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***All Figures and Appendices are contained in separate volumes that serve as companion documents to this report*.**

INTERSTATE 95 HOV/HOT LANES PROJECT

Commonwealth of Virginia

Virginia State Project Number 0095-96A-107, PE-101
UPC # 70849

Interchange Justification Report

Interstate Project
This document has been prepared and submitted pursuant to 23 U.S.C. 111 to obtain FHWA approval to add new access ramps/modify existing interchange ramps on a fully-controlled interstate highway.

Submitted November 2011 to:

United States Department of Transportation

Federal Highway Administration

Submitted by:

VDOT Virginia Department of Transportation

The request for reconfiguration of the interstate access points is approved for engineering and operational acceptability. This approval is conditional upon compliance with applicable federal requirements, specifically with the National Environmental Policy Act (NEPA). Completion of the NEPA process is considered acceptance of the general project location and concepts denoted in the environmental documentation.

For [signature]	[signature]
Irene Rico Division Administrator Federal Highway Administration, Virginia Division	Malcolm T. Kerley, PE Chief Engineer Virginia Department of Transportation
12-19-11 Date of Approval	12/15/11 Date of Approval

INTERSTATE 95 HOV/HOT LANES PROJECT

Commonwealth of Virginia

VIRGINIA MEGAPROJECTS

Interchange Justification Report

This document has been prepared to satisfy the requirements set forth by Federal and State Policy for changes in interstate access. It is consistent with the Virginia Department of Transportation's Location and Design Division Instructional and Informational Memorandum LD-200.4, and in accordance with the most recent update to FHWA's policy on *Access to the Interstate System* dated August 27, 2009.

Submitted to:

United States Department of Transportation

Federal Highway Administration

Submitted by:

VDOT Virginia Department of Transportation

Prepared under the direction and review of:

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11/19/11
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Executive Summary

ES.1 Project Background

Interstate 95 (I-95) serves as a major corridor for the movement of people and freight along the entire eastern seaboard. It also serves as a regional route for commuters to and from the Washington, DC metropolitan area and is a local route for traffic in the suburban areas of the City of Fredericksburg and southeastern Fairfax County/ northeastern Prince William County. This segment of the I-95 corridor is one of the most congested freeways in the region and in the Commonwealth of Virginia, based on regular freeway operations / congestion surveys performed by both the local Metropolitan Planning Organization (the Metropolitan Washington Council of Governments, or MWCOG) and the Virginia Department of Transportation.

The existing I-95 mainline freeway has three general purpose (GP) lanes in each direction, from the south-most project terminus at the Garrisonville interchange to the Route 123 interchange (Exit 160). Between the Route 123 interchange and the Fairfax County Parkway interchange, I-95 was just recently expanded to four GP lanes in each direction, with additional lanes in each direction developed to the north up to the Capital Beltway (I-495). These basic through lanes are supplemented in a number of locations with acceleration/deceleration lanes at on and off-ramps and auxiliary lanes between interchanges.

The existing I-95 reversible High Occupancy Vehicle (HOV) facility through the study area is comprised of two lanes located in the center median, between the northbound and southbound GP lanes. The existing HOV lanes extend from Dumfries in Prince William County, just south of the Route 234 (Dumfries Road) interchange, to the Springfield Interchange at Interstate 495 (the Capital Beltway) /Interstate 395 in Fairfax County. North of the Capital Beltway, the reversible HOV lanes continue in the center median of Interstate 395 (I-395) through the City of Alexandria and Arlington County to the urban core of Washington, DC. [The mainline of I-95 makes a 90-degree turn at the Springfield Interchange and runs coincidental to I-495 around the eastern half of the Capital Beltway]. South of Dumfries to the southern terminus of the project at the interchange with Route 610 (Garrisonville Road) in Garrisonville, a distance of approximately 9 miles, there are currently no HOV lanes.

Under provisions of Virginia's Public-Private Transportation Act of 1995 (PPTA), the Virginia Department of Transportation (VDOT) and private partners Fluor Virginia, Inc. and Transurban USA, Inc. (Fluor-Transurban) propose to make the following changes along the I-95 corridor, as shown in **Figure ES-1**:

- Construct two new reversible HOV/HOT lanes along the 9-mile segment within the median between Route 610 (Garrisonville Road) and the existing terminus south of Route 234 (Dumfries Road);

- Convert the existing two-lane directional HOV facility to a two-lane reversible HOV/ High Occupancy Toll (HOT) lanes along a 6-mile segment between Route 234 (Dumfries Road) and Route 3000 (Prince William Parkway);
- Re-stripe and convert the existing two-lane directional HOV facility to a three-lane reversible HOV/ High Occupancy Toll (HOT) lanes along a 13.5-mile segment between Route 3000 (Prince William Parkway) and the Turkeycock ramps north of Edsall Road;
- Modify, upgrade and/or add new entry/exit points, including structures, between the GP lanes and the HOV/HOT lanes, and in a few isolated locations, to/from arterials.

ES.1.1 Project Termini

Several iterations of study limits and construction phasing have been proposed through the development history of this project over a number of years. The southernmost terminus proposed in the I-95 HOV/HOT Lanes Environmental Assessment (approved for Public Distribution by FHWA September 8, 2011) is located approximately 1.10 miles south of the U.S. Route 17 (Mills Drive) overpass near Massaponax. The proposed project study area in the NEPA documentation extends northward along existing I-95, and ends north of the I-395/Edsall Road interchange in Fairfax County. At the northern terminus, the transition to the existing I-395 HOV lanes and GP lanes is proposed just north of the I-395/Edsall Road interchange, at the existing Turkeycock ramp connections between the GP lanes and the HOV lanes south of the Alexandria City Limits.

Proposed improvements to the I-95 corridor, as part of the I-95 HOV/HOT Lanes project, will be constructed in two sections:

- Northern Section (Phase 1, 2015 opening year) – 40 miles from north of Garrisonville to south of Alexandria
- Southern Section (Phase 2, 2018 opening year) – 17 miles from south of Massaponax to north of Garrisonville

The Northern Section, or Phase 1 of the project, will include capacity expansion of the existing two-lane reversible HOV facilities in Fairfax County and portions in Prince William County to a three-lane reversible section between the Prince William Parkway and the Springfield Interchange. It will also include conversion of the reversible HOV facility to reversible HOT Lanes (HOV 3+ and toll-paying motorists). North of the Capital Beltway on I-395, the proposed HOT Lanes will transition back to HOV 3+ at the Turkeycock ramps, north of the Edsall Road interchange. All northbound HOT traffic will be directed to exit from the HOT lanes back into the GP lanes at a new flyover connection constructed at the Turkeycock ramps when the reversible lanes are flowing to the north. Conversely, southbound traffic will be able to enter the HOT lanes at the existing ramp connection between the GP lanes and the HOT lanes. Provision of additional ramp connections to and from the HOT Lanes, or ramp modifications to existing ramp connections within the corridor, will be included as a component of the Northern Section of the project. The Northern Section also includes construction of a nine-mile extension of the HOT lanes south of the current barrier-separated HOV facility terminus at Route 234 in Dumfries, with an extension down to Garrisonville. **Figure ES-2** illustrates the configuration of the southern terminus to be constructed as part of the Northern Section (also known as the interim configuration of the southern terminus). Construction of the Northern Section is anticipated to commence in 2012 and last approximately three years, with an opening year of 2015 or 2016.

This Interchange Justification Report (IJR) is being prepared for the Northern Section of the project (Phase 1) only, with a southern terminus proposed just north of Route 610 Garrisonville Road. A separate IJR will be produced for the southern section (Phase 2) between Massaponax and Garrisonville at a later date. These project limits for the IJR extend approximately 40 miles, affect 23 interchanges and lie within Stafford County, Prince William County, the Town of Dumfries, Fairfax County, and the southern edge of the City of Alexandria.

The Southern Section (Phase 2) of the I-95 HOV/HOT Lanes project would extend the two-lane reversible HOT lanes for another 17 additional miles, from Garrisonville down to Massaponax, and include additional slip ramps and access points. **Figure ES-3** illustrates the configuration of the southern terminus to be constructed as part of the Southern Section (also known as the final configuration of the southern terminus). Construction would begin within the next few years, with an anticipated opening date of 2018. The complete system is anticipated to be fully operational by 2018 for the entire 57-mile corridor.

ES.1.2 Summary of Project Purpose and Need

The purpose of the project is to expand highway capacity while also facilitating ridesharing and transit choices by providing dedicated lanes for multi-occupant vehicles. One of the objectives of the expansion and conversion of the HOV system to HOV/HOT is to be able to realize underutilized capacity on the existing HOV lanes while reducing congestion on the sections of the GP lanes that currently operate over capacity and that will continue to be oversaturated in the future.

ES.2 Summary of Proposed Action

Under the proposed action for this IJR, the Northern Section of the I-95 HOV/HOT Lanes proposes the following improvements to the I-95 corridor:

- Extend the new HOV/HOT lane facility approximately 9 miles to the south by constructing two lanes in the median of I-95 between Garrisonville in Stafford County and the existing southern terminus at Dumfries in Prince William County;
- Convert the existing two-lane HOV facility, from south of Dumfries to north of Prince William Parkway, to a two-lane HOV/HOT lane facility;
- Expand the current two-lane HOV facility, between the Prince William Parkway and the northern terminus (located approximately 2 miles north of Capital Beltway near Turkeycock Run), to a three-lane HOV/HOT lane facility;

- Add new entry/exit points into and out of the lanes.

New entry/exit points into and out of the HOV/HOT lanes, as listed in **Table ES-1** Modifications in Access below, will be added along the corridor. All existing entry/exit points between 2 miles north of I-495 (including Turkeycock Run southbound HOV ramp) and south of the Town of Dumfries will be converted to HOV/HOT unless modified as indentified below.

Table ES-1. Modifications in Access

No.	Route	Connection Location:	Morning Connections	Evening Connections	Type of Modification
1	I - 95	Between VA 619 (Joplin Road) and VA 610 (Garrisonville Road)	NB general purpose lanes to NB HOV/HOT lanes	SB HOV/HOT Lanes to SB general purpose lanes	New – NB slip ramp and SB flyover
2	I - 95	Between US 234 (Dumfries Road) and VA 619 (Joplin Road)	N/A	SB HOV/HOT Lanes to SB general purpose lanes	Expanded – replace SB slip ramp with flyover
3	I - 95	Between Opitz and Dale Blvd	N/A	SB GP to SB HOV/HOT Lanes	New
4	I - 95	Between VA 123 (Gordon Road) and VA 3000 (Prince William County Parkway)	NB HOV/HOT Lanes to NB general purpose lanes	N/A	New
5	I - 95	Between VA 642 (Lorton Road) and Rt 1	N/A	SB GP to SB HOV/HOT Lanes	New
6	I - 95	Between VA 7100 (Fairfax County Pkwy) and VA 638 (Pohick Road)	N/A	SB HOV/HOT Lanes to SB general purpose lanes	Ramp Deleted (to accommodate No. 2 above)
7	I - 95	VA 7100 (Fairfax County Parkway) via Alban Rd / Doudinot Dr	NB HOV/HOT Lanes to Fairfax County Parkway (via Alban Rd / Boudinot Dr)	Fairfax County Parkway (via Alban Rd / Boudinot Dr) to SB HOV/HOT Lanes	New (*REVERSIBLE*)
8	I - 395	Between VA 648 (Edsall Road) and Turkeycock Run	NB HOV/HOT Lanes to NB general purpose lanes	N/A	New

With the exception of the following locations, at-grade slip ramps would enable access between the GP and HOT lanes:

- Between Garisonville Road and Russell Road and between Joplin Road and Dumfries Road, flyovers would be constructed to enable traffic to exit the HOV/HOT lanes and enter the right-hand southbound GP lane.

- A reversible flyover would be constructed to provide direct access between Alban Road and the HOV/HOT lanes.
- At the northern terminus of the project (north of Edsall Road), a flyover would be constructed to enable traffic to exit the HOV/HOT lanes and enter the right-hand northbound GP lane.

Other infrastructure elements associated with the project would include signage, electronic variable message displays, electronic toll collection equipment, reversible traffic control gates, sound barrier walls and stormwater management facilities.

ES.3 Summary of Findings

The operational and safety analysis performed as part of the access request includes the GP mainline and reversible HOV or HOT freeway segments, associated ramps and C-D roads for the length of the project, plus the first adjacent interchange on each side of the proposed HOT Lanes termini for the Northern Project. At each of the interchanges, the crossroads included the ramp terminal intersections and adjacent local street intersections (within close proximity). At the Capital Beltway and at the Springfield-Franconia Parkway, the next adjacent interchanges on either side of I-95 were also included in the analysis.

The proposed plan should produce marked operational improvements to the overall system by increasing capacity and access on the reversible lanes and by transferring some of the traffic currently using the over-saturated GP Lanes to the proposed HOT Lanes, which operate with excess capacity if they are left to remain as operating under HOV-3+ only. The analysis using traffic simulation showed improvements in travel times, throughput, speeds, and congestion/queuing on a number of segments within the GP Lanes, without adversely impacting those same elements on the HOT Lanes. A detailed assessment of traffic operations using microsimulation (VISSIM) and deterministic methods (Highway Capacity Software HCS-2010) is presented in Chapter 9 of this document.

ES.3.1 Operational Analysis Findings

Traffic operational analyses and quantitative safety studies consistent with FHWA's policy are documented herein. The preliminary 2018 and 2035 traffic operational analyses do not show marked degradation between the No-Build and Build conditions. One exception is during the AM peak period at the northern terminus of the project, in the GP Lanes from Edsall Road to north of Duke Street. In both 2018 and 2035, the operations show some degradation of operations on the GP Lanes due to the proposed change in capacity of the HOT Lanes north of Edsall Road (transition from 3 lanes to 2 lanes) and transition of toll-paying traffic back to the GP lanes.

A major contributing element to operations at the northern terminus which occurs in the Existing, No-Build and Build scenarios is the downstream congestion and queuing resulting from operations at Seminary Road interchange and the northbound freeway segment between Duke Street and Seminary Road. However, the proposed plan was also assessed with a sensitivity analysis which identified some downstream improvements that could be implemented at some point as a separate project, as deemed appropriate by FHWA and VDOT, to mitigate traffic operational or safety issues resulting from the existing spillback. A detailed discussion on mitigation for the northern terminus in Section 9.3 of this IJR provides a range of options to address the issues specific to the northbound traffic at the northern terminus mentioned above. This mitigation is focused on addressing potential traffic operational issues that could be associated with downstream conditions such that the proposed project can be implemented without adverse impacts to adjacent interchange and arterials.

A similar issue was observed under a "Phase 1 interim conditions" sensitivity analysis at the southern terminus for the Northern Section, for the 2018 horizon year only, assuming that all southbound HOT/HOV traffic must exit the reversible lanes and transition back to the GP Lanes at Garrisonville. This scenario is limited to the PM peak period in the near term, up until such time that the Southern Project is completed and HOT/HOV traffic may continue south on the new HOT Lanes beyond Garrisonville and down to Massaponax (southern terminus for the Southern Section). Sensitivity analyses for this location show that bottle-neck congestion may be mitigated through the use of dynamic tolling on the south-most tolling segment, and that the total travel time and vehicle throughput improve for the Build Scenario. The analysis and results are discussed in detail in Section 9.3.

Supporting documentation also includes a functional signing plan (Appendix G) and assumptions used in developing a signing concept, as provided in Section 13 of this document.

ES.3.2 Crash Analysis Findings

From 2006 to 2008, there were 5,948 reported crashes along I-95/395 from south of Garrisonville Road to north of Duke Street. There were also 892 reported crashes along I-495 from north of Braddock Road to east of Van Dorn Street. Several exhibits were prepared to summarize the crash history for the mainline corridor (I-95/395) by freeway direction and analysis segments. Graphics included in the detailed Crash Analysis Chapter show the total number of study area crashes by location and severity for the northbound and southbound GP lanes respectively, as well as the total number of study area crashes by location and collision type for each travel direction.

Crashes peak between Gordon Boulevard and Fairfax County Parkway. It should be noted that the proportion of rear end crashes greatly increases at the northern end of the corridor. Overall, rear end (including sideswipe-same direction) plus lane departure (including fixed object crashes and non collisions) collisions account for over 95 percent of all crashes in the GP lanes. In the southern half of the corridor, approximately 60 percent of all crashes were rear end. However, in the northern half, rear end crashes represented nearly 80 percent of all collisions. Inspection of the data reveals that the crash increases seen in the northern corridor are predominately a result of growth in rear end crashes. This trend is expected to be directly related to existing congestion and degraded traffic operations that are concentrated around Gordon Boulevard and at the northern end of the corridor. The expectation is that higher volumes along with more frequent stop and go traffic operations result in more conflicts and related rear end collisions.

Overall it can be concluded that the preferred design should not have significant adverse impacts on the safety of the freeway systems within the study area. Rather, with the proposed project and balancing of traffic flow and congestion within the corridor, it is expected that the anticipated operations improvements will have a positive effect on the corridor's safety performance, such that the built corridor may be better than, and certainly no worse than, the no-build condition. While the safety performance review of the corridor indicates that crash frequency may increase at the points of new connections with the freeway facility, the improvement of traffic operations along the corridor, especially the northern half of the study corridor should have an overall positive effect on safety, thus reducing crash rates along the mainline sections. Though crashes may increase on the reversible lanes, the cumulative effect of this project on the safety of the corridor will be a positive impact.

ES.4 Conclusions

VDOT and private partners Fluor-Transurban have developed a design solution to resolve the issues raised in the Purpose and Need Statement for the I-95 HOV/HOT Lanes project, as documented in the EA prepared for the project. Throughout the entire project development process for the improvements proposed in this IJR, VDOT and Fluor-Transurban have worked in partnership to advance engineering and analysis in support of the proposed improvements. The Preferred Alternative has no significant impacts on the operations and safety of I-95 (i.e. no major degradation between No-Build and Build scenarios), and does not preclude implementation of an ultimate long range plan for the I-95 corridor.

This report demonstrates that the Preferred Alternative is consistent with eight policy points under FHWA's *Policy on Access to the Interstate System*. VDOT supports this Preferred Alternative as addressing the fundamental issues and concerns presented in this document and in the EA, and formally requests that FHWA find this plan to be geometrically and operationally acceptable.