

ROUTE 7

WIDENING

— FAIRFAX COUNTY —

ALTERNATIVES TECHNICAL REPORT

NOVEMBER 2017



Route 7 Corridor Improvements

Reston Avenue to Jarrett Valley Drive

Alternatives Technical Report

Fairfax County, Virginia

Project Number: 0007-029-128, B610, C502, P102, R202; UPC: 52328

Federal Project Number: DEMO-5A01(439)

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Appendix

Appendix A – Design Criteria

List of Acronyms

AASHTO	American Association of State Highway Transportation Officials
CCT	Cross County Trail
CLRP	Constrained Long-Range Plan
DEQ	Department of Environmental Quality
EA	Environmental Assessment
EPA	Environmental Protection Agency
FCPA	Fairfax County Park Authority
FHWA	Federal Highway Administration
FY	Fiscal Year
LOS	Level of Service
MPH	Miles Per Hour
MWCOG	Metropolitan Washington Council of Governments
NEPA	National Environmental Policy Act
NVTA	Northern Virginia Transportation Authority
SPUI	Single Point Urban Interchange
SYIP	Six-Year Improvement Program
TIP	Transportation Improvement Plan
TPP	Transportation Project Priorities
TSM	Transportation Systems Management
USACE	United States Army Corp of Engineers
VAC	Virginia Administrative Code
VDOT	Virginia Department of Transportation
VDRPT	Virginia Department of Rail and Public Transportation
VSMP	Virginia Stormwater Management Program

1.0 INTRODUCTION

1.1 Project Description

The Virginia Department of Transportation (VDOT), in coordination with the Federal Highway Administration (FHWA), is evaluating improvements along a seven mile section of Leesburg Pike (Route 7) between Reston Avenue and Jarrett Valley Drive in Fairfax County, Virginia (herein referenced as “the study area”). The purpose of these improvements under consideration is to increase capacity, as well as address safety and deficiencies in access management. Pursuant to the National Environmental Policy Act of 1969, as amended, (NEPA) and in accordance with FHWA regulations, an Environmental Assessment (EA) has been prepared to analyze and document the potential social, economic and environmental effects associated with the transportation improvements being considered. As part of the EA, VDOT is evaluating the environmental consequences of the No Build Alternative and one Build Alternative.

To support the analysis in the EA, this Alternatives Technical Report has been prepared to document the following:

- **Section 1** provides project background information and an overview of the study area;
- **Section 2** describes the No Build Alternative and Build Alternative.

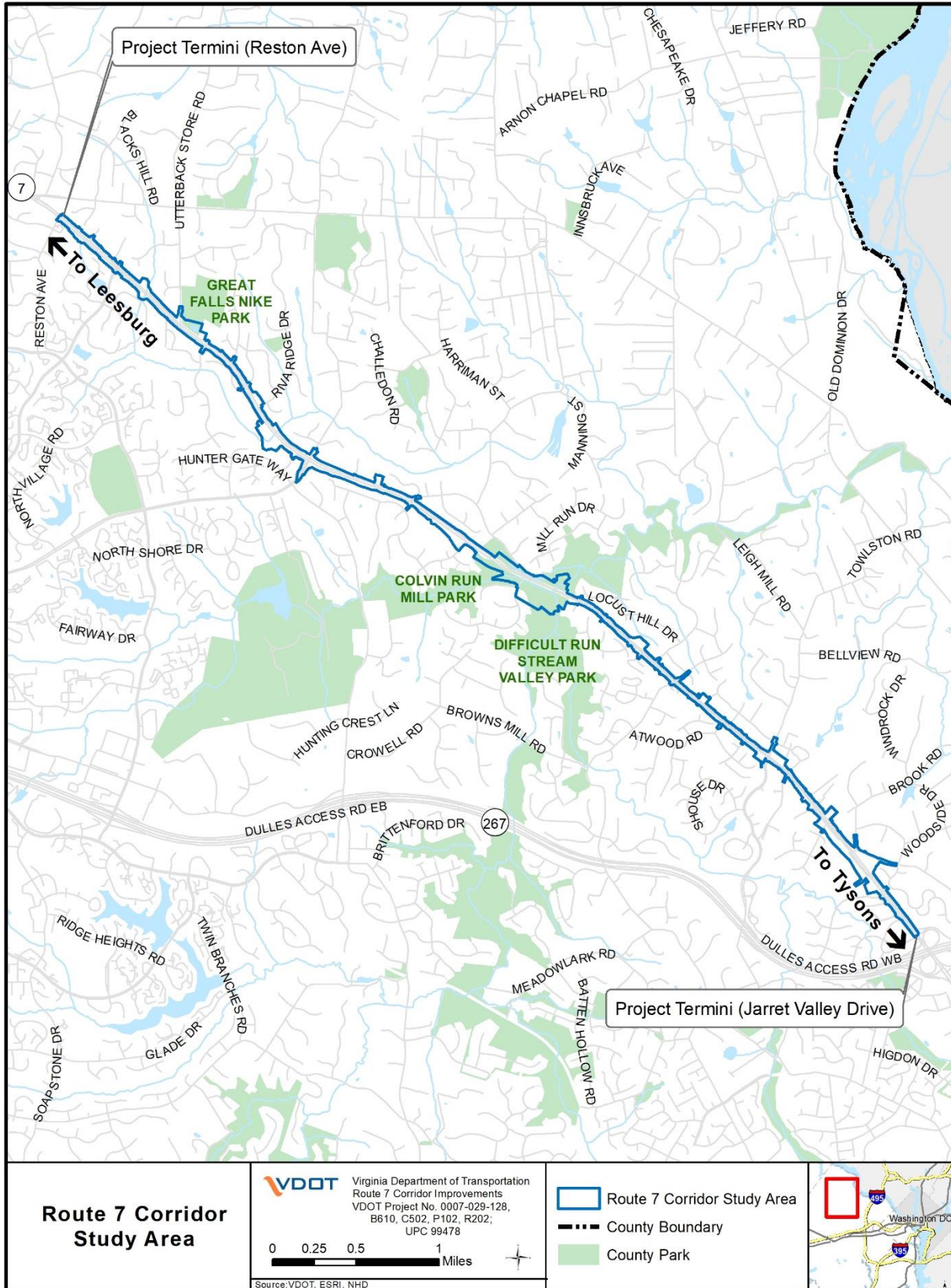
The proposed roadway improvements would provide an additional lane in each direction and would widen to the inside median where possible. A raised median, multi-purpose trail, and intersection improvements are also proposed. A bridge replacement is proposed for the Difficult Run stream crossing with the wider typical section. The study area is bounded by Reston Avenue to the west and Dulles Toll Road to the east (see **Figure 1-1**).

1.2 Project History

The widening of the Route 7 corridor from four to six lanes west of Tysons Corner to the Fairfax County line has been contemplated in Fairfax County’s Comprehensive Plan since 1975. The Fairfax County Parkway (Route 286) interchange at Route 7 was completed in 1999 and included the widening of Route 7 between the Loudoun and Fairfax County line to Rolling Holly Drive. In 2016, a one-mile section of Route 7 was widened between Rolling Holly Drive and Reston Avenue. Currently VDOT is widening Route 7 for a half of a mile between Jarrett Valley Drive and Tyco Road, which includes the replacement of the bridge deck over Dulles Airport Access Highway and Toll Road (Route 267) with construction expected to be completed in Spring 2018.

Currently, the widening of this section of Route 7 from four to six lanes is included in Fairfax County’s Comprehensive Plan 2013 Edition (as amended) for Transportation (Fairfax County, 2017). The County’s interest in improving safety and capacity along Route 7 is also documented in the County’s *Third Four Year Transportation Program (FY2013-FY2016)* and the *FY2015-FY2020 Transportation Project Priorities (TPP)* (Fairfax County 2014c and 2014d). This project has long been a part of the Metropolitan Washington Council of Governments (MWCOC) (the Region’s Metropolitan Planning Organization) *Constrained Long Range Plan (CLRP)* and the *Transportation Improvement Plan (TIP)* (MWCOC, 2016a and 2016b).

Figure 1-1: Study Area



In addition to being included in this regional plan, the Northern Virginia Transportation Authority’s regional transportation plan entitled TransAction 2040 designates the Dulles/VA 7 corridor as their top corridor for improvements (NVTA, 2012). This project is also included in VDOT’s 2025 State Highway Plan (VDOT, 2005). This plan is included as part of the 2035 Virginia Surface Transportation Plan Update (VDRPT, 2013).

1.3 Purpose and Need

The purpose and need for the proposed improvements is to:

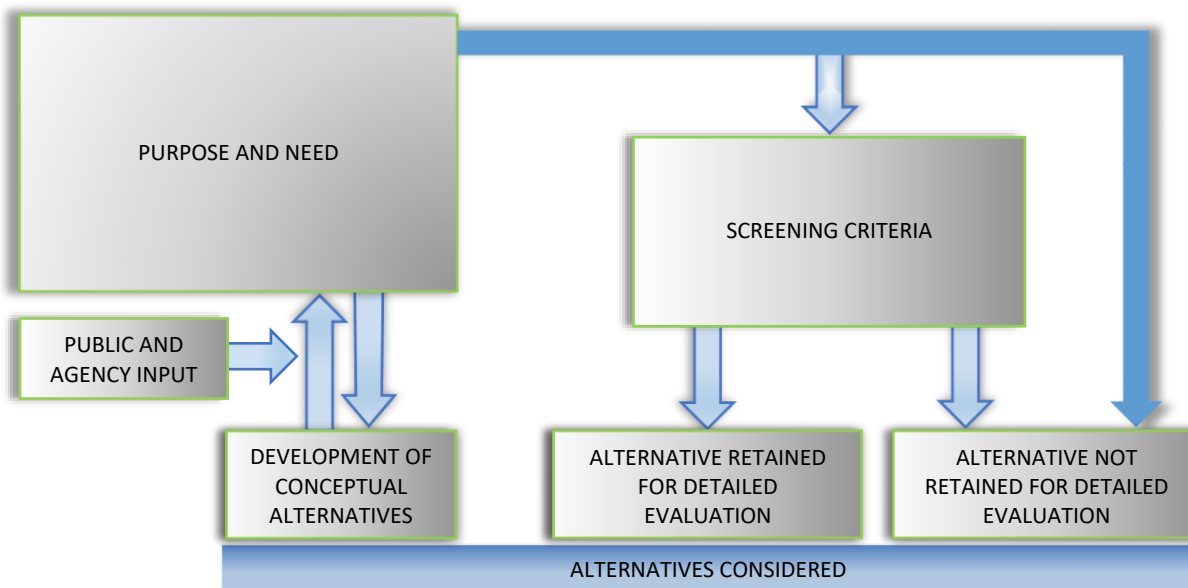
- Address capacity deficiencies resulting from existing and future traffic demand.
- Address access management deficiencies.

2.0 ALTERNATIVES CONSIDERED

2.1 Alternatives Development and Screening Process

The alternatives development process was initiated with the development of the project’s purpose and need as discussed in **Section 1.3**. Upon the establishment of the project’s design criteria, alternatives were developed and evaluated to determine whether they satisfy the project’s purpose and need. As a result, alternatives were either not carried forward for further study or retained for detailed study. The alternatives development process included a robust public involvement program in addition to agency and utility coordination. **Figure 2-1** illustrates the general process used to identify and screen alternatives.

Figure 2-1: Alternatives Development and Screening Process



2.1.1 Establishment of Design Criteria

The design criteria for the project is based on Virginia Department of Transportation (VDOT) design standards as specified in VDOT’s Road Design Manual (VDOT, 2012). Route 7 is classified as an Urban

– Other Principal Arterial (Geometric Design Standard, GS-5) with a design speed of 60 miles per hour (mph) and rolling terrain. The project design criteria table is provided in **Appendix A** and contains the design criteria for Route 7, the intersecting roadways, service roads, and shared use paths within the project limits.

2.1.2 Alternatives Development Screening Criteria

The purpose of developing alternatives is to study design options that not only meet the need and criteria of the project, but also minimize impacts to the environment, private property, and existing utilities. In addition, the design options should strive for public approval as well as Fairfax County Department of Transportation and Fairfax County Park Authority (FCPA) acceptance. The concepts need to be constructible, utility relocations proposed need to be feasible, and the project needs to be able to obtain the necessary permits to construct.

After defining the purpose and need, which informed the development of the alternatives development screening criteria, a reasonable range of alternatives were considered. These alternatives were evaluated to determine how well they addressed the purpose and need, based on the alternatives development screening criteria for the study. The alternatives developed included a No Build Alternative, Transportation Systems Management (TSM) strategies, investigation of future mass transit, and one Build Alternative. Since Route 7 west of Reston Avenue is currently six lanes and Route 7 east of Jarrett Valley Drive is currently being widened to six lanes, an additional build alternative that did not involve the expansion of the roadway to six lanes was not considered. The evaluation of one Build Alternative is consistent with FHWA’s Technical Advisory *T 6640.8A Guidance For Preparing and Processing Environmental and Section 4(f) Documents*. In order to provide a baseline for comparison, a No Build Alternative is also being evaluated as described in **Section 2.3.1**.

2.2 Alternatives Not Retained for Evaluation

Through the alternatives screening process, two alternatives were not retained for further consideration and were not carried forward for detailed study. The justification for the elimination of the alternatives is summarized below. However, even though these alternatives are not being retained for further consideration at this time, they are not precluded from being implemented in the future.

2.2.1 Transportation System Management (TSM) Alternative

“TSM” generally means implementation of relatively low-cost actions to improve efficiency of existing transportation systems. Examples include traffic controls, signal synchronization, turn lanes, parking management, access management, operations modifications, flexible work hours, van pools, transit scheduling, bicycle and pedestrian improvements, modifying driver behavior with incentives, pricing, or restrictions. Although such actions are improvement elements in the overall transportation plan for any urbanized area, TSM was not retained as an individual stand-alone alternative because it does not meet the identified needs for this project because they would not address the capacity and access management deficiencies.

2.2.2 Mass Transit Alternative

This alternative would increase mass transit service in the study area. The travel hazards along Route 7 mostly stem from the uncontrolled access points and the current and future carrying capacity issues. Increasing the use of mass transit will not solve the capacity and access management problems, nor would it substantially reduce the congestion and capacity deficiencies. Since it does not meet the project purpose or need, the Mass Transit Alternative has been eliminated from further study.

2.3 Alternatives Retained for Evaluation

2.3.1 No Build Alternative

In accordance with the regulations implementing the National Environmental Policy Act (NEPA) (40 CFR § 1502.14(d)), the No Build Alternative has been included for evaluation as a benchmark for the comparison of future conditions and impacts. The No Build Alternative would retain the existing Route 7 roadway and associated intersections/interchanges in their present configuration, and allow for routine maintenance and safety upgrades. This alternative assumes no major improvements to the Route 7 corridor with the exception of previously committed projects, including projects currently programmed and funded in VDOT Fiscal Year (FY) 2018-2023 Six-Year Improvement Program (SYIP), the MWCOG for the National Capital Region CLRP 2016, and Fairfax County Department of Transportation Capital Projects. As these other projects are independent of the proposed action, they are not fully evaluated in this Alternatives Technical Report, nor in the EA.

2.3.1.1 Ability of No Build Alternative to Address the Purpose and Need

According to 2011 traffic counts, Route 7 carries 46,000 to 54,000 vehicles per day along Route 7 between Reston Avenue and Jarrett Valley Drive (VDOT, 2016). In 2040, Route 7 is expected to carry between 73,000 and 86,000 vehicles per day. This will lead to more severe and a longer duration of congestion during both the AM and PM peak periods. Therefore, the No Build Alternative would not address the purpose and need for the project as identified in **Section 2.3.1**.

2.3.2 Build Alternative

The proposed project would provide an additional lane on each side of the existing roadway for a total of six 11-foot lanes with curb and gutter divided with a 16-foot raised median. Turn lane lengths would also be improved to meet the full American Association of State Highway Transportation Officials (AASHTO) requirements for deceleration and storage to eliminate backups into through lanes. Unsignalized median crossovers not meeting signal warrants would either be closed or converted to median left turn lanes.

In addition, the following improvements are proposed for the corridor:

- There are a number of substandard vertical curves that do not meet the required lengths for stopping sight distance and the roadway's design speed; substandard vertical curves would be corrected to meet the required design speeds;
- Intersection sight distance at the Trap Road/Route 7 intersection is substandard; the Build Alternative would configure the intersection to a right in/right out from the existing full access intersection to prohibit unsafe traffic movements;

- The Utterback Store Road intersection with Route 7 would be reconfigured to eliminate the existing severe skew;
- The project would replace the existing bridge over Difficult Run with a new structure to eliminate flooding issues experienced with the existing structure;
- 10-foot wide shared use paths would be provided along the westbound and eastbound lanes creating a continuous pedestrian route for the entire corridor; and,
- Protected signalized pedestrian movements would be provided at all signalized intersections.

The Build Alternative is in compliance with Fairfax County’s planning documents. The Fairfax County Comprehensive Plan includes improving Route 7 by widening the roadway to six lanes from the Loudoun County line to the Dulles Toll Road (Fairfax County, 2017). In addition, the Comprehensive Plan’s Transportation Plan Map identifies future interchanges along Route 7 at Baron Cameron Avenue (as a partial interchange) and Reston Parkway (full interchange, but not included as part of the current project) (Fairfax County, 2015). Both the Countywide Trails Plan and the County Bicycle Master Plan depict shared use paths along both sides of Route 7 within the project area (shared use paths are included as part of the current project) (Fairfax County, 2014a and 2014b).

During the project development phase, VDOT coordinated with Fairfax County Department of Transportation, FCPA, regulatory agencies, and the public to refine the Build Alternative based on their feedback. Subsequent to the preparation of the EA, the Build Alternative was further refined by VDOT based upon additional feedback with state and federal regulatory agencies. The following sections detail the design modification options considered to refine the Build Alternative to avoid or minimize impacts to environmentally sensitive areas and describe the design options that are included in the Build Alternative.

2.3.2.1 Route 7 Widening Typical Section and Roadway Alignment Options

The VDOT Geometric Design Standard GS-5 for this portion of Route 7 (an Urban – Other Principal Arterial) with a design speed of 60 mph specifies a minimum lane width of 12 feet and the use of mountable curb and gutter (if curb and gutter is being specified). The minimum width for a two-way shared use path is 10 feet and the required separation from the edge of a shared use path to the face of curb is eight feet (VDOT, 2012).

Generally with roadway widening projects, it is desirable to utilize the existing roadway pavement where feasible and practical and, thereby, generally maintain the existing roadway centerline and widen the roadway proportionally on both sides. However, it is not always feasible, especially if the geometric features of the existing roadway do not meet current design standards (i.e. substandard horizontal and vertical curves, substandard superelevation, etc.). Within the project limits, Route 7 is an open-section, divided two-lane roadway with a grassy median of varying width. The project proposes installing a raised median separating eastbound and westbound traffic. Early in the project development, the roadway widening proposed a 48-foot wide raised, landscaped median for the western half of the project (from Reston Avenue to Difficult Run). The wider median was proposed to accommodate the possibility of future transit along the corridor. However, a wider median would require widening to the outside of the existing lanes, increasing the footprint of the project, which would result in increased impacts to existing utilities and the acquisition of right of way along most of the length of the corridor.

Through project development, public engagement, and coordination with utility companies and public agencies, the proposed width of the raised median was reduced through several iterations, in the western half of the project, from 48 feet to 28 feet to 16 feet. A 16-foot wide median is the minimum width of median that can accommodate a left turn lane and a four-foot wide concrete median approaching intersections while taking into consideration vehicular and pedestrian safety.

The initial widening concepts depicted 12-foot wide travel lanes as specified by the VDOT Geometric Design Standard GS-5 (see **Figure 2-2**) (VDOT, 2012).

Through the project development process, the lane widths were reduced to 11 feet and a design waiver was requested and approved by VDOT for this variation in the design standards. The reasons cited in the design waiver for the reduction in lane width include: to reduce costs and reduce property impacts/right of way needs. **Figure 2-2** shows the iteration of the typical section.

The reduction in lane width will also result in a reduction of the following:

- Proposed pavement;
- Right of way and utility impacts;
- Impacts to wetlands, historic properties, and environmentally sensitive areas; and
- Pedestrian crossing times for pedestrians crossing Route 7.

In addition, the width of the buffer between the back of curb and the edge of shared use path has been reduced to 5 feet in width. A design waiver will be required for the deviation to the design standard which specifies that the separation from the face of curb to the edge of the shared use path shall be a minimum of 8 feet in order to meet the minimum lateral offset distance to install signs for the roadway and the shared use path (VDOT, 2017c). This reduction of width of the buffer will reduce right of way impacts and impacts to environmentally sensitive areas.

Existing substandard design features, such as substandard horizontal or vertical curves, substandard sight distance at intersections, etc., would be corrected to meet current design standards. Design items that prove to be infeasible to upgrade to current standards would require the approval of a design waiver or exception.

The initial horizontal alignment developed for the Route 7 Widening project depicted the roadway being widened uniformly on both sides of the roadway. There are documented flooding problems on Route 7 in the vicinity of Colvin Run / Difficult Run. **Figure 2-3** shows photographs of Route 7 being overtopped during a 2-year storm event. The initial horizontal alignment was conceptual in nature and did not address the flooding issues at Colvin Run / Difficult Run.

As noted in VDOT's Drainage Manual, an Urban – Other Principal Arterial is required to convey the 25-year storm event, otherwise known as the design year storm (VDOT, 2017c). In order to pass the design year storm through the Difficult Run bridge structure, the roadway profile needs to be raised approximately five feet over the existing roadway/bridge elevation and the proposed bridge structure opening needs to be increased to 330 feet in length. In addition, grading is required under the proposed bridge to provide sufficient area for the surge of the storm event runoff to pass under the proposed structure to achieve the hydraulic needs for the opening (see **Figure 2-4**).

Figure 2-2: Typical Section Iterations

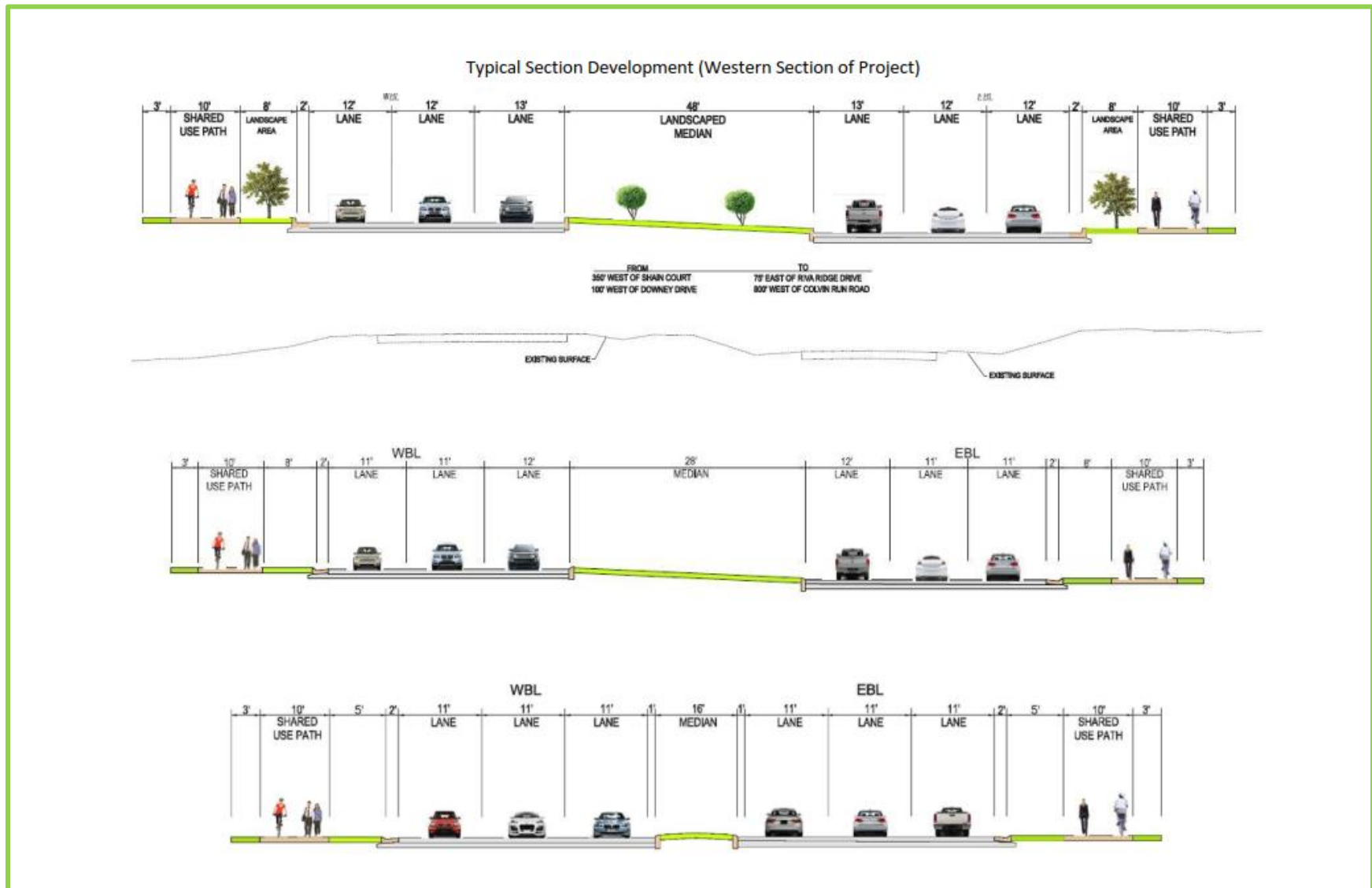
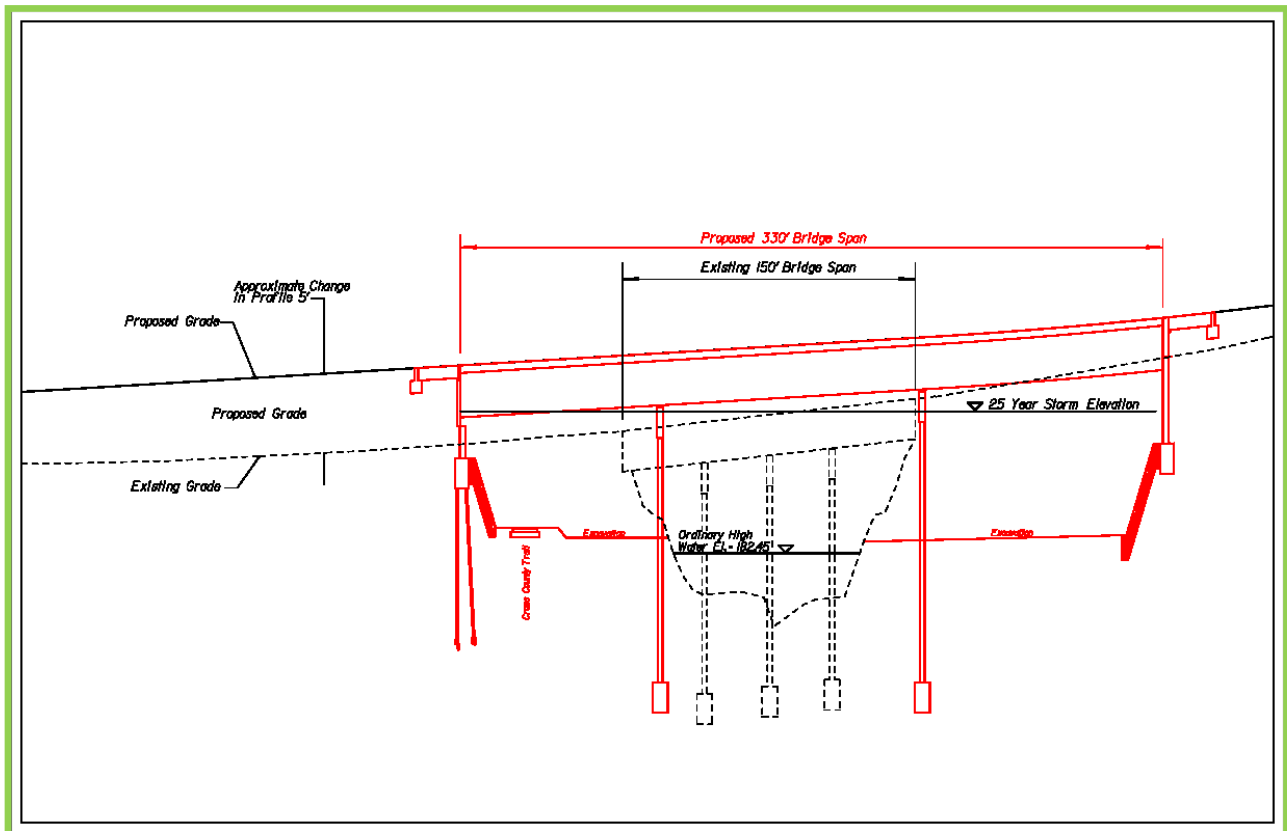


Figure 2-3: Photos of Route 7 at Difficult Run (facing west)



As a result of the rainfall from Tropical Storm Lee on September 9, 2011, Carpers Farm Way near the intersection of Route 7 was washed out and Route 7 was overtopped leaving several motorists stranded in the flood waters and requiring emergency rescue.

Figure 2-4: Revised Route 7 Profile and Proposed Bridge



The design team evaluated bridge options for design and construction since it is not feasible to construct the proposed roadway over the existing facility while maintaining traffic on the existing roadway. The recommended solution resulted in a permanent roadway shift in horizontal alignment to the south on the southern portion of Difficult Run Stream Valley Park property just enough to facilitate the construction of a new eastbound Route 7 bridge structure at the new elevated profile that would be wide enough to accommodate four lanes of traffic for existing Route 7 onto the new bridge to maintain traffic during construction. Once the eastbound side is constructed, traffic would be shifted to the new bridge and the existing eastbound and westbound Difficult Run bridge structures would be demolished. This would allow the contractor to construct the proposed westbound Difficult Run bridge off-line while traffic is utilizing the newly constructed eastbound bridge. This shifting of the Route 7 alignment to the south would eliminate impacts to the Colvin Run Mill property, as well as other environmental resources on the north side of existing Route 7. This option also eliminates flooding of Route 7 travel lanes at an earlier stage in the project. **Figure 2-5** depicts the construction phasing of the bridge structure and where traffic would be running in each phase of construction.

2.3.2.2 Colvin Run / Difficult Run Relocation Design Options

The widening of Route 7 will require the relocation of Colvin Run Stream between Carpers Farm Way and Difficult Run. **Figure 2-6** shows photographs of the existing channel and its proximity to the existing Route 7 eastbound embankment. As shown in the photographs, the existing embankment is currently eroding and existing utility conduits are being exposed by the erosion.

Figure 2-6: Colvin Run adjacent to eastbound lanes of Route 7 in vicinity of Difficult Run



The existing Colvin Run has become disconnected from the adjacent wetlands and floodplain. From historical information and mapping, it appears that Colvin Run was relocated with the original construction of Route 7 which may have led to its disconnection from the floodplain. As part of the avoidance and minimization process, VDOT evaluated the merits of a range of design options with consideration of various design elements to achieve the most practicable solution with the least amount of impacts to wetlands.

Throughout the project development process, the project team has been in consultation with permitting agencies to ensure that the project would be permissible. The project team met on June 22, 2017 with the regulatory agencies (U.S. Army Corp of Engineers (USACE), Virginia Department of Environmental Quality (DEQ), U.S. Environmental Protection Agency (EPA) and FCPA) to review twelve options for the Colvin Run Stream relocation to present the advantages and disadvantages of each, including the environmental impacts and the estimated costs associated with each option. Discussion with the regulatory agencies at the conclusion of the field meeting yielded three additional options for the Colvin Run Stream relocation for a total of fifteen options analyzed. At the field meeting, the following design elements that were considered in order to avoid and minimize the anticipated impacts included:

- Use of retaining walls;
- Location of pump station access road;
- Location and need for the equestrian bridle trail and the Gerry Connolly Cross County Trail (CCT);
- Width of proposed Route 7 median;
- Width of the proposed shared use paths;
- Width of buffer between shared use path and back of curb;
- Lane width;

- Typical section of stream channel (e.g., box culvert, rip rap lined, concrete lined, natural channel with wide meander and floodplain, natural channel with narrow meander and no floodplain, etc.); and,
- Possibility of shifting of tangent of the proposed baseline of construction to move alignment further to the north.

During project development, an option (Option 10C) was developed that:

- shifts the proposed baseline by approximately 20 feet to the north;
- utilizes a retaining wall in lieu of a fill slope;
- relocates Colvin Run in a rip rap-lined trapezoidal channel;
- installs a wood chip trail adjacent to the south side of the proposed Colvin Run channel to serve as an equestrian bridle trail;
- collocates the relocated 54-inch water main with the equestrian bridle trail;
- lowers the road profile at Difficult Run crossing by one foot by reducing freeboard;
- reduces the lane width from 12 feet to 11 feet;
- reduces the median width from 48 feet to 16 feet;
- directs the CCT so that it crosses at the signalized intersection of Route 7 and Carpers Farm Way;
- provides access to the pump station from the north under the Difficult Run bridge;
- reduces the width of the shared use path from 10 feet to 8 feet in the vicinity of Colvin Run; and,
- reduces the width of the equestrian bridle trail from 10 feet to 7 feet.

Option 10C is depicted in **Figures 2-7** and **2-8**. The separation between the shared use path and the back of proposed curb has been reduced to 5 feet for the entire project (the reduction in separation to the shared use path will require a design waiver). This alternative minimizes the impacts to the wetlands south of Route 7. For more details regarding the fifteen alternatives analyzed to avoid and minimize impacts to the natural resources within the Colvin Run vicinity, please refer to the Natural Resources Technical Report (VDOT, 2017a).

Figure 2-7: Colvin Run Stream Relocation Plan View

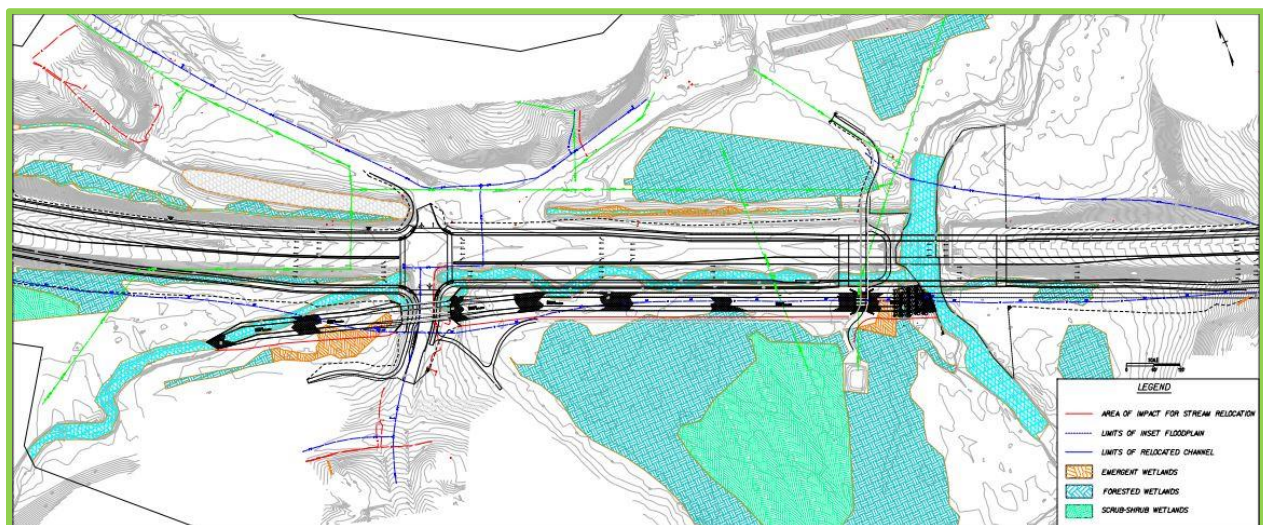
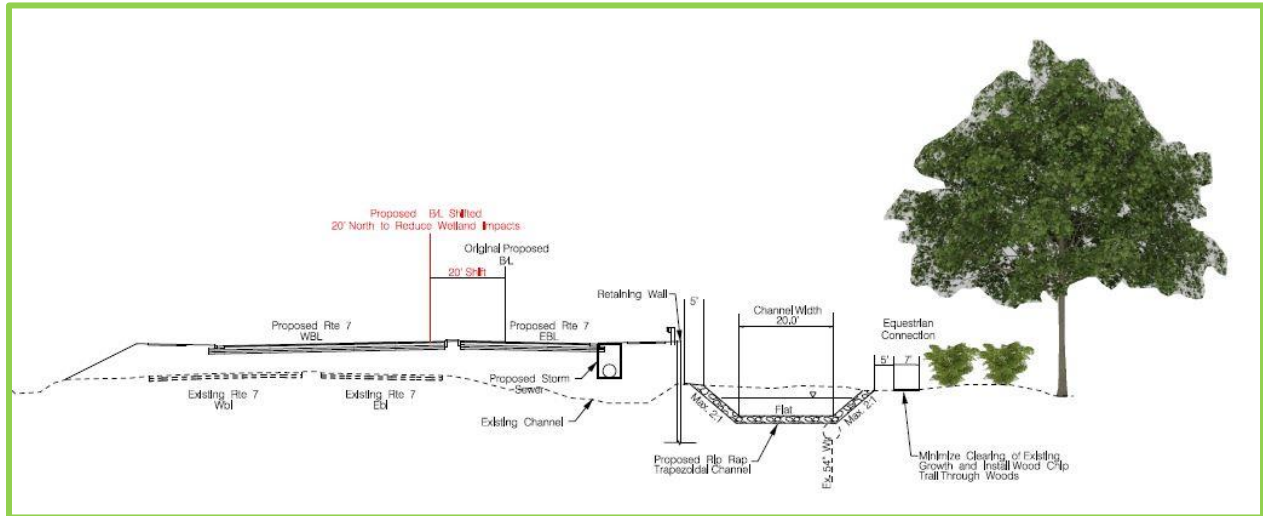


Figure 2-8: Colvin Run Stream Relocation Typical Section



As part of evaluating the alternatives to avoid environmentally sensitive areas, widening the roadway in the area of the proposed bridges uniformly on both sides was studied with the idea that it may minimize the footprint of impacts. The vertical profile would be raised by approximately 5 feet to convey the 25-year storm event. A four-lane temporary roadway (detour) would need to be constructed similarly to the current proposed eastbound lanes in order to facilitate maintenance of traffic and enable the contractor to demolish the existing westbound and eastbound Route 7 bridges over Difficult Run. With this scenario, the Colvin Run Stream would need to be relocated in a similar location as currently proposed to facilitate the construction of the temporary four-lane detour roadway and bridge. **Figure 2-9** shows the detour roadway location needed to facilitate the ultimate construction of Route 7.

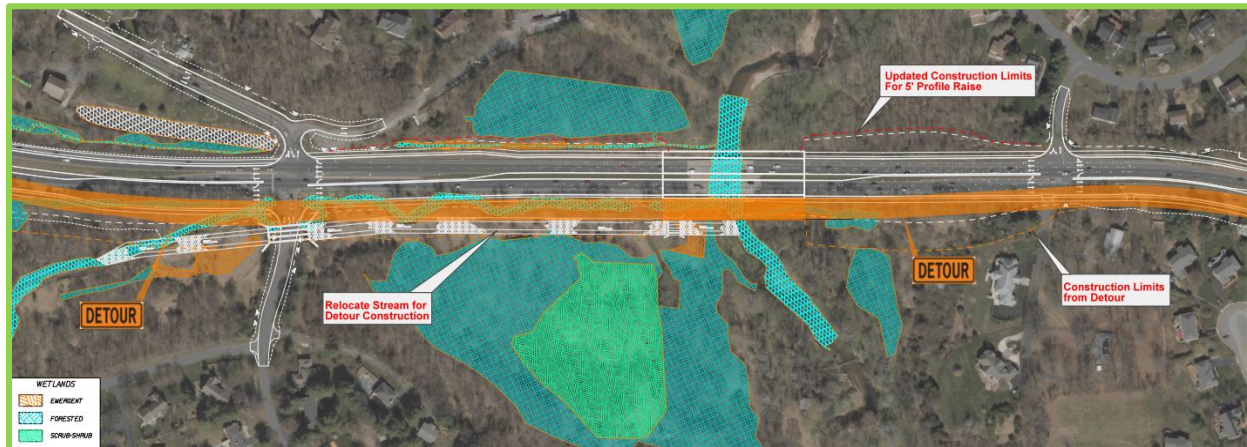
Figure 2-9: Route 7 Widening Option with New Bridges at Existing Bridge Location Maintenance of Traffic



At the completion of the construction of the new proposed westbound and eastbound Route 7 bridges over Difficult Run, the temporary four-lane detour roadway and temporary bridge over Difficult Run would need to be demolished and removed. This would increase the construction cost due to the resulting need for a

third bridge that would be required for maintenance of traffic during construction, that would then be ultimately demolished and removed (as opposed to the cost of two bridges for the option shifting the roadway to the south in the vicinity of Colvin Run / Difficult Run). In addition, this alternative of widening to the north side of Route 7 would have additional wetland and stream impacts as depicted in **Figure 2-10**.

Figure 2-10: Route 7 Widening Option with New Bridges at Existing Bridge Location



Based on the evaluation of constructing the existing bridges at the existing crossing of Difficult Run and the review of the resulting impacts based on maintaining traffic during the construction of the bridges, the Build Alternative option in the vicinity of Colvin Run / Difficult Run recommends shifting the alignment to the south in order to accommodate the construction of a permanent bridge for use during construction and as the proposed westbound Route 7 lanes.

In order to minimize the impacts to the environmentally sensitive areas in the vicinity of Colvin Run / Difficult Run, the separation between the edge of the proposed shared use path and the face of proposed curb has been reduced from 8 feet to 5 feet; a design waiver will be required for this reduction in the separation (see **Figure 2-11**).

2.3.2.3 Cross County Trail (CCT) Options

The CCT is a multi-use trail that primarily runs north/south through the County, is over 40 miles in length, and crosses Route 7 at grade at the intersection of Route 7 and Carpers Farm Way / Colvin Run East. With the proposed Route 7 Widening project, the CCT is being routed over top of the proposed triple 12'x12' box culvert conveying Colvin Run under Carpers Farm Way and turns east parallel to Route 7 immediately to the south of the toe of the fill embankment and crosses under the new Route 7 bridge structures for Difficult Run. This section of the CCT that parallels Route 7 would also serve as a maintenance access road to the Fairfax County Sewer Authority's sanitary pump station located in the floodplain adjacent to Route 7. Equestrian use is permitted on the CCT. Where the CCT would cross under the proposed bridge structures, since the hydraulics required a larger area be graded out to accommodate the storm flows, a separate equestrian crossing is proposed under the bridge structures. This separate crossing would provide additional vertical clearance for the horses and their riders under the proposed bridge structure and provide horizontal separation for the pedestrians and bicyclists from the horses and their users as a safety precaution (separation of an equestrian facility and other users is recommended in confined spaces) (U.S. Forest

Service, 2009). There is no additional grading required to accommodate the equestrian crossing under the bridge structures; the grading is required to meet the hydraulic needs for the project passing the 25-year design storm under the new bridge structures.

A direct link for the CCT that would span directly through the floodplain and forested wetlands, effectively paralleling Difficult Run, was investigated. This option would connect to the entrance to the Fairfax County's access to the pump station. The trail would need to be elevated through the floodplain further adversely impacting the adjacent forested wetlands and streams. With the elimination of the CCT connection from Carpers Farm Way to the east, a separate driveway access would need to be provided off of Route 7 to provide access to the Fairfax County Sewer Authority's sanitary pump station (see **Figure 2-12**).

Figure 2-11: Typical Section in vicinity of Colvin Run / Difficult Run

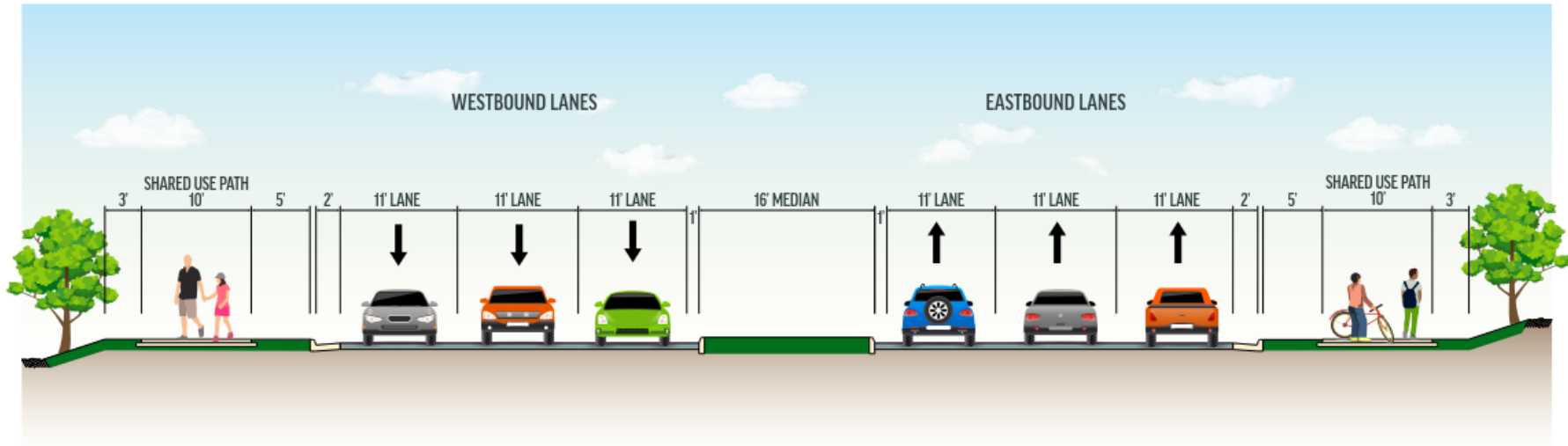
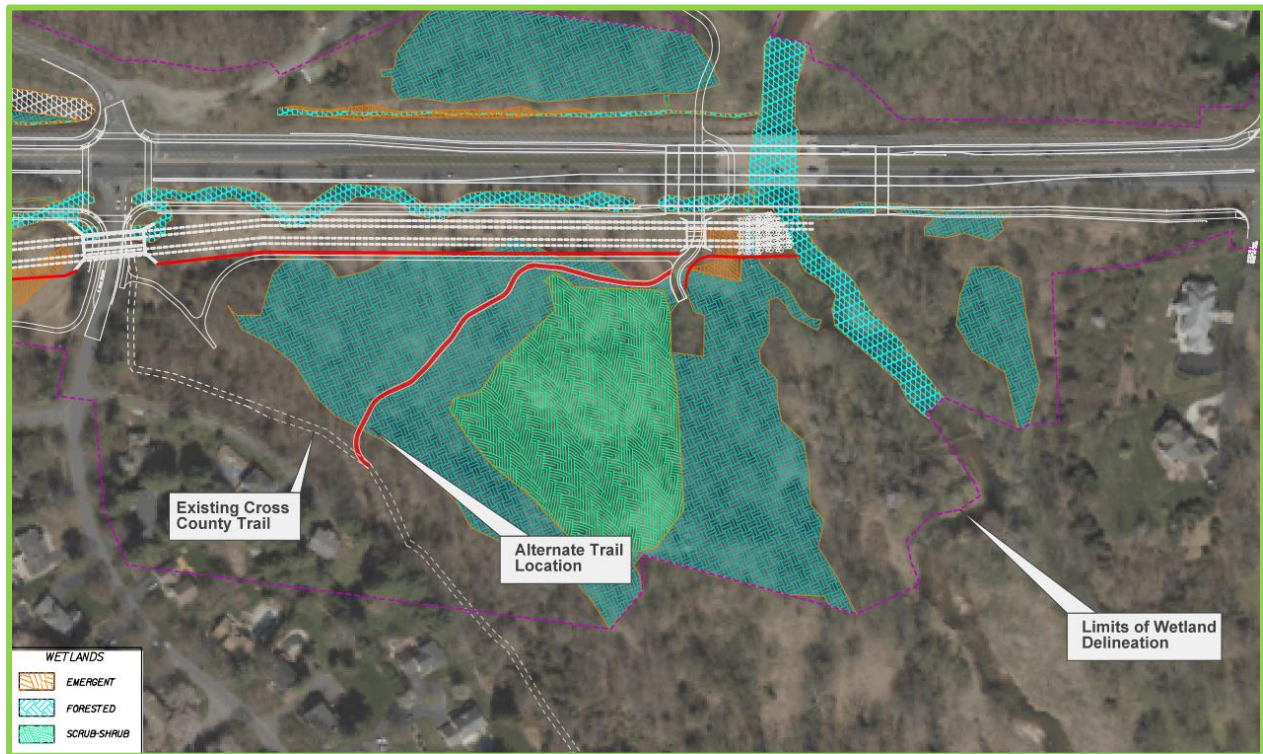


Figure 2-12: Alternative Trail Relocation



The Build Alternative does not include the Alternative Trail Relocation for the CCT as depicted in **Figure 2-12**.

2.3.2.4 Intersection Improvement Options

VDOT previously assessed options for intersection improvements in their study *Alternative Intersection Analysis and Design Report for the Route 7 Corridor Improvement Project* (VDOT, 2016). The report is the main source of information for design options for the Route 7 Widening project. The widening will impact nine signalized and fifteen unsignalized intersections within the project area. An Alternative Intersection Analysis was prepared to analyze and assess the operations of the intersection configuration options and to recommend the preferred option for each intersection in the project corridor. The FHWA *Alternative Intersections/Interchange Report (FHWA-HRT-09-060)* was used as a basis for generating the various options to be evaluated for this project (FHWA, 2010a). The main goal was to optimize the throughput of the Route 7 corridor traffic in the project area. The FHWA *Alternative Intersection Selection Tool* spreadsheet was used as a guide in the selection of conventional and alternative intersection configurations for determining a starting point in the evaluation (FHWA, 2010b).

Roundabout options were evaluated; however, they were found not adequate for the intersections along the corridor due to the design speeds and number of lanes along the corridor. Thus, roundabouts were excluded from further analysis.

Five alternative intersection configuration options were identified by the spreadsheet to be applicable along the corridor:

1. Quadrant Roadway Intersection
2. Displaced Left Turn/Continuous Flow Intersection
3. Restricted Crossing U-Turn Intersection/Super Street Intersection
4. Median U-Turn Intersection
5. Partial Median U-Turn Intersection

Other alternative intersection configurations were considered as well as hybrids of some configurations but were not carried further for evaluation, see *Alternative Intersection Analysis and Design Report for the Route 7 Corridor Improvement Project* (VDOT, 2016).

Table 2-1: Recommended Unsignalized Intersection Configuration

Unsignalized Intersection	Recommended Design
<ul style="list-style-type: none"> ● Trotting Horse Lane ● Lyons Street ● Stokley Way ● Trap Road 	<ul style="list-style-type: none"> ● Right-in/right-out
<ul style="list-style-type: none"> ● Bishopsgate Way ● Faulkner Drive ● Middleton Ridge Road ● Atwood Road 	<ul style="list-style-type: none"> ● Right-in/left-in and right-out
<ul style="list-style-type: none"> ● Amanda Drive / Markell Court 	<ul style="list-style-type: none"> ● Right-in/right-out for Markell Court ● Right-in/left-in and right-out for Amanda Court
<ul style="list-style-type: none"> ● Lucky Estates Drive / Wolftrap Run Road 	<ul style="list-style-type: none"> ● Access for Wolftrap Run Road will be relocated to Lucky Estates Drive access and a service road will be added to connect to the western access to the McLean Bible Church to allow movements through a signalized intersection. ● Right-in/left-in and right-out access modification
<ul style="list-style-type: none"> ● Great Passage Boulevard ● Riva Ridge Drive ● Colvin Forest Drive ● Newcombs Farm Road ● Laurel Hill Road 	<ul style="list-style-type: none"> ● To remain unchanged as a right-in/right-out

Table 2-2: FHWA Intersection Alternative Spreadsheet Summary

Intersections	Signal-ized?	Conven-tional	Quadrant Roadway				Displaced Left Turn			Restricted Crossing U-Turn		Median U-Turn		Partial Median U-Turn	
			SE	NE	SE	NW	NS	EW	FULL	NS	EW	NS	EW	NS	EW
Reston Parkway	Yes	*	*	-	*	-	*	*	-	-	*	-	-	-	-
Utterback Store Rd	Yes	*	*	*	*	*	*	*	*	-	-	*	-	*	*
Amanda Dr/ Markell Ct	No	*	*	*	*	*	*	*	*	-	*	*	*	*	*
Baron Cameron Ave/ Springvale Rd	Yes	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Delta Glen Ct/ Colvin Run Rd (West)	Yes	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Carpers Farm Way/ Colvin Run Rd (East)	Yes	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Faulkner Dr	No	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Middleton Ridge Rd	No	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trotting Horse Ln	No	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Beulah Rd/ Forestville Dr	Yes	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Towlston Rd	Yes	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trap Rd	No	*	*	*	*	*	*	*	*	-	*	*	-	*	*
Wolftrap Run Rd	No	*	*	*	*	*	*	*	*	-	*	*	*	*	*
Lewinsville Rd	Yes	-	-	-	-	-	*	*	-	-	-	-	-	-	-
Dulles Toll Rd WB Off-Ramp/ Jarrett Valley Dr	Yes	*	*	*	*	*	*	*	*	-	*	*	*	*	*

Note: * = Adequate, - = Inadequate

Source: Alternative Intersection Analysis and Design Report for the Route 7 Corridor Improvement Project (VDOT, 2016).

Many of the alternative intersection configurations were determined to be inadequate; particularly between Baron Cameron Avenue/Springvale Road and Towlston Road. The main reason is due to the high PM peak hour westbound through volumes in this segment of the corridor. Also, many of these options were eliminated due to right of way restrictions. Additionally, many of the intersections have relatively low traffic on the minor streets, which do not warrant an alternative intersection configuration.

Because of the traffic patterns and right of way restrictions, only five intersections, including Reston Parkway, Utterback Store Road, Baron Cameron Avenue/Springvale Road, Carpers Farm Way/Colvin Run Road, and Lewinsville Road were evaluated for alternative designs within the corridor.

Reston Parkway Intersection

The intersection of Route 7 and Reston Parkway is a four-legged intersection, with the north leg of the intersection operating as an access drive to a commercial landscape / nursery store. The intersection experiences long delays for the northbound left-turn movement in the PM peak hour. Two alternative intersection configurations were studied for this intersection including a Displaced Left Turn and a Continuous Green “T”, in addition to a conventional intersection configuration.

The use of a Green “T” intersection at this location would require relocating the nursery’s entrance which would be difficult to achieve due to access management and geometric considerations. In addition, the merging traffic from the dual left-turn merge lanes would result in conflicts with the adjacent intersection with Reston Avenue. As such, the Green “T” option was removed from further study consideration. The Displaced Left Turn option was removed from further consideration due to spacing concerns with the Utterback Store Road intersection to the east and the moderate benefits achieved from the alternative.

A conventional intersection configuration has been retained as the option for this intersection. The conventional intersection configuration minimizes the impacts to the nursery while providing acceptable traffic operations.

Utterback Store Road Intersection

The intersection of Route 7 and Utterback Store Road is a three-legged intersection with Route 7. The intersection experiences high mainline through volumes with the largest turning movement being the southbound right turn movement with over 300 vehicles in the PM peak hour. Two different configurations were reviewed for the alternative intersection evaluation:

- Displaced Left Turn (Eastbound Route 7 to Northbound Utterback Store Road); and
- Continuous Green “T”.

The displaced left-turn was dismissed in the preliminary analysis phase since the eastbound left-turn movement is not a significant movement at this intersection and due to spacing concerns with the Reston Parkway intersection to the west; separating the eastbound left-turn movement from the main intersection did not have a significant positive impact on operations.

A Continuous Green “T” intersection design was evaluated due to the anticipated benefits in the AM peak hour and its minimal impact to the surrounding area. As the evaluation progressed, it was determined that the benefits of the alternative design would have only marginal improvements to the intersection operations. Moreover, a school and a park are located near the intersection; the Continuous Green “T” design would prevent the anticipated pedestrian crossings at the intersection. Bishopsgate Way is located approximately 1,000 feet east of the existing Utterback Store Road intersection and the alternate design would create a “weave” for the vehicles that intend to turn into Bishopsgate Way from Utterback Store Road and vice versa. This was undesirable to the surrounding community and for the safety of the anticipated pedestrian

and bicyclists. It was determined that the Utterback Store Road would remain a conventional intersection design.

Baron Cameron Avenue/Springvale Road

The intersection with Baron Cameron Avenue/Springvale Road experiences high westbound left-turn volumes from Route 7, high northbound right turn volumes from Baron Cameron Avenue, as well as high through volumes along Route 7; particularly in the westbound direction during the PM peak hour. As such, the conventional intersection design experiences over saturated conditions. Fairfax County's Comprehensive Plan delineates this intersection to be a partial interchange in the future (Fairfax County, 2017). At-grade intersection options were developed to assess whether the implementation of the interchange is warranted for the design year conditions or if it should be deferred to a future improvement. The options that were evaluated for this intersection included the following:

At-Grade Options:

- Synchronized Split Phase
- At-Grade Diverging Diamond

Grade Separation Options:

- Westbound Flyover Ramp (Grade Separated Ramp from Westbound Route 7 to Southbound Baron Cameron Avenue)
- Single Point Urban Interchange (SPUI)
- Eastbound Flyover (Partial Interchange with Grade Separation of Eastbound Route 7 through Traffic)

The preliminary traffic analysis of the at-grade intersection options (including a conventional at-grade layout) indicated that an at-grade option would not be able to provide acceptable improvements to traffic flow in terms of improvements to delay, queuing, and overall operations for the corridor. Therefore, the at-grade options were removed from further study.

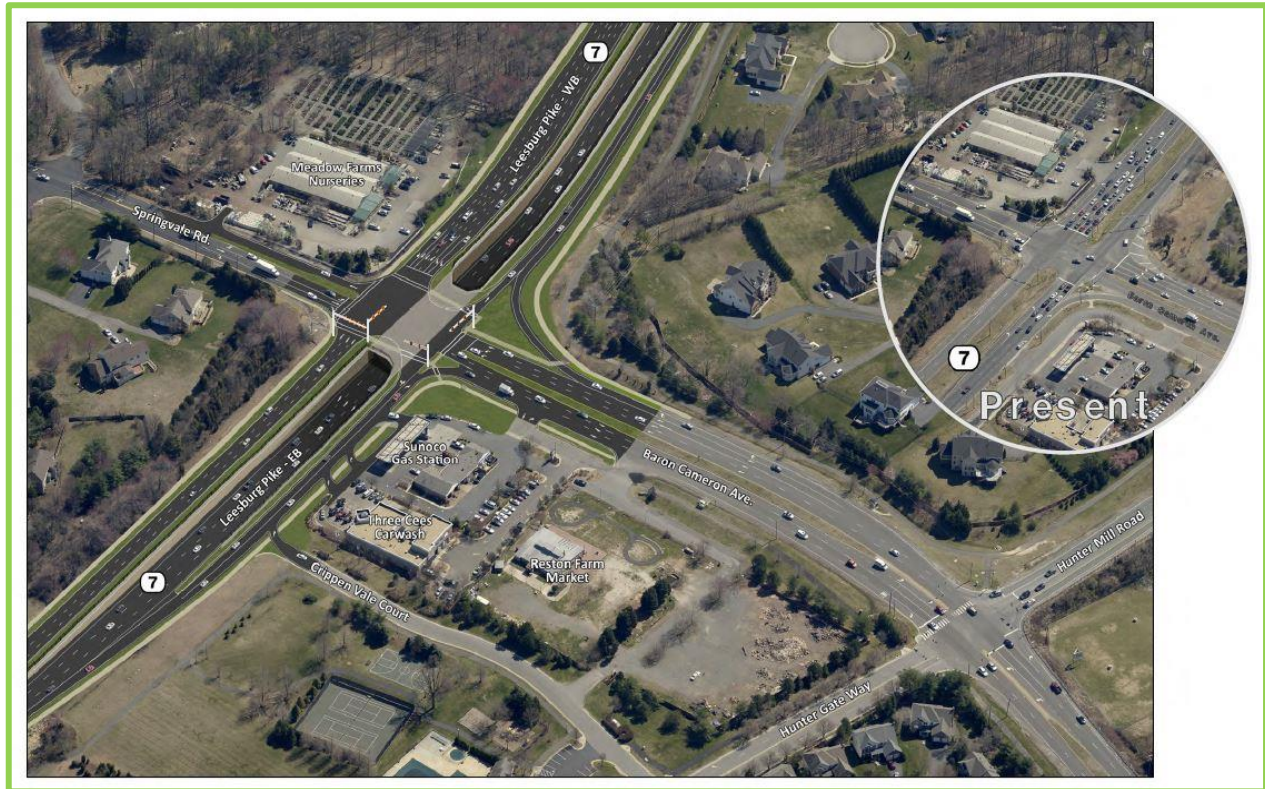
The preliminary traffic analysis of the grade separation options showed that the SPUI improves queuing for all movements and has the largest total intersection throughput of all of the alternative intersection models. However, the County's Comprehensive Plan includes only a partial interchange for this intersection. In order to provide a SPUI at this location, a comprehensive plan amendment would be required. The SPUI option was removed from further consideration at this intersection.

The Westbound Flyover Ramp option resulted in complications with the adjacent intersection south of Route 7, the intersection of Baron Cameron Avenue Road / Hunter Gate Way. The geometrics of the design made it difficult to provide accommodations for the users of the flyover ramp to turn onto Hunter Mill Road or Hunter Gate Way.

The original concept of the Eastbound Flyover layout at the intersection did not provide for eastbound Route 7 travelers to turn left onto Springvale Road; they would need to perform a U-turn further east of the intersection to access Springvale Road. Based on feedback from the community and re-assessing the conceptual layout, an eastbound left-turn lane was added to the off ramp to Baron Cameron to accommodate left turns onto Springvale Road.

The Eastbound Flyover options improved traffic operations for both peak hours most noticeably in the through movements of Route 7 and, as a partial interchange, conforms to the Fairfax County Comprehensive Plan. The conventional intersection design did not provide acceptable traffic operational improvements for the peak period. Therefore, the Eastbound Flyover option is the preferred option for this intersection (see **Figure 2–13**).

Figure 2-13: Baron Cameron Avenue Eastbound Flyover Ramp Intersection Design



Carpers Farm Way/Colvin Run Road

The Carpers Farm Way/Colvin Run Road (East) intersection is a four-legged intersection; the north leg serves Colvin Run Road (East) and Old Leesburg Pike and the south leg serves the Carpers Farm neighborhood and serves as their only ingress and egress to and from the neighborhood. The intersection has relatively high southbound left-turn movement from Colvin Run Road while the other street movements are relatively minor. Initial concepts studied a “Hybrid Median U-turn” option which restricted left-turning movements from Route 7 at the intersection. Left turns would be achieved by performing a U-turn at a median opening downstream of the intersection along Route 7 while granting more time to the through movements.

The Carpers Farm Way/Colvin Run Road (East) intersection is located approximately 1,000 feet west of Difficult Run. The Carpers Farm Way/Colvin Run Road (East) Hybrid Median U-Turn design layout was shown to community members from the Carpers Farm Way area and was immediately met with strong opposition. After discussions with the nearby communities and stakeholders and considering that while the configuration would enhance intersection operations, the enhancements would be marginal; i.e. the level of

service (LOS), a measure of the quality of the traffic flow, for the conventional intersection is expected to be maintained at an acceptable level. Thus, the intersection of Carpers Farm Way and Route 7 was determined to remain a conventional intersection for the design improvements.

Lewinsville Road

Lewinsville Road serves as the main access to the Spring Hill area north of Tysons and also serves as a bypass road around the Tysons area for those going north of Tysons. One hundred and fifty feet north of the intersection of Route 7 and Lewinsville Road, Lewinsville Road intersects with Brook Road. The spacing between the two intersections is substandard, thus limiting the storage for the southbound turning movements from Lewinsville Road.

A displaced left turn intersection design was evaluated for this intersection as an alternative intersection design. In theory, the displaced left turn geometry grants additional green time to the side street movements and improves operations at the main intersection while the heavy left turning movement is shifted to a displaced signalized intersection. The conceptual layout would relocate the intersection approximately 800 feet east of its current location. The relocated location provides additional separation from the Lewinsville Road / Brook Road intersection.

Due to the high peak turning volumes, for a conventional intersection, dual left turn lanes would be recommended from westbound Route 7 onto Lewinsville Road which would require Lewinsville Road be widened to accommodate a second receiving lane. The community was opposed to widening Lewinsville Road. With the use of a displaced left turn intersection and a single left turn lane from Route 7 to Lewinsville Road, the overall traffic operations of the intersection would be improved. Through the project's public involvement process and community feedback, the intersection concept was further developed to include the following:

- A service road from the Wolftrap Run Road / Lucky Estates Drive to the western McLean Bible Church Campus access;
- A shared Northbound Through / Left-turn lane to access westbound Route 7 and Lewinsville Road at the western McLean Bible Church Campus access;
- Dual left-turn lanes from westbound Route 7 to the western McLean Bible Church Campus access; and
- Single left-turn lane from westbound Route 7 to the eastern McLean Bible Church Campus access.

The main ingress for the church would be the western access and the main egress from the church would be the eastern access; both accesses would be signalized.

The displaced left turn option would improve the peak hour queues and intersection throughput by providing longer green times and lengthening the storage for the left turning movements.

Conceptual layouts of individual intersection configurations that provided the most benefits to traffic operations for the corridor were selected as the preferred configurations. The construction impacts, design applicability and feasibility, and stakeholder inputs were used as considerations in the selection of the preferred options. The remaining signalized intersections would remain as conventional intersection design

due to factors including: limited right of way, context sensitive design, applicability of the FHWA Alternative Intersection Selection Tool, and/or the contents of the County's Comprehensive Plan.

Median modifications at several unsignalized intersections are also recommended. The modifications include completely closing the existing median cross-over, implementing left in/right, in/right out configurations, or right in/right out configurations.

2.3.2.5 Stormwater Management Facilities Options

The initial design of the Route 7 Corridor Improvements project commenced prior to the change in DEQ's Stormwater Management regulations. As such, the initial stormwater management design was based on the "old" regulations. With the advent of the "new" regulations, the concepts for the stormwater management facilities were revised to meet the criteria of the "new" regulations which resulted in additional stormwater management facilities and additional impacts to wetlands, utilities, and private property. With the decision by VDOT to pursue the project delivery method as a Design-Build project, the project could meet the requirements for being "grandfathered" (i.e. the use of the "old" regulations with the requirement that the project construction commences by no later than July 1, 2019).

Using the "new" regulations in compliance with the Virginia Stormwater Management Program (VSMP) Part IIB technical criteria ("new" regulations) consisted of 14 stormwater basins resulting in 2.53 acres of wetland impacts. Iteration 1 further refined the base design to reduce wetland impacts through a combination of pond relocation and elimination. Iteration 1 resulted in impacts to 0.49 acres of wetland impacts. DEQ determined that the project would be grandfathered pursuant to Title 9 of the VAC (9VAC25-870-48); therefore, Iteration 2 was developed in compliance with the VSMP Part IIC technical criteria ("old" regulations) which eliminated three additional basins leaving a total of 8 basins and reducing the wetland impacts to 0.42 acres. The final iteration, Iteration 3, was further optimized to remove basins from all wetlands which reduced wetland impacts to 0.02 acres (see the Natural Resources Technical Report [VDOT, 2017a]).

2.3.2.6 Ability of Build Alternative to Address the Purpose and Need

Due to the number of intersections along the corridor and the intersection spacing, maximizing the efficiency of the intersection throughput in the design year will determine the effectiveness of the roadway widening. The 2040 No Build and 2040 Build AM/PM Delay and LOS for signalized intersections along the corridor are summarized in **Table 2-3**. Under the No Build Alternative, most of the intersections would operate at a LOS F (with the exception of the intersections with Towlston Road and the Dulles Toll Road Westbound Off-Ramp / Jarrett Valley Drive). Whereas, under the Build Alternative, the intersections operate at a LOS C or better (with the exception of the Crossover for Lewinsville Road for the displaced left turn intersection during the AM Peak).

Table 2-3: 2040 No Build vs. Build AM/PM Delay and LOS at Signalized Intersections

Signalized Intersection	2040 AM				2040 PM			
	No Build		Build		No Build		Build	
	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS	Delay (s/veh)	LOS
Reston Parkway	100.2	F	24.2	C		F	22.1	C
Utterback Store Road	107.9	F	10.3	B	105.0	F	18.1	B
Baron Cameron Avenue / Springvale Road	236.0	F	21.9	C	113.6	F	23.2	C
Delta Glen Court / Colvin Run Road (West)	156.2	F	9.4	A	36.0	D	9.1	A
Carpers Farm Way/ Colvin Run Road (East)	137.1	F	22.5	C	21.3	C	25.5	C
Beulah Road / Forestville Drive	97.8	F	30.8	C	47.6	D	18.5	B
Towlston Road	60.2	E	25.1	C	59.0	E	30.1	C
Lewinsville Road	82.5	F	11.7	B	72.0	E	14.0	B
Lewinsville Road at Crossover	N/A	N/A	37.2	D	N/A	N/A	18.3	B
Dulles Toll Road WB Off-Ramp/ Jarrett Valley Drive	46.8	D	7.1	A	35.4	D	5.4	A

The widening of Route 7 to six lanes will increase capacity along the corridor. The widening would also provide the continuity along Route 7 and remove the bottleneck of a four-lane facility located in between two six-lane roadway segments.

In addition to the widening, the proposed improvements to the 24 intersections within the project limits would enhance access management and increase safety along the corridor.

3.0 REFERENCES

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APPENDIX A: DESIGN CRITERIA

ROUTE 7 WIDENING - FAIRFAX COUNTY

