the HOT lane concept is considered an operational issue, which has not fundamentally changed the alternatives under consideration. The operational impact on traffic, resulting from the implementation of the HOT lane concept, and the resulting impact on air quality and noise has been considered in preparing the FEIS. Changes in air quality and noise impacts have been found to be minimal. Details of the supporting analyses for these operational-related impacts will be included in the FEIS.

Therefore, based on the findings of the reevaluation, it is our opinion that a Supplemental DEIS is not warranted. A statement to this fact, as well as the supporting information, will be included in the Summary Section of the FEIS.

Thank you for your attention to this matter. Should you have questions, please contact Ken Wilkinson at 804-371-6758.

Sincerely,

Earl T. Robb
State Environmental Administrator

The Federal Highway Administration concurs with the Virginia Department of Transportation's assessment that: because the changes to the scope of the project has resulted in a substantial reduction of adverse environmental and social impacts evaluated in the Draft EIS and because there is no new information or circumstances relative to environmental concerns that would result in significant environmental impacts not already evaluated in the Draft EIS, a Supplemental EIS is not needed.

Mr. Edward Sundra
Federal Highway Administration

September 8, 2005
Date

Table 1. Issue Evaluation Checklist

Issue or Area of Concern	New Resource Present	Method of Review	Have the Impacts Changed?	Comment
TRANSPORTATION				
Traffic Volumes/Patterns/Time Public Transportation Highways Transportation Plan Freight	☐ Yes ☒ No ☐ Yes ☒ No ☐ Yes ☒ No ☐ Yes ☒ No ☐ Yes ☒ No	Revised Candidate Build Alternatives analyzed using the same travel forecast and operations model employed for Draft EIS.	No significant change in operational impacts.	Mainline operations are comparable to Candidate Build Alternatives contained in the Draft EIS. Some reduced capacity is experienced at interchanges with revised alternatives. 12-Lane alternative is capable of accommodating HOT and HOV operations. Direct HOV / HOT connections are consistent with transportation elements in Fairfax County's comprehensive plans. FHWA has advised that an update of traffic model is not required.
LAND USE				
Land Use Conversion Development Consistent with Area's Comprehensive Plan	☐ Yes ☒ No ☐ Yes ☒ No ☒ Yes ☐ No	Review of current aerial photography supplemented by field reviews. Review of Fairfax County comprehensive plans.	Substantial reduction in right-of-way requirements. No change in consistency with local plans.	There have been no significant land use conversions or developments within the study area since the Draft EIS. Right-of-way requirements have been dramatically reduced under the revised alternatives. DEIS Candidate Build Alternatives required 118 to 168 acres of new right-of-way. The revised Candidate Build Alternatives require 5 to 10 acres of new right-of-way. Comprehensive plans or zoning ordinances have not changed such that the proposed action is no longer consistent with local plans and zoning.
POPULATIONS & SERVICES				
Populations Emergency Services	☐ Yes ☒ No ☐ Yes ☒ No	Review of current Fairfax County planning documents.	No new impacts.	There have been no significant changes in populations since the completion of the Draft EIS. The Revised Candidate Build Alternatives will allow for improved emergency service times.

Issue or Area of Concern	New Resource Present	Method of Review	Have the Impacts Changed?	Comment
RELOCATION IMPACTS				
Potential Relocations Environmental Justice Populations	☐ **Yes** ☒ **No** ☐ **Yes** ☒ **No**	Review of revised engineering plans. Review of current Fairfax County planning documents and census reports.	Substantial reduction in relocation impacts.	Reduced right-of-way requirements have substantially reduced the number of potential relocations. The DEIS Candidate Build Alternatives could potentially displace 217 to 294 homes. The revised Candidate Build Alternatives would potentially displace 1 to 3 homes. No disproportionate impacts to minority or low-income populations would occur.
ECONOMIC IMPACTS				
Business Relocations Construction & Operations Employment	☐ **Yes** ☒ **No** ☐ **Yes** ☒ **No**	Review of revised engineering plans. Review of current Fairfax County planning documents and census reports.	Substantial reduction in commercial relocation impacts.	Reduced right-of-way requirements have substantially reduced the number of potential commercial relocations. The DEIS Candidate Build Alternatives could potentially displace 31 to 32 local businesses. The revised Candidate Build Alternatives would not require any commercial relocations. Projections for construction and operations employment created through project implementation remain valid.
VISUAL & AESTHETICS				
Visual & Aesthetics	☐ **Yes** ☒ **No**	Field review of project corridor and review of revised engineering plans.	Reduction in visual impacts.	Interchange designs have been reduced dramatically. Multi-level ramps and bridges have been reduced and therefore limiting the amount of visual intrusion caused by these structures. There have been no major changes in the visual character of the landscape along the Beltway corridor.
FARMLANDS				
Farmlands	☐ **Yes** ☒ **No**	Not Applicable.	Not Applicable.	There are no farmlands present in this urban corridor (as noted in the Draft EIS).

Issue or Area of Concern	New Resource Present	Method of Review	Have the Impacts Changed?	Comment
NOISE & VIBRATION				
Noise Criteria Existing Noise Conditions	☐ **Yes** ☒ **No** ☐ **Yes** ☒ **No**	Acoustical analysis of Revised Candidate Build Alternatives.	Reduction in the number of potentially affected receptors.	Noise predictions based on FHWA's Traffic Noise Model indicated that 2,949 to 3,113 dwellings would experience noise levels that approach or exceed 67dBA or experience substantial increases of 10 dBA over ambient. This is less than potential impacts from the DEIS Candidate Build Alternatives which would potentially impact 3,672 to 3,879 dwellings.
AIR QUALITY				
Existing Conditions Regional Compliance with the Standards	☐ **Yes** ☒ **No** ☐ **Yes** ☒ **No**	Review of the current Conformity Standards Review of 2005-2030 CLRP, 2005-2010 TIP.	No new impacts.	Since publication of the DEIS, the Washington DC Metropolitan Area has been classified as a "Moderate" nonattainment area for ozone and nonattainment for $PM_{2.5}$. The Transportation Planning Board (Metropolitan Washington MPO) is developing the FY 2005-2030 CLRP and the FY 2006-2011 TIP. In February 2005, VDOT submitted the proposed action for the Capital Beltway Study for inclusion in the CLRP and TIP. The air quality conformity determination of the CLRP and TIP will be conducted and then released for public comment in July 2005. It is anticipated that the Air Quality Conformity Determination, the 2005 CLRP, and the FY 2006-2011 TIP will be approved by the TPB in September 2005.
ECOSYSTEMS				
Native Wildlife Existing Vegetation Threatened & Endangered Species Critical Habitat Wildlife and Waterfowl Refuges	☐ **Yes** ☒ **No** ☐ **Yes** ☒ **No** ☐ **Yes** ☒ **No** ☐ **Yes** ☒ **No** ☐ **Yes** ☒ **No**	Field review and updated data search.	Reduced impacts.	The affected environment for the resources listed has not changed substantially since the completion of the Draft EIS. However, reduction in right-of-way requirements have resulted in reduced impacts to natural resources. There are no new reported sightings of threatened and endangered species in the project corridor or identification of new areas of critical habitat.

Issue or Area of Concern	New Resource Present	Method of Review	Have the Impacts Changed?	Comment
WATER RESOURCES				
Surface Waters Dredging Requirements Public Water Supply	☐ **Yes** ☒ **No** ☐ **Yes** ☒ **No** ☐ **Yes** ☒ **No**	Field review and updated data search.	Reduced impacts. .	The affected environment for the resources listed has not changed substantially since the completion of the Draft EIS. However, reduction in right-of-way requirements for the Revised Candidate Build Alternatives have resulted in reduced impacts to water resources. Encroachment impacts to streams in the corridor have been reduced from 8,000 linear feet of impact to approximately 4,000 linear feet. There have been no changes to the public water supply in the project areas.
AQUATIC RESOURCES				
Fish Submerged Aquatic Vegetation Benthos Other Flora and Fauna	☐ **Yes** ☒ **No** ☐ **Yes** ☒ **No** ☐ **Yes** ☒ **No** ☐ **Yes** ☒ **No**	Field review and updated data search.	Reduced impacts.	The affected environment for aquatic resources has not changed substantially since the completion of the Draft EIS. However, reductions in the size of the Candidate Build Alternatives right-of-way requirements have resulted in reduced impacts to aquatic resources.
FLOODPLAINS				
Floodplains	☐ **Yes** ☒ **No**	Review of current FIRM mapping.	Reduced impacts.	The affected environment for floodplains has not changed substantially since the completion of the Draft EIS. However, reductions in the size of the Candidate Build Alternatives have resulted in reduced impacts to floodplains by approximately 4 to 5 acres.
WETLANDS				
Wetlands	☐ **Yes** ☒ **No**	Field review and updated data search.	Reduced impacts.	The affected environment for the resources listed has not changed substantially since the completion of the Draft EIS. However, reductions in the size of the Candidate Build Alternatives have resulted in reduced impacts to wetlands by approximately 0.8 acres.

Issue or Area of Concern	New Resource Present	Method of Review	Have the Impacts Changed?	Comment
ENERGY				
Energy	☐ Yes ☒ No	Review of Draft EIS.	No new impacts.	The affected environment has not changed substantially since the completion of Draft EIS. In addition, revisions to the Candidate Build Alternatives would not alter the energy analysis that was recorded in the findings of the Draft EIS.
HAZARDOUS WASTE SITES				
Hazardous Waste Sites	☐ Yes ☒ No	Review of the Draft EIS and updated data search.	No impacts.	No new hazardous material sites have been identified since the completion of the Draft EIS. In addition the reduction in the right-of-way requirements for the Revised Candidate Build Alternatives has eliminated all involvement with identified hazardous material sites.
COASTAL BARRIERS & COASTAL ZONE				
Coastal Barriers & Coastal Zone	☐ Yes ☒ No	Review of the FEIS.	Reduced impacts.	There has been no changes to the boundaries of these resource areas since the completion of the Draft EIS. However, reductions in the size of the revised Candidate Build Alternatives right-of-way requirements have resulted in reduced impacts to these special jurisdictions.
PUBLIC PARKLANDS				
Public Parklands	☒ Yes ☐ No	Review of mapping of new park boundaries for the expanded Accotink Stream Valley Park.	Reduction to the total number of parks impacted. One new park effected.	The Fairfax County Park Authority purchased two contiguous parcels (26.85 acres) within the Accotink Stream Valley Park immediately west of the Little River Turnpike (Route 236) interchange. Proposed ramps within the interchange could potentially impact up to 0.4 acre of this new parkland – representing a new parkland impact not evaluated in the Draft EIS. However, reductions of interchange and mainline designs have resulted in a reduction in the total number of parks impacted from 7 down to 4. And the total number of acres of parkland required is reduced from 15 to 19 acres down to 1 to 2.6 acres. (*See Section 4(f) Evaluation on the following page*).

Issue or Area of Concern	New Resource Present	Method of Review	Have the Impacts Changed?	Comment
HISTORIC & ARCHAEOLOGICAL RESOURCES				
Architectural Resources Archaeological Resources	☐ Yes ☒ No ☐ Yes ☒ No	Review of the Draft EIS and updated data search.	Reduced impacts.	There has been no apparent change in the number of architectural, archaeological resources since the completion of the Draft EIS. However, the revision of the Gallows Road interchange now avoids potential impact to Holmes Run Acres Historic District.
SECONDARY & CUMULATIVE				
Socioeconomic Impacts Natural Resource Impacts	☐ Yes ☒ No ☐ Yes ☒ No	Discussions with Fairfax County planning staff.	No new impacts.	There have been no significant changes to the socioeconomic or natural environment since the completion of the Draft EIS. Therefore, secondary and cumulative impacts presented in the Draft EIS remain valid.
CONSTRUCTION IMPACTS				
Air Quality Noise Water Quality Maintenance & Control of Traffic Health & Safety Pollution Control	☐ Yes ☒ No ☐ Yes ☒ No ☐ Yes ☒ No ☐ Yes ☒ No ☐ Yes ☒ No ☐ Yes ☒ No	Review of potential construction techniques for the project.	Reduced impacts.	Reduction in the size and mass of the Revised Candidate Build Alternatives will result in shorter construction periods and reduced construction-related impacts.
SECTION 4(f) EVALUATION				
Section 4(f) Evaluation	☒ Yes ☐ No	Review of mapping of new park boundaries for the expanded Accotink Stream Valley Park.	New Section 4(f) impact.	The Fairfax County Park Authority purchased two contiguous parcels (26.85 acres) within the Accotink Stream Valley Park immediately west of the Little River Turnpike (Route 236) Interchange. Proposed ramps within the interchange could potentially impact up to 0.4 acre of this new parkland – representing a new Section 4(f) use that was not evaluated in the Draft EIS. A complete evaluation of this new Section 4(f) use will be contained in the project's Final EIS.

Issue or Area of Concern	New Resource Present	Method of Review	Have the Impacts Changed?	Comment
PERMITS				
Compliance with E.O. 11990 (Wetlands)	☐ Yes ☒ No	Review of the Revised Candidate Build Alternatives and environmental regulations	Reduced impacts.	There have been no regulatory changes related to project development or construction activities. No significant changes to the affected environment have occurred that warrant additional study or change the findings of the Draft EIS. Those permits or compliances required for the Candidate Build Alternatives, as listed in the Draft EIS, remain valid.
Section 404 Permit (Clean Water Act)	☐ Yes ☒ No			
Section 10 Permit (Rivers & Harbors Act)	☐ Yes ☒ No			
Virginia Water Protection Permit	☐ Yes ☒ No			
Subaqueous Bed Permit	☐ Yes ☒ No			
Coast Guard Permit	☐ Yes ☒ No			
Compliance with the ESA	☐ Yes ☒ No			
Compliance with Section 106 of the National Historic Preservation Act	☐ Yes ☒ No			
Compliance with Section 4(f) of the 1966 Department of Transportation Act	☐ Yes ☒ No			
Compliance with E.O. 12898 (Environmental Justice)	☐ Yes ☒ No			
Consistency with Coastal Zone Management Act	☐ Yes ☒ No			
Compliance with E.O. 11988 (Floodplains)	☐ Yes ☒ No			
Erosion & Sediment Control Laws	☐ Yes ☒ No			
Stormwater Management Act	☐ Yes ☒ No			
MITIGATION MEASURES				
Relocations	☐ Yes ☒ No	Review of the mitigation measures prescribed in the Draft EIS.	Overall, reduced impacts.	The types of impacts associated with the Revised Candidate Build Alternatives are consistent with those described in the Draft EIS but generally at reduced levels. The types of mitigation measures recommended in the Draft EIS are therefore still valid.
Farmlands	☐ Yes ☒ No			
Noise	☐ Yes ☒ No			
Threatened & Endangered Species	☐ Yes ☒ No			

Issue or Area of Concern	New Resource Present	Method of Review	Have the Impacts Changed?	Comment
MITIGATION MEASURES (CONTINUED)				
Floodplains	☐ Yes ☒ No			
Wetlands	☐ Yes ☒ No			
Water Quality	☐ Yes ☒ No			
Aquatic Resources	☐ Yes ☒ No			
Hazardous Waste Sites	☐ Yes ☒ No			
Construction Impacts	☐ Yes ☒ No			
Air Quality	☐ Yes ☒ No			
Noise	☐ Yes ☒ No			
Water Quality	☐ Yes ☒ No			
Maintenance & Control of Traffic	☐ Yes ☒ No			
Health & Safety	☐ Yes ☒ No			
Pollution Control	☐ Yes ☒ No			

Table 2. Summary of Environmental Impacts

	CANDIDATE BUILD ALTERNATIVES					
	Revised – Final EIS			Draft EIS		
	No-Build	12-Lane HOT	10-Lane HOV	Concurrent HOV (10 Lanes)	Express/ Local with HOV (10 Lanes)	Barrier-Separated HOV (12 Lanes)
Noise Impacts (dwellings)	3,054	3,113	2,949	3,879	3,717	3,672
Dwellings Protected and Benefited by Noise Barriers	NA	4,168	4,241	5,123	5,199	5,129
Homes Displaced	0	3	1	217	294	258
Businesses Displaced	0	0	0	31	32	32
Community Facilities Displaced	0	0	0	0	2 tennis courts	0
Carbon Monoxide (ppm) 1 hr. Range from 10 sites 8 hr.	6.1 - 17.9 3.1 - 11.5	6.1 - 9.2 3.1 - 5.8	6.1 - 9.1 3.1 - 5.7	6.1 - 9.1 3.1 - 5.7	6.1 - 9.6 3.1 - 6.2	6.1 - 9.2 3.1 - 5.8
Public Parks Impacted	0	4	4	7	7	7
Parkland Required (acres)	0	2.63	1.14	15.05	18.13	19.36
Adverse Effects to Historic Resources	0	0	0	1	1	1
Wetlands Displaced (acres)	0	4.42	3.86	4.62	4.74	5.06
Impacted Length of Streams (feet)	0	4,451	4,235	8,262	8,031	8,053
Floodplain Encroachments (acres)	0	9.98	8.79	14.99	15.15	15.49
Potential Hazardous Material Sites	0	0	0	7-8	8-9	8
Threatened and Endangered Species	0	0	0	0	0	0
Length of Alternative (miles)	14	14	14	14	14	14
Right-of-Way Required (acres)	0	10	5	118	168	153
Right-of-Way, Utilities, and Relocation Costs (millions)	$0	$7.6	$2.9	$345	$423	$402
Construction Costs (millions)	$0	$891	$783	$2,340	$2,830	$2,480

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DESIGN EXCEPTIONS

The following provides a list of the potential design exceptions for the Preferred Alternative. These exceptions were incorporated into the conceptual designs to further reduce potential impacts to parks, residential areas and Metro's Orange Line tracks. Existing curve radii and design speeds are detailed for each specific location along with current requirements and what has been designed in the proposed improvements. Included with each potential design exception is a brief description indicating the types of impacts avoided and/or minimized. Design exceptions used in the conceptual design have not been approved by FHWA. Consequently, VDOT will need to submit a formal design exception request to FHWA before any design exceptions can be incorporated into the final design plans.

The existing radii and related design speeds presented below have been estimated with the use of MicroStation CAD files created through aerial photography and surveys. The required standard radii and design speeds listed below were derived from the design criteria set forth using the 2001 AASHTO *A Policy on Geometric Design of Highways and Streets* and VDOT's *Road Design Manual (Rev 7/05).* In addition, the proposed radii and design speeds represent those of the final preliminary design presented in the Final EIS. Because many of the ramps in the design have multiple curves, the sharpest curve was used to determine the need for a potential design exception. The information is presented by interchange starting at the southern limit of the project.

Braddock Road Interchange

Loop Ramps (Sharpest Curve)	Existing Radius/ Design Speed	Standard Radius/ Design Speed	**Proposed Radius/ Design Speed**
NE Quadrant	180'/25 mph	250'/30 mph	**210'/25 mph**

(Standard design criteria would require impacts to several homes in the NE quadrant and increase impacts to Fitzhugh Park.)

SW Quadrant	180'/25 mph	250'/30 mph	**210'/25 mph**

(Standard design criteria would require impacts commercial properties along Port Royal Road in the SW quadrant.)

NW Quadrant	160'/25 mph	250'/30 mph	**175'/25 mph**

(Standard design criteria would increase impacts to Wakefield Park and the existing trail through the park.)

Route 236 Interchange

Loop Ramps (Sharpest Curve)	Existing Radius/ Design Speed	Standard Radius/ Design Speed	**Proposed Radius/ Design Speed**
NE Quadrant	200'/25 mph	250'/30 mph	**210'/25 mph**

(Standard design criteria would require reconfiguration of Lafayette Village Drive and impacts to homes in the NE Quadrant.)

SE Quadrant	150'/25 mph	250'/30 mph	**180'/25 mph**

(Standard design criteria would require reconfiguration of Americana Drive and impacts to the townhouse community in the SE quadrant.)

NW Quadrant	190'/25 mph	250'/30 mph	**220'/25 mph**

(Standard design criteria would increase impacts to Accotink Stream Valley Park and impact two major utility towers in the NW quadrant.)

At-Grade Directional Ramps

EB to SB	180'/25 mph	250'/30 mph	**230'/25 mph**

(Standard design criteria would require impacts to Americana Park.)

Gallows Road Interchange

Loop Ramps (Sharpest Curve)	Existing Radius/ Design Speed	Standard Radius/ Design Speed	**Proposed Radius/ Design Speed**
	200'/25 mph	250'/30 mph	**200'/25 mph**

(Standard design criteria would require additional ROW in the NW quadrant and also would further shorten the weave distance between the Route 50 and Gallows Road intersection.)

Length of Auxiliary Lanes

Off Ramp SB	1250'	2000'	**1100'**

(weaving movements between Rte 50 and Gallows Road SB)

(Standard design criteria for the weave length would require further reduction of substandard loop ramps at both interchanges.)

I-66 Interchange

Loop Ramps (Sharpest Curve)	Existing Radius/ Design Speed	Standard Radius/ Design Speed	**Proposed Radius/ Design Speed**
Between Mainlines	135'/20 mph	250'/30 mph	**150'/25 mph**

(Standard design radius doesn't fit between NB and SB I-495 and realignment of the beltway would require additional impacts to adjacent properties, W&OD Trail, I-66, and the Metro line.)

Route 7 Interchange

Loop Ramps (Sharpest Curve)	Existing Radius/ Design Speed	Standard Radius/ Design Speed	**Proposed Radius/ Design Speed**
NE Quadrant	150'/20 mph	250'/30 mph	**170'/25 mph**
SE Quadrant	130'/20 mph	250'/30 mph	**160'/25 mph**
SW Quadrant	170'/25 mph	250'/30 mph	**200'/25 mph**

NE Quadrant: *(Standard design criteria would require reconfiguration of Corporate Ridge and impacts to commercial properties.)*

SE Quadrant: *(Standard design criteria would require impacts to commercial properties.)*

SW Quadrant: *(Standard design criteria would require impacts to commercial properties.)*

Route 123 Interchange

Loop Ramps (Sharpest Curve)	Existing Radius/ Design Speed	Standard Radius/ Design Speed	**Proposed Radius/ Design Speed**
SE	230'/30 mph	250'/30 mph	**200'/25 mph**
SW Quadrant ramp	New	250'/30 mph	**200'/25 mph**

SE: *(Standard design criteria would require impacts to commercial properties.)*

SW Quadrant ramp: *(Standard design criteria would require impacts to commercial properties and existing bridge crossing Route 123 west of the Capital Beltway.)*

Dulles Toll Road Interchange

Ramp Curve			
Ex. Ramp NB to WB	350'/35 mph	465'/40 mph	**390'/35 mph**
HOT Ramp NB to WB	New	465'/40 mph	**370'/35 mph**
Ex. Ramp EB to NB	400'/35 mph	465'/40 mph	**400'/35 mph (1)**
Ex. Ramp SB to EB	300'/30 mph	465'/40 mph	**340'/30 mph**
HOT Ramp SB to EB	New	465'/40 mph	**300'/30 mph**

Ex. Ramp NB to WB: *(Standard design would require commercial impacts in the NE quadrant and reconfiguration of Dulles Toll Road.)*

HOT Ramp NB to WB: *(Insufficient space to meet design standard.)*

Ex. Ramp EB to NB: *(Standard design would require impacts to commercial properties in SE quadrant.)*

Ex. Ramp SB to EB: *(Standard design would require impacts to residential properties in NW quadrant.)*

HOT Ramp SB to EB: *(Insufficient space to meet design standard.)*

(1) Ramp is tied to existing before curve, so the substandard design is not being modified.

Length of Auxiliary Lanes

Off Ramp NB (Right)	N/A	2000' (Weave Section)	**1600'**

(Extension of weave length would require reduction in the radius of the ex. Ramp NB to WB at this intersection which is already below standard.)

On Ramp SB	1400'	2000' (Weave Section)	**900'**

(Insufficient space to meet design standard.)

C-D Lanes:

Continuous C-D Lanes are required but not provided between Gallows Road, Route 50 and I-66.

Continuous C-D Lanes between Route 7, Route 123 and Toll Road are required but not provided.

(To provide C-D lanes at all necessary locations would require increased impacts along both sides of the Capital Beltway and would increase commercial and residential impacts.)

E

QUALITATIVE HOTSPOT ANALYSES FOR $PM_{2.5}$ AND PROJECT-LEVEL CONFORMITY DETERMINATION

E.1 PURPOSE OF THIS DETERMINATION

Section 176(c) of the Clean Air Act requires that federally supported highway and transit projects and activities be consistent with state air quality goals, found in the *State Implementation Plan* (SIP). The process to ensure this consistency is called Transportation Air Quality Conformity. Conformity to the SIP means that the transportation activities will not cause new violations of the *National Ambient Air Quality Standards* (NAAQS or "standards"), worsen existing violations of the standard, or delay timely attainment of the relevant standard.

Transportation conformity is required for federally supported transportation projects in areas that have been designated by the U.S. Environmental Protection Agency (EPA) as not meeting one of the NAAQS. These areas are called *nonattainment areas* if they currently do not meet air quality standards or *maintenance areas* if they have previously violated air quality standards, but currently meet them and have an approved Clean Air Act maintenance plan. On January 5, 2005, the EPA designated the Washington, DC-MD-VA area as nonattainment for fine particulate matter, called $PM_{2.5}$. This designation became effective on April 5, 2005, 90 days after EPA's published action in the Federal Register. Transportation conformity for the $PM_{2.5}$ standards became effective April 5, 2006, following the one-year grace period provided by the Clean Air Act. Effective this date, metropolitan $PM_{2.5}$ nonattainment areas must have a fiscally constrained long- range transportation plan (CLRP) and Transportation Improvement Program (TIP) in place that conforms; in certain instances, federally supported projects must also be shown to conform if they are not included in a CLRP and TIP. An additional requirement for $PM_{2.5}$ is that a project-level conformity determination is also required for certain projects based on an assessment of localized emission impacts. This localized assessment is called a *hotspot analysis*.

The 14-mile segment of the Capital Beltway Improvement Project is within the Washington, DC-MD-VA $PM_{2.5}$ nonattainment area; and, therefore, the project is required to meet Transportation Conformity requirements found in 40 CFR Part 93 as amended. EPA amended the Transportation Conformity Rule on March 10, 2006[1], requiring a hotspot

[1] EPA posted the final rule on its website on March 1, 2006 and the final rule was published in the Federal Register on March 10, 2006.

analysis as part of the project-level conformity determination in $PM_{2.5}$ nonattainment areas for certain projects. On March 29, 2006, EPA and the Federal Highway Administration issued joint guidance for conducting qualitative hotspot analyses to meet the requirements established in the March10th final Transportation Conformity Rule (71 FR 12468).

This appendix addresses the project-level transportation conformity requirements for the proposed Capital Beltway improvements, including a qualitative hotspot analysis that is described in greater detail in Section E.5 below.

E.2 PROJECT DESCRIPTION

E.2.1 General

The Federal Highway Administration (FHWA), in conjunction with the Virginia Department of Transportation (VDOT), proposes to improve the Capital Beltway (I-495) in Fairfax County, Virginia, between the I-95/I-395/I-495 interchange and the American Legion Bridge. The project is located in Northern Virginia. Improvements are needed to increase the Beltway's capacity to accommodate expected growth in daily traffic volumes and remedy current congestion, operational deficiencies, and safety problems on this critical link in the region's transportation system.

Constructed as part of the Interstate highway system, the Beltway was originally designed to serve through traffic bypassing Washington, DC. However, since its completion in 1964, the growth of the Washington, DC metropolitan area and changes in travel patterns have made the Beltway an integral part of the regional transportation system. Instead of functioning as a bypass, the Beltway is now used primarily for travel to and from destinations within the region. Each day hundreds of thousands of local residents use the Beltway to get to work, shop, and travel throughout the metropolitan area.

The proposed improvements to the Beltway and its interchanges would extend for about 14 miles from Backlick Road to the American Legion Bridge (see Figure 1-2 in the final EIS). The FHWA has determined that these termini are logical and that improving this portion of the Beltway has independent utility. The project also would include improvements to portions of 10 roadways that intersect and connect to the Beltway via existing interchanges at Braddock Road, Little River Turnpike, Gallows Road, Arlington Boulevard, Interstate 66, Leesburg Pike, Chain Bridge Road, Dulles Access / Toll Road, Georgetown Pike, and the George Washington Memorial Parkway. Modifications to these roadways would be necessary to properly integrate the proposed Beltway and interchange improvements with existing (or planned) roadway designs and traffic patterns. Improvements to the remainder of the Beltway in Virginia and to the Maryland Beltway are not included as part of this project.

E.2.2 Preferred Alternative

Based on input received at the Location Public Hearing held in May 2002, the Public Information Meetings held in June 2004, and additional analysis and agency input, the 12-Lane High Occupancy Toll (HOT) Alternative was adopted by the Commonwealth Transportation Board (CTB) as the project's Preferred Alternative on January 20, 2005. This alternative would add two HOT lanes to the Capital Beltway in each direction and modify, improve and reconfigure the interchanges within the project's limits to increase capacity, reduce congestion, and improve safety.

Under this alternative, the Beltway would have a total of 12 through lanes: four general-purpose lanes and two HOT lanes in each direction, i.e., a 4-2-2-4 configuration. The two far left lanes in each direction would be designated as HOT lanes and separated from the general-purpose lanes with a 4-foot buffer strip. The HOT lanes would be used by High Occupancy Vehicles (assumed to be HOV-3+ (three or more occupants) for purposes of developing the Environmental Impact Statement (EIS)), buses, and tolled low occupancy vehicles with less than three occupants. See Figures 2-1 and 2-2 of the final EIS for cross section and plan views of the Preferred Alternative.

The main advantage of this roadway type is the capacity it provides for both HOV and HOT traffic, thereby encouraging car-pooling and bus ridership by facilitating movement throughout the HOV/HOT roadway network. Accordingly, the HOT lanes would have direct access/egress to the existing and anticipated HOV facilities located at four of the interchanges in the project area: Braddock Road, I-66, Route 123, and the Dulles Access/Toll Road, as well as direct HOT access to and from Lee Highway (Route 29).

Collector-distributor (C-D) roadways would be barrier-separated from the mainline roadways at interchanges and also between closely spaced interchanges to minimize movement conflicts and to improve safety and traffic operations. Continuous C-D roadways would be provided in both directions between Gallows Road and Route 50 (there is also an existing C-D road at Route 7 and along the northern portion of the Dulles Access/Toll Road). Generally, connection to interchanges would be made via the C-D roadways; however, direct access/egress would also be provided from the main roadways at selected interchanges. The locations where direct access/egress would occur are southbound at Gallows Road, I-66 (both directions), Route 123 (both directions), and Georgetown Pike. Northbound traffic at Gallows Road would have direct access, but egress onto a C-D road. The Dulles Access/Toll Road would have direct access northbound but egress onto a C-D road, while southbound traffic at the Dulles Access/Toll Road would have direct egress, with access via a C-D road. Left exits and entrances for non-HOV traffic, from the mainline and the C-D roadways, would be eliminated. The existing left exits and entrances would be retained to serve HOV/HOT traffic only.

At the northern end of the project segment, the 12-lane roadway configuration would transition to match the roadway cross-section prior to the George Washington Memorial Parkway interchange. The required transition in the I-495 mainline cross section would begin after the Dulles Access/Toll Road. The improvements to the southbound I-495 roadways would also begin south of the George Washington Memorial Parkway.

Similarly, at the southern end of the project segment, the I-495 mainline cross section would tie into the I-95/I-395/I-495 interchange improvements immediately north of the Beltway bridge crossing over the Norfolk Southern Railway. At this location, the Beltway cross section would consist of a 12-lane cross section.

Most of the recommended improvements would be accommodated within the existing right-of-way. A limited amount of additional right-of-way (approximately 10 acres) will be necessary because of widening at a few locations. The proposed improvements that would reduce traffic congestion and enhance traffic operation and safety are:

- Additional capacity by adding four lanes to the Beltway.

- Replacement of left exit and entrance ramps for general traffic with right exit and entrance ramps; this would eliminate multilane weaving and improve traffic safety and operation.
- Existing loop ramps that have radii smaller than the minimum design standard would be improved or replaced. Some minor design exceptions for loop ramps would be sought at locations where potential impacts to parks, residences and Metro's Orange Line could occur.
- Interchange configurations would be modified to reduce traffic congestion by eliminating the weaving movements at Braddock Road, Little River Turnpike (Alternative), and Chain Bridge Road interchanges. For instance, traffic weaving movements at the Chain Bridge Road interchange would be eliminated through the use of a flyover ramp southbound and the replacement of a loop ramp with left turn lanes for northbound traffic.

Direct HOV/HOT access would also be provided at the Lee Highway (Route 29) crossing of the Beltway. This access would involve two center access ramps for HOV/HOT traffic only: one from the northbound I-495 HOT lanes to Lee Highway in either direction, and one from Lee Highway in either direction to the southbound I-495 HOT lanes. There would be no HOV/HOT access from southbound I-495 or to northbound I-495, nor any access for non-HOV/HOT traffic. A traffic signal would be required on Lee Highway at this location.

The construction costs for the Preferred Alternative are estimated at $891 million (in Year 2002 dollars). Right-of-way costs are estimated to be $7.6 million. (Note: A supplemental estimate was prepared to forecast these same costs for the anticipated year of expenditure - 2009 - which represents the mid-point of construction. The escalated construction cost for the future year is $1.15 billion and the escalated right-of-way cost is $18.9 million.)

E.3 BACKGROUND

E.3.1 What is Fine Particulate Matter ($PM_{2.5}$)?

Particulate matter (PM) is the term for particles and liquid droplets suspended in the air. Motor vehicles (i.e., cars, trucks, and buses) emit direct PM from their tailpipes, as well as from normal brake and tire wear. In addition, vehicles cause dust from paved and unpaved roads to be re-entrained, or resuspended, in the atmosphere. Also, highway and transit projects construction may cause dust. Finally, gases in vehicle exhaust may react in the atmosphere to form PM.

Particles come in a wide variety of sizes and have been historically assessed based on size, typically measured by the diameter of the particle in micrometers. $PM_{2.5}$, or fine particulate matter, refers to particles that are 2.5 micrometers in diameter or less. (Note: A human hair is about 70 micrometers in diameter and a grain of sand is about 90 micrometers in diameter. The NAAQS for fine particulate matter include an annual standard of 15 micrometers per cubic meter ($\mu g/m^3$) and a 24-hour standard of 65 $\mu g/m^3$). The annual standard is based on a 3-year average of annual $PM_{2.5}$ concentrations; the 24-

hour standard is based on a 3-year average of the 98th percentile of the 24-hour concentrations.

E.3.2 Statutory Requirements for PM Hotspot Analyses

On March 10, 2006, EPA issued amendments to the Transportation Conformity Rule to address localized impacts of particulate matter: "$PM_{2.5}$ and PM_{10} Hotspot Analyses in Project-level Transportation Conformity Determinations for the New $PM_{2.5}$ and Existing PM_{10} National Ambient Air Quality Standards" (71 FR 12468). These rule amendments require the assessment of localized air quality impacts of federally-funded or approved transportation projects in $PM_{2.5}$ or PM_{10} nonattainment and maintenance areas deemed to be *projects of air quality concern*[2]. This assessment of localized impacts (i.e., "hotspot analysis") examines potential air quality impacts on a scale smaller than the entire nonattainment or maintenance area. Such an analysis is a means of demonstrating that the transportation project meets Clean Air Act conformity requirements to support state and local air quality goals.

Qualitative hotspot analysis is required for projects of air quality concern until such time as EPA releases its future quantitative modeling guidance and announces that quantitative $PM_{2.5}$ hotspot analyses are required under 40 CFR 93.123.(b)(4). In the interim, EPA and FHWA have issued joint guidance for conducting qualitative hotspot analyses[3]. EPA requires hotspot findings to be based on directly emitted $PM_{2.5}$, since secondary particles take several hours to form in the atmosphere, giving emissions time to disperse beyond the immediate area of concern. The Conformity Rule requires $PM_{2.5}$ hotspot analyses to include road dust emissions only if such emissions have been found significant by EPA or the state air agency prior to the $PM_{2.5}$ SIP or as part of an adequate $PM_{2.5}$ SIP motor vehicle emissions budget (40 CFR 93.102(b)(3)). Emissions resulting from construction of the project are not required to be considered in the hotspot analysis if such emissions are considered temporary according to 40 CFR 92.123(c)(5).

E.4 $PM_{2.5}$ REGIONAL CONFORMITY DETERMINATION

Section 176(c) of the Clean Air Act and the federal conformity rule require that transportation plans and programs conform to the intent of the state air quality implementation plan (SIP) through a regional emissions analysis in $PM_{2.5}$ nonattainment areas. The National Capital Region 2005 Constrained Long Range Transportation Plan (CLRP) and the 2006-2011 Metropolitan Transportation Improvement Program (TIP) have been determined to conform to the intent of the SIP. The U.S. Department of Transportation made a $PM_{2.5}$ conformity determination on the CLRP and the MTIP on February 21, 2006, and thus there is a currently conforming CLRP and TIP in accordance with 40 CFR 93.114. The current conformity determination is consistent with the final conformity rule found in 40 CFR Parts 51 and 93. The Capital Beltway project was included in the regional emissions analysis and there have been no significant changes in

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[2] Criteria for identifying *projects of air quality concern* is described in 40 CRF 93.123(b)(1), as amended.
[3] *Transportation Conformity Guidance for Qualitative Hotspot Analysis in $PM_{2.5}$ and PM_{10} Nonattainment and Maintenance Areas.* EPA420-B-06-902. March 29, 2006.

the project's design concept or scope, as used in the conformity analyses. Therefore, the Capital Beltway Improvement Project comes from a conforming plan and program in accordance with 40 CFR 93.115.

E.5 $PM_{2.5}$ HOTSPOT ANALYSIS

As noted previously, EPA's final rule on $PM_{2.5}$ hotspot analyses required a localized assessment for projects of air quality concern. FHWA has reviewed the Capital Beltway Improvement Project and determined that it meets the criteria set forth in 40 CFR 93.123(b)(1) as amended for projects of air quality concern because it is an expanded highway facility with an ADT that exceeds the threshold established in the final rule and the facility carries a significant number of diesel vehicles. Construction-related emissions for the project were considered to be temporary since the project will be completed within the next five years, meeting the criterion set forth in 40 CFR 193(c)(5). Therefore, construction-related emissions have not been considered in this hotspot analysis. EPA has not approved a $PM_{2.5}$ SIP for Virginia, nor has EPA or the Virginia Department of Environmental Quality (state air agency) made any significance findings related to re-entrained road dust for the Washington, DC-MD-VA $PM_{2.5}$ nonattainment area. Therefore, re-entrained road dust is not considered in the analysis, per the Conformity Rule. In addition, there is no applicable $PM_{2.5}$ SIP, there are no $PM_{2.5}$ control measures, and the project is in compliance with 40 CFR 93.117.

According to 40 CFR 93.123(b)(2) and (4), a quantitative analysis for applicable projects is not required until such time as EPA releases modeling guidance in the Federal Register. However, a qualitative hotspot analysis is still required. For the Capital Beltway Improvement Project, a qualitative hotspot analysis was conducted in order to assess whether the project would cause or contribute to any new localized $PM_{2.5}$ violations, or increase the frequency or severity of any existing violations, or delay attainment of the $PM_{2.5}$ NAAQS.

E.5.1 Existing Conditions

The affected area for the purposes of this analysis is the Capital Beltway study area, as discussed in Section 2 of this document and further elaborated in Chapter 3 of the final EIS. This section includes a discussion of currently available information on existing conditions related to air quality and traffic conditions in the study area.

Air Quality Monitors

There are currently thirteen air quality monitors in the Washington, DC-MD-VA $PM_{2.5}$ nonattainment area: five in the Commonwealth of Virginia, four in the State of Maryland, and four in the District of Columbia. Based on 2005 air quality monitoring data, there are three monitors that exceed the annual mean $PM_{2.5}$ standard of 15 $\mu g/m^3$: one in Virginia and two in DC. None of the monitors in the $PM_{2.5}$ nonattainment area are exceeding the 24-hour $PM_{2.5}$ standard of 65 $\mu g/m^3$. **Table E-1** provides a summary of the 2005 air quality monitoring data.

Table E-1
2005 MONITORS IN WASHINGTON, DC-MD-VA $PM_{2.5}$ NONATTAINMENT AREA

Monitor Number and Name	Number of Observations (24-hour)	98th Percentile (24-hour)	Annual Mean (24-hour)
510590030 – Franconia, VA (L-46-B9)	314	35	13.4
51059005 – Annandale, VA (L-46-C1)	110	35	14.3
5109595001 – McLean, VA (L-46-A8)	95	36	14.7
511071005 – Ashburn, VA	104	38	14.5
510130020 – Pentagon City, VA	110	34	15.2
240330030 – Muirkirk, MD	107	32	13.4
24031001 – Rockville, MD	120	32	13.6
240338003 – Upper Marlboro, MD #1	108	31	13.8
240338003 – Upper Marlboro, MD #2	60	32	13.3
110010041 – RFK Stadium, DC #1	321	36	14.8
110010041 – RFK Stadium, DC #2	67	31	15.5
110010043 – Howard University, DC	332	35	14.5
110010042 – Tidal Basin, DC	115	36	15.8

Sources:

Virginia and Washington, DC data: US Environmental Protection Agency, Office of Air Quality Planning and Standards, Information Transfer and Program Integration Information Transfer Group. AIRS Data (website: http;//www.epa.gov/air/data/monvals.html).

Maryland data: Maryland Department of the Environment. Air Monitoring Program.

The Virginia Department of Environmental Quality (VDEQ) and the Fairfax County Health Department operate three air quality monitoring stations in the project area: Doctor's Exchange at 6120 Brandon Avenue in Franconia (Station No. L-46-B9); Mason Government Center at 6507 Columbia Pike (Route 244) in Annandale (Station No. L-46-C1); and McLean Government Center at 1437 Balls Hill Road in McLean (Station No. L-46-A8). See Figure 3-9 in the final EIS for the locations of these monitoring sites.

As indicated in Table E-1, the annual mean for each of these monitoring sites is currently below the NAAQS for $PM_{2.5}$ (annual and 24-hour) and no violations have been recorded. These same trends are being experienced by the region as a whole. A recent report published by the Metropolitan Washington Council of Governments (MWCOG) demonstrates a downward trend in annual average $PM_{2.5}$ design values between 1999 and 2004 for the Metropolitan Washington, DC region.[4]

Traffic and Transportation Conditions

Average daily traffic (ADT) volumes on the 14-mile segment of the Capital Beltway between the Springfield Interchange and the American Legion Bridge vary among segments. In 2004, the daily volumes ranged from 165,000 vehicles (Braddock Road – Little River Turnpike) to 205,000 vehicles

[4] *Air Quality Trends: Metropolitan Washington Region 1993 – 2004.* Metropolitan Washington Council of Governments, 2005.

(Route 50 – I-66). The types of vehicles traveling on this portion of the Beltway are fairly consistent throughout: automobiles comprise 94 – 95% of vehicle mix with trucks and buses making up the remaining 5 – 6%. Chapter 2 of the final EIS includes a complete presentation of the traffic data.

Built and Natural Environment

The Capital Beltway traverses a well-developed suburban segment of Fairfax County. Lands along the highway facility are extensively developed with little developable land available. Land uses include commercial, residential, industrial, public facilities, and park properties. Development has occurred at each of the ten major interchanges as well as along the highway mainline. More than 14 miles of noise barriers exist along this segment of interstate highway, with twice this amount proposed as part of future improvements. Chapter 3 of the final EIS contains a detailed description of existing as well as future land uses.

E.5.2 Future Scenario

According to a recent report by the Regional Transportation Planning Board[5], $PM_{2.5}$ annual emissions associated directly to on-road mobile sources are expected to decrease by 56% in 2010 from a 2002 baseline. Emissions estimates using EPA's approved emissions estimation tool, MOBILE6.2, show that $PM_{2.5}$ emissions rates from vehicles will drop by almost 50% between 2010 (anticipated completion of Beltway construction) and 2030 (the project design year). In the MWCOG $PM_{2.5}$ conformity assessment, regional emissions of direct $PM_{2.5}$ from on-road mobile sources show a continued decline through 2020, and they show that the regional emissions of direct $PM_{2.5}$ from on-road mobile sources are well below the 2002 baseline for all milestone years (2010, 2020, and 2030).

According to EPA, the 2007 heavy-duty engine standards will result in the introduction of new, highly effective control technologies for heavy-duty engines. Particulate matter emission levels are expected to be 90% lower on a per vehicle basis than 2000 standard levels due to the 2007 diesel engine and fuel program.[6]

Improvements to the Capital Beltway are intended to provide additional roadway capacity in the study area to accommodate current and future demand and to link regional HOV systems (e.g., I-95, Braddock Road, I-66, Route 123, and the Dulles Toll Road). Increasing the capacity on the Beltway through the use of managed lanes will reduce congestion on the Interstate facility and, as a result, remove cut-through traffic from nearby local roadways. In addition to improving safety, the proposed improvements will help reduce stop-and-go traffic and extended idling and will improve traffic flow in the area overall. Chapter 2 of the final EIS includes a complete presentation of the traffic data.

E.5.3 Analytical Considerations

In accordance with the March 29, 2006 guidelines, a project-level analysis was conducted to qualitatively assess whether the proposed Beltway improvements would be expected to

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[5] *Fine Particles ($PM_{2.5}$) Standards Air Quality Assessment*. National Capital Regional Transportation Planning Board, Metropolitan Washington Council of Governments. December 21, 2005.

[6] Heavy-duty Engine and Vehicle Standards and Highway Diesel Fuel Sulfur Control Requirements – Final Rule. ("2007 Heavy Duty Highway Final Rule"). Signed December 21, 2000.

cause violations of the $PM_{2.5}$ standards, worsen existing violations of the standard, or delay timely attainment of the relevant standard. The analysis considered worst case traffic impacts (i.e., highest daily traffic volumes) along with existing air quality data from air quality monitors in the project area plus regional air quality findings issued by the MWCOG.

To conduct the project-level analysis, FHWA and VDOT reviewed traffic data for the Capital Beltway and nearby roadways to identify worst-case locations along the corridor. This review led to the assessment of three sites with the highest daily traffic volumes (see **Table E-2**).

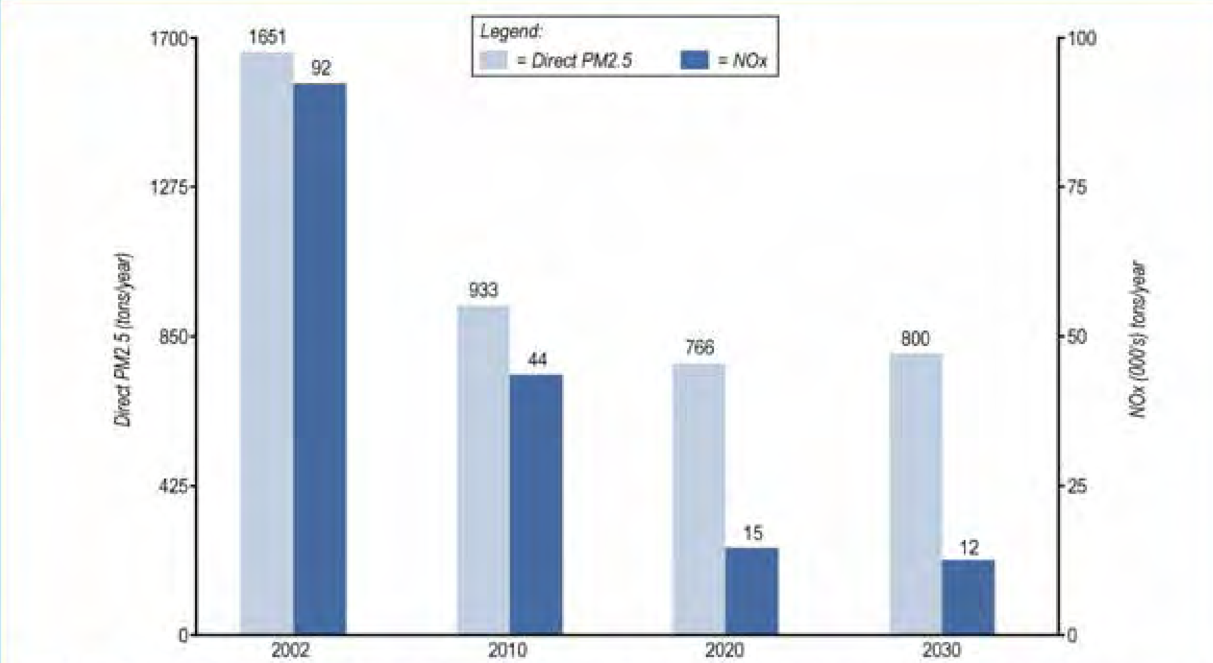
Table E-2
WORST-CASE LOCATONS FOR TRAFFIC AND TRUCK IMPACT

Location	2004 Average Daily Traffic (ADT)	2020 Average Daily Traffic (ADT)	Trucks (percent)
1. I-95 / I-395 / I-495	370,000	555,000	7%
2. I-495 / US 50	218,000	310,000	6%
3. I-495 / Dulles Toll Road	215,000	240,000	6%

The location with the highest overall traffic volumes in the corridor is the interchange of Interstate 95 with the Capital Beltway (Location No. 1). Today more than 370,000 vehicles pass through this interchange daily, making it one of the highest traffic volumes locations in the Northern Virginia area. By the year 2020, volumes are expected to increase by approximately 50 percent to 555,000 vehicles per day. This location also has the highest mix of trucks and buses within the corridor. The second highest location (Location No. 2) is at the interchange of US 50 and the Beltway. Current daily volumes for this location are 218,000 and are expected to increase to 310,000 by 2020. This forecasted growth (42 percent) and percent trucks is slightly less than that for the I-95/I-495 interchange to its south. The third highest location (Location No. 3) is located on the north end of the corridor at the interchange of I-495 and the Dulles Toll Road. Existing daily traffic volumes are 215,000 and are slightly less than Location No. 2. The percent trucks is approximately the same. Although these three sites represent worst case locations for air quality analysis, they are felt to be representative of the entire corridor in terms of land uses, traffic volumes, and truck percentages.

As described in Section E.5.1, air quality data was provided by the Virginia Department of Environmental Quality (VDEQ) and the Fairfax County Health Department for the monitors located near the three worst-case locations noted above. The meteorology at these sites as well as along the entire project corridor can be generally characterized as variable. Light winds generally tend to disperse $PM_{2.5}$ emissions at these sites. In addition, temperature, humidity, and rainfall do not seem to influence the level of $PM_{2.5}$ at the sites. As indicated in Table E-1, the 2005 annual average $PM_{2.5}$ concentrations at each of the three worst-case sites range from 13.4 to 14.7 ug/m^3, all below the annual NAAQS for $PM_{2.5}$ of 15 ug/m^3. In 2005, the 98th percentile reading for the 24-hour $PM_{2.5}$ concentration at these sites were 35 to 36 ug/mg^3, all well below the 24-hour NAAQS of 65 ug/mg^3.

Future year levels of $PM_{2.5}$ emissions have also been considered as part of this project-level analysis. As clarified in the preamble to the July 1, 2004 revision to the Transportation Conformity Rule (64 FR 40056), the conformity rule requires that project-level analyses consider the year of expected peak emissions from the project. For $PM_{2.5}$, this is expected to be a near-term year, such as the first year of operation for the Capital Beltway Improvement Project, because emission rates from vehicles are predicted to decline substantially between the opening year (2010) and the design year (2030) due in part to improvements in tailpipe emissions and national vehicle emissions control programs. As shown in **Figure E-1**, the regional $PM_{2.5}$ emissions are forecasted to decrease at a significant rate in future years. As shown in the figure, levels are much higher in 2010 than in 2020 and 2030. Since regional emission is a good indicator of the overall emissions trends in the regions, it is expected that 2010 would be the year of peak emissions from the project and other emissions sources that affect the project area despite increases in traffic in the design year. In addition, EPA finalized a series of national vehicle control programs expected to reduce vehicle emissions substantially. These programs include the Tier II vehicle and fuel sulfur standards for light-duty vehicles, the 2007 Highway Rule for heavy-duty diesel vehicles, and other related programs.[7] Based on this regional modeling data, it is estimated that a 56% reduction in $PM_{2.5}$ direct emissions by 2010, from the 2002 baseline.



Source: Fine Particulates (PM2.5) Standards Air Quality Conformity Assessment, Metropolitan Washington Council of Governments, 2005

BLTWY157

$PM_{2.5}$ TRENDS ANALYSIS FOR WASHINGTON, DC-MD-VA NONATTAINMENT AREA Figure E-1

CAPITAL BELTWAY STUDY

[7] For more information on EPA's national vehicle control programs, refer to EPA's Office of Transportation and Air Quality program information available at http://www.epa.gov.otaq.

E.6 CONCLUSION

In summary, based on the analysis, it is determined that the Capital Beltway project meets all the project-level conformity requirements, and that the proposed Beltway improvements will not cause or contribute to a new violation of the $PM_{2.5}$ NAAQS, or increase the frequency or severity of a violation for the following reasons:

- Air quality information supplied by the Virginia DEQ and Fairfax County Health Department found that air quality monitors located near the three worst-case traffic impact sites in the project area did not record any current violations and all were well below the annual and 24-hour $PM_{2.5}$ standards. These monitors are located in areas where the ADT on adjacent roadways is comparable to the ADT that can be expected on the Capital Beltway.
- $PM_{2.5}$ emissions are expected to be reduced in the project area, as demonstrated by projected reductions in the regional emissions analysis conducted by the MWCOG, as well as by national projections by EPA reflecting impacts of national emissions control programs, such as the 2007 Heavy-duty Diesel Rule.
- Any increase in emissions due to traffic changes associated with the project, will be offset by decrease in emissions from the transportation facility due to decreasing on-road vehicle emission trends, as well as decreasing background concentrations. This conclusion is supported by scientific journal articles about the air quality impact of similar projects.

VDOT