

ROUTE 28 CORRIDOR FEASIBILITY STUDY

FINAL REPORT

Funded By: Northern Virginia Transportation Authority

Prepared For: Prince William County City of Manassas Northern Virginia Transportation Authority December 2017



EXECUTIVE SUMMARY

INTRODUCTION

Long-term, high-capacity solutions to facilitate travel between Prince William County, the City of Manassas, and the City of Manassas Park and Fairfax County, I-66, and locations north have been sought for decades. Previous studies have recommended solutions such as the Tri-County Parkway; however, no solution has been palatable for all jurisdictions involved and only short-term spot improvements have been constructed. Over 57,000 vehicles per day use Route 28, a four-lane divided principal arterial, to travel between jurisdictions. The corridor is experiencing significant congestion and queuing between Liberia Avenue and US Route 29. In 2015, VDOT conducted the Route 28 Corridor Safety and Operation Study which recommended short-term solutions to address some of the congestion and safety problems along the corridor. The study also recommended that a long-term study be conducted for the corridor.

At the time of this writing, Fairfax County is planning to widen Route 28 from north of the Fairfax County/Prince William County border to US Route 29 to be up to four lanes in each direction and make improvements to existing intersections. This project is scheduled to be completed in 2023. Prince William County is widening Route 28 to a six-lane divided facility between Linton Hall Road and Pennsylvania Avenue. The City of Manassas is widening Route 28 to six lanes between Pennsylvania Avenue and Godwin Drive through the Prince William County Parkway (Rte. 234)/Route 28 interchange. This will leave a section of Route 28 between Godwin Drive and Bull Run unimproved with recurring daily congestion.

The goals for the Route 28 Corridor Feasibility Study are to identify infrastructure improvements that will improve travel times and network reliability within the Route 28 Corridor through Prince William County, the City of Manassas and the City of Manassas Park and to develop a plan to implement these improvement project(s). Nine key objectives listed in Chapter 2 were developed for the study to be used in evaluating alternative solutions.

The study was jointly managed by the City of Manassas and Prince William County and fully funded by the Northern Virginia Transportation Authority (NVTA). The study was guided by a Technical Committee made up of technical staff from impacted jurisdictions, transportation agencies, and other governmental agencies. Recommendations from the Technical Committee were vetted with an Executive Committee comprised of local elected officials, members from modal agencies, and Commonwealth Transportation Board members.

EXISTING AND 2040 NO BUILD CONDITIONS

The existing traffic volumes for this study were gathered from two count data sets, one conducted in 2014 and one in 2016. The data collection process and data balancing methodology were described in the Study Methods and Assumptions Document (November 2016) that was developed for this project and was approved by the Technical Committee on October 26, 2016. This document is included in Appendix A. The evaluation of existing conditions was accomplished using the Synchro/SimTraffic software tools for AM and PM peak models.

VDOT's Traffic Operations and Safety Analysis Manual (TOSAM) lists 95th Percentile Queue Length, Average Control Delay, Average Travel Speed and Volume to-Capacity (v/c) Ratio as appropriate Measures of Effectiveness (MOEs) to evaluate the operations for an arterial network. Average control delay and 95th percentile queue lengths were captured from Synchro output data for all the signalized intersections for both existing AM and PM models. Ten simulation runs from SimTraffic were completed and averaged to gather additional MOEs pertaining to arterial performance for the existing models.

Travel demand forecasts were developed for this study. The forecasts were based on the MWCOG regional travel demand model Version 2.3.66, which was the most recent model at the time of this report. The model included proposed roadway and transit improvements as part of the 2016 Amendment to the Constrained Long-Range Transportation Plan (CLRP) and 2017-2022 Transportation Improvement Program (TIP). Model runs were performed for the base year (2010) and 2040 for the No Build and Build alternatives that were recommended for more detailed screening. The 2040 MWCOG model results were post-processed. The 2040 No Build alternative, while being a valid alternative on its own, serves as a point of comparison to determine the long-term effectiveness of specific improvements to the roadway network.

FIRST SCREENING OF PRELIMINARY ALTERNATIVES

Ten preliminary alternatives were identified to be evaluated as part of this study. These alternatives included alternative concepts that have been proposed by elected officials, local transportation staff or citizens in the past to address the congestion problems on Route 28. One of the alternatives is the No Build alternative which was used to compare the other alternatives. Several of the alternatives; Alternative 2, Alternative 9, and Alternative 10 have portions of their alignment where there are optional alignments. These are labeled A, B, and/or C.

The preliminary alternatives carried through the first screening of alternatives are shown in Exhibit 1 and include:

Alternative 1: 2040 No Build Alternative

This alternative assumes that the planned improvements in the region, except for the widening or alternative alignments for Route 28 in Prince William County and Manassas, will be in place. These include improvements to I-66 inside and outside of the Beltway and the extension of New Braddock Road across I-66. This alternative also includes the widening of Route 28 to up to four lanes in each direction in Fairfax County from the Prince William County line to Route 29.

Alternative 2A: Godwin Drive extended to existing Route 28 south of Bull Run

This alternative will create a bypass of existing Route 28 that passes through Prince William County, the City of Manassas Park, and the City of Manassas. The alignment of Alternative 2A will extend Godwin Drive north from the existing Godwin Drive/Sudley Road intersection, parallel to Flat Branch, then turn east following the south side of Bull Run until joining existing Route 28. Route 28 will be widened from this point north to tie into the improvements planned by Fairfax County. A 10-foot shared use path will extend along the length of the project on the east side of Route 28. For the purposes of this study, this alternative will tie into the existing Route 28 at an at-grade signalized intersection. The actual configuration of the tie-in point will be determined during subsequent phases when traffic operations and intersection/interchange configurations will be studied in more depth.



Exhibit 1. Preliminary Alternatives



Alternative 2B: Godwin Drive extended to existing Route 28 north of Bull Run This alternative will create a bypass of existing Route 28 that passes through Prince William County, the City of Manassas Park, and the City of Manassas. The alignment of Alternative 2B will extend Godwin Drive north from the existing Godwin Drive/Sudley Road intersection parallel to Flat Branch, then turn east following the south side of Bull Run until Centreville Road where it will cross Bull Run at the existing crossing of Old Centreville Road on a new widened bridge, and tie in existing Route 28 north of Bull Run at an at-grade signalized intersection. Route 28 would be widened from this point north to tie into the improvements planned by Fairfax County. A 10-foot shared use path will extend along the length of the project on the east side of Route 28. For the purposes of this study, this alternative will tie into the existing Route 28 at an at-grade signalized intersection. The actual configuration of the tie-in point will be determined during subsequent phases when traffic operations and intersection/interchange configurations will be studied in more depth.

This alternative will extend Godwin Drive north from the existing Godwin Road/Sudley Road intersection parallel to Flat Branch, then cross Bull Run and continue across Bull Run Regional Park to tie into I-66. This alternative follows the previously studied Tri-County Parkway alignment which was deemed non-permittable in the past by the US Army Corps of Engineers.

Alternative 4: Widening Route 28 on existing alignment between Liberia Avenue and the Fairfax County line

The widening would be designed to urban principal arterial standards with three lanes in each direction and a 16-foot wide raised landscaped median. Curb and gutter would be provided as well as a five-foot sidewalk on the west side of Route 28 and a 10-foot shared use path on the east side. The widening would begin just south of Liberia Avenue to provide an additional through lane through the Route 28/Liberia Avenue intersection in each direction and continue north to tie into the improvements planned by Fairfax County.

Alternative 5: Reversible Lanes between Liberia Avenue and the Fairfax County Line

This alternative consists of providing a barrier separated reversible center lane on existing Route 28 between Manassas Drive and the Prince William County Line. During the morning peak period, the center lane would be dedicated to northbound traffic providing a total of three lanes in that direction. During the afternoon/evening peak period, the direction of travel would switch, and the center lane would be open for southbound traffic only providing a total of three lanes in that direction. The existing roadway would need to be widened to handle the additional shoulders and barriers associated with the reversible lane. Curb and gutter would be provided as well as a five-foot sidewalk on the west side of Route 28 and a 10-foot shared use path on the east side.

Alternative 6: Widening Old Centreville Road/Ordway Road Throughout its length

Old Centreville Road would be widened by one lane in each direction. Furthermore, one lane would be added in each direction on Route 28 between Liberia Avenue and Old Centreville Road.

Alternative 7: Converting Old Centreville Road/Ordway Road to a reversible facility This alternative would convert Old Centreville Road/Ordway Road from the Route 28/Blooms Quarry Road intersection to Compton Road to a reversible facility. During the morning peak period, both lanes of the two-lane road would be open for northbound traffic only. During the afternoon/evening peak period, the direction of travel would switch and both lanes would be open for southbound traffic only. One lane would be added in each direction on Route 28 between Liberia Avenue and Old Centreville Road.

Alternative 3: Godwin Drive extended to I-66 near the existing Compton Road crossing (the former Tri-County Parkway alignment)





Alternative 8: Transit Alternatives to include BRT and/or VRE expansion along the corridor

This alternative involves providing a dedicated right of way or lane for Bus Rapid Transit (BRT) on Route 28 and/or extension of Virginia Railway Express to accommodate corridor travel.

Alternative 9: Euclid Avenue extension north to Route 28 near Bull Run and south to Sudley Road/Route 28 intersection.

This alternative would create a bypass of existing Route 28 that passes through Prince William County, City of Manassas Park, and City of Manassas. The alignment of Alternative 9 would extend Euclid Avenue to the south from Quarry Road to the Route 28/Sudley Road intersection. Prescott Avenue would be disconnected from Route 28 and made into a cul-de-sac. The alignment would also extend Euclid Avenue north from near Manassas Park High School along the west bank of Bull Run until joining with existing Route 28. Route 28 would be widened from this point north to tie into the improvements planned by Fairfax County. As with the other options, the existing Route 28 bridge over Bull Run would be replaced with a wider and longer bridge across the floodway.

Alternative 10A, 10B, and 10C: A new southern alignment (Hasting Drive/Signal View Drive)

This alternative would create a bypass of existing Route 28 that passes through Prince William County, the City of Manassas Park, and the City of Manassas. The three option alignments of Alternative 10 would follow Godwin Drive/Hastings Drive from Route 28 to Liberia Avenue. A shared use path would be added and some improvements to the roadway would be required to bring it up to arterial standards. At Liberia Avenue, the three option alignments diverge as they head north. Alternative 10A follows Liberia Avenue north past Signal Hill Road and then turns northeast crossing the Manassas Drive/Signal View Drive intersection. Alternative 10A then follows Manassas Drive north to the General's Ridge Golf Course. Alternative 10B crosses Wellington Road and continues north crossing the Birmingham Drive/Signal Hill Road intersection and ties into Signal View Drive. Alternative 10B then follows Signal View Drive and Manassas Drive north to the General's Ridge Golf Course. Alternative 10C crosses Wellington Road continues north and ties into Birmingham Drive following it north at the east edge of Manassas Park to the General's Ridge Golf Course.

The alignments of the three options of Alternative 10 then cross General's Ridge Golf Course and come together. Next, the alignments will cross the railroad tracks and then traverse along the west bank of Bull Run until joining with existing Route 28. Route 28 would be widened from this point north to tie into the improvements planned by Fairfax County.

The first screening compared all 10 alternatives, including the sub-alternatives, within four criteria for evaluation.

- Traffic impacts
- Policy Considerations •
- Environmental Impacts •
- Socioeconomic/ROW Impacts

Based on the evaluation of the preliminary alternatives, four of the alternatives were deemed reasonable and feasible and advanced for further study. These alternatives were those that best met the key objectives of the study and showed the most benefits to the traffic operations to existing Route 28. These alternatives were also deemed to be long-term solutions for Route 28 that best met the future traffic demands of the corridor. The four alternatives recommended for further study, in addition to Alternative 1 (No Build), by the study's Technical and Executive Committees were Alternative 2A. Alternative 2B, Alternative 4 and Alternative 9.

SECOND SCREENING OF ALTERNATIVES

The first screening of preliminary alternatives resulted in the Technical Committee and Executive Committee recommending four preliminary alternatives to be carried forward for more detailed development and evaluation. During the second screening of alternatives, each alternative was compared to one another and the 2040 No Build Alternative to determine the highest-ranked alternative. The highestranked alternative is the alternative that is most feasible and cost-effective and best meets the study goals and objectives.

Four screening-level criteria were used to compare the four alternatives from the first screening.

- 2017 Planning Level Costs
- Traffic Impacts •
- Environmental Impacts
- Socioeconomic/ROW Impacts

To determine the highest-ranked alternative, each of the alternatives were ranked for each category of screening criteria, (2017 planning level costs, project benefits, environmental/socioeconomic/right-of way-impacts), and then the average cumulative rating across the three categories was used to identify the highest-ranked alternative. The Technical and Executive Committees confirmed Alternative 2B as the highest-ranking alternative.

Alternative 2B was ranked the highest due to being:

- ✓ The alternative with the greatest project benefits including:
 - Greatest reduction in traffic in Historic Manassas
 - Shortest Travel time between Godwin Drive and Route 29 in 2040.
 - Greatest travel time savings on Future Business Route 28 in 2040.
- \checkmark The alternative with the second least environmental impacts.
- ✓ The alternative with the least socioeconomic and right-of-way impacts and no required business relocations.
- ✓ The alternative with the lowest estimated cost

CONCLUSION AND NEXT STEPS

The next step in the process is that Prince William County and the City of Manassas will begin the National Environmental Policy Act (NEPA) process to select a preferred alternative that can then proceed to design and construction. During the NEPA process, Prince William County and the City of Manassas will identify potential funding strategies. If a preferred alternative is identified through the NEPA process, funding will be sought and, if secured, design and construction of the preferred alternative will commence. Funding will be sought from local, regional, state, and federal sources. NVTA funding and VDOT Smart scale funding are the most likely sources to fund the project.





A NEPA document will be required for the project in accordance with VDOT guidance and FHWA regulations since federal funds will likely be used for some portion of the project. For the proposed Route 28 improvements, an Environmental Impact Statement (EIS) will be required by FHWA. An EIS will refine the purpose and need for the project, refine the alternatives evaluated for the project, identify environmental resources and environmental impacts, evaluate avoidance/minimization of impacts to those resources, and identify a preferred alternative. The EIS process will include public and stakeholder involvement. A Record of Decision (ROD) will be needed from the FHWA to conclude the NEPA process. The EIS will address project alternatives, including the build alternatives, the No Build alternative, and any other possible traffic management and transit alternatives. The environmental information presented in this feasibility study should be considered preliminary and is subject to change once field work and field verification is completed as part of the NEPA analysis. The NEPA document will trigger analysis and avoidance, minimization, and mitigation measures for other resources that were not considered in this feasibility study such as air quality, socio-economic, geologic, and soils. The NEPA documentation process will likely require several years to complete.

Prince William County and the City of Manassas may proceed with funding and design and construction of the preferred alternative following a record of decision from FHWA. Construction of the project will require right-of-way acquisition, utility relocations, and the securing of additional environmental permits and approvals.

A preliminary potential project schedule is shown in Exhibit 2. The project could take seven or eight years from the date of this report before being open to traffic. Potential dates and time frames for the activities shown are subject to change as the project moves through the project development process. Alternative 2B is expected to cost \$190 million in 2017 dollars. Actual project costs will be higher to account for inflation as most of the activities to implement the project would occur between 2020 and 2025.



Exhibit 2. Potential Project Schedule

Note: Dates subject to change as the project progresses through the project development process.

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ROUTE 28 CORRIDOR FEASIBILITY STUDY





CHAPTER 1 INTRODUCTION

1.1 BACKGROUND

Travel between Prince William County, the City of Manassas, and the City of Manassas Park and Fairfax County, I-66, and locations north

has become increasingly difficult over the last several decades. Long-term high-capacity solutions have been sought over those same years and have resulted in a multitude of studies and potential solutions. The following are the major studies that have been conducted and their associated proposed solutions.

<u>Washington Bypass Study (1990)</u>: Was a joint study by Maryland and Virginia to develop alternative conceptual corridors for an outer freeway bypass around the Washington, D.C. area. The study concluded in 1990 and resulted in alternative western corridors largely along Route 28. Maryland and Virginia had different preferred alternatives and funding became an issue. No additional studies or projects were initiated as a direct result of this study.

Western Transportation Corridor Major Investment Study (WTC MIS) (1997): In late 1994, after the

State of Maryland eliminated the Eastern Corridor alternatives based on the findings from the Washington Bypass Study; Virginia reevaluated its needs as well as changes in planning regulations and data. The project was changed to the WTC MIS to consider the Western Bypass alternatives that connect activity centers, facilitate north-south travel, reduce congestion, and provide improved access to Washington Dulles International Airport from the west. The study resulted in identifying a need for a Tri-County Parkway to connect Fairfax, Prince William, and Loudoun Counties.



Tri-County/Bi-County Parkway Study (2005): A location study was completed by the Virginia Department of Transportation (VDOT) in 2005 to propose a corridor that improves transportation mobility and access; enhance linkage between communities; accommodate social demands and economic development needs; and to improve safety for travel between Prince William, Fairfax and Loudoun counties. The Tri-County Parkway has been the subject of many local studies and plans, and has been known by many names throughout the years. In Prince William County, it has been referred to as the Route 28 Bypass and in Loudoun County the Tri-County Parkway has been known as the Loudoun County Parkway. The Tri-County Parkway was adopted by the Metropolitan Washington Council of Governments (MWCOG) and has been included in their Constrained Long-Range Plan (CLRP) and Transportation Improvement Program (TIP) beginning in the early to mid-1990's. The Tri-County Parkway is also listed in the Comprehensive Plans for Fairfax, Prince William, and Loudoun Counties. The alternative would extend Godwin Drive north from the existing Godwin Road/Sudley Road intersection, traversing north to intersect with I-66 and ultimately Route 7 in Loudoun County. However, the United States Army Corps of Engineers (USACOE) did not permit this alternative to carry forward due to its significant environmental impacts.

VDOT Route 28 Corridor Safety and Operations Study (2015):

This study recommended short-term low-cost safety and operational improvements on Route 28 between Liberia Avenue in Prince William County to just south of I-66 in Fairfax County. It also recommended a long-term study be conducted on this corridor.

In addition to the short-term low-cost improvements recommended in this study, Fairfax County, City of Manassas, and Prince William County have projects to widen Route 28. Prince William County is widening Route 28 to a six-lane divided facility between Linton Hall Road and Pennsylvania Avenue. The City of Manassas is widening Route 28 to six lanes between Pennsylvania Avenue and Godwin Drive through the Route 234 (Prince William Parkway)/Route 28 interchange. Fairfax County is planning to widen Route 28 from Bull Run north to Route 29 to be up to four lanes in each direction and make improvements to existing intersections. This project is scheduled to be completed in 2023. This will leave a section of Route 28 between Godwin Drive and Bull Run unimproved with recurring daily congestion.

The Northern Virginia Transportation Authority (NVTA) elected to fund this long-term corridor feasibility study for Route 28 to develop a plan to address the deficiencies on Route 28, including the gap between improvement projects. This report documents the process and results of the Route 28 Corridor Feasibility Study.









1.2 STUDY TEAM AND COMMITTEES

This study was jointly managed by the City of Manassas and Prince William County and fully funded by the Northern Virginia Transportation Authority (NVTA). The study was guided by a Technical Committee made up of technical staff from impacted jurisdictions, transportation agencies, and other governmental agencies. The Technical Committee was used to provide guidance to the study team, inform their agency's leadership about the project, approve the study methods and assumptions, review study deliverables, and help reach consensus on study recommendation(s). The individuals listed in Table 1-1 were invited members of the Technical Committee.

Table 1-1. Members of Technical Committee							
Eric Ferguson	Bull Run Regional Park	Rick Canizales	Prince William County				
Steve Burke	City of Manassas	David McGettigan	Prince William County				
Bryan Foster	City of Manassas	Rebecca Horner	Prince William County				
Matt Arcieri	City of Manassas	Elizabeth Scullin	Prince William County				
Chloe Delhomme	City of Manassas	Benjamin Ziskal	Prince William County				
John Evans	City of Manassas Park	Trent Berger	Prince William County				
Calvin O'Dell	City of Manassas Park	James Davenport	Prince William County				
Andrew Williams	City of Manassas Park	Don Pannell	PWC Service Authority				
Tim Roseboom	DRPT	Perrin Palistrant	PRTC				
Tom Biesiadny	Fairfax County	Allison Richter	VDOT				
Noelle Dominguez	Fairfax County	Claudia Llana	VDOT				
Karyn Moreland	Fairfax County	Terry Yates	VDOT				
Smitha Chellappa	Fairfax County	Robert losco	VDOT				
W. Todd Minnix	Fairfax County	Tina Curtis	VDOT				
James Beall	Fairfax County	Andrew Beacher	VDOT				
Thomas Burke	Fairfax County	Dic Burke	VDOT				
Paul Doku	Fairfax County	Jalen Jennings	VDOT				
Ivan Rucker	FHWA	Christine Hoeffner	VRE				
Keith Jasper	NVTA	Sonali Soneji	VRE				
Sree Nampoothiri	NVTA	Don Pannell	PWC Service Authority				

The Executive Committee met twice during the study: once to confirm the Technical Committee recommendation for preliminary alternatives to move forward for further study and a second time to confirm the highest-ranked alternative to present to the public.

The Technical Committee met monthly throughout the study. A total of 11 meetings were held with the Technical Committee.

The study was also guided by an Executive Committee which provided input into the study and reviewed and confirmed Technical Committee recommendations at key milestones. The individuals listed in Table 1-2 were invited members of the Executive Committee:

Table 1-2. Members of Executive Committee					
Senator George Barker	Virginia General Assembly				
Senator Richard Black	Virginia General Assembly				
Senator Jeremy McPike	Virginia General Assembly				
Delegate Tim Hugo	Virginia General Assembly				
Delegate Randy Minchew	Virginia General Assembly				
Delegate Bob Marshall	Virginia General Assembly				
Delegate Jackson Miller	Virginia General Assembly				
Chairman Corey Stewart	Prince William County				
Supervisor Martin Nohe	Prince William County				
Mayor Hal Parrish	City of Manassas				
Council Member Pamela Sebesky	City of Manassas				
Supervisor Kathy Smith	Fairfax County – Sully District				
Supervisor Pat Herrity	Fairfax County – Springfield District				
Chris Price	Prince William County				
Monica Backmon	NVTA				
Helen Cuervo	VDOT				
Renee Hamilton	VDOT				
Maria Sinner	VDOT				
Todd Horsley	DRPT				
Scott Kasprowicz	СТВ				
Mary Hughes Hynes	СТВ				
Gary Garczynski	СТВ				
Mayor Jeanette Rishell	City of Manassas Park				
Councilman Preston Banks	City of Manassas Park				
Chairman Sharon Bulova	Fairfax County				
Chief Executive Officer Doug Allen	VRE				
Paul Gilbert	Northern Virginia Regional Parks Authority				





1.3 STUDY AREA

The study area shown in Figure 1-1 encompasses areas of Prince William County, the City of Manassas, the City of Manassas Park, and Fairfax County. From south to north, the Route 28 Study Corridor generally begins at the terminus of Godwin Drive at Route 28, passes through historic Manassas, crosses Bull Run, and ends at Route 29 in Centreville, just south of I-66. The study area is bordered by Flat Branch and Ben Lomond Regional Park on the west and Bull Run on the east.

Figure 1-1. Study Area



1.4 STUDY PROCESS, METHODS AND ASSUMPTIONS **STUDY PROCESS**

The corridor feasibility study used a typical transportation planning process. The process shown in Figure 1-2 begins with data collection. Data collected included traffic volumes, travel time runs, aerial photos, geographic informational systems (GIS) files of environmental features, proposed developments, property lines, existing buildings, socioeconomic data, land use, and traffic signal timings.

Figure 1-2. Study Process



The data collected during the first step was used to evaluate existing (2016) traffic operational conditions. Goals and objectives were established for the study. The next step was to develop future travel demand for the model. Traffic forecasts were generated for 2040 using the MWCOG Regional Travel demand model. These forecasts were used to evaluate future No Build and build traffic operational conditions.

Next, the first screening of the preliminary alternatives was performed based on how well the study goals and objectives were met, longterm solutions were represented, and enough project benefits to potentially justify any environmental/socioeconomic and right-of-way impacts were provided. This screening was informal and partially subjective and is further described in Chapter 4.

The No Build alternative and four of the preliminary build alternatives, that were either highest ranked or recommended by the Executive Committee, were carried forward for the second screening where the project benefits, overall planning level costs, and environmental/socioeconomic and right-of-way impacts were reviewed in greater detail. The alternatives were ranked individually taking into consideration the benefits, impacts, and costs. A highest-ranked alternative was determined by taking the average of the individual rankings.

Throughout the study, stakeholder involvement was obtained from the Technical and Executive Committees. Public comment was sought on the study findings and recommendations at two public meetings held at the end of the study.





This document summarizes the results and clarifies the next steps forward required to implement a project.

STUDY METHODS AND ASSUMPTIONS

At the beginning of the project, the project team developed a Study Methods and Assumptions document. The document was used by the project team and associated committees as a guide for moving the project through the study process described above. The document covered items such as data collection methods, use of previous study data, level of environmental analysis, traffic operational tools and methods, analysis and peak travel periods to be evaluated, and traffic forecasting methodology. Other items covered included a list of preliminary alternatives to evaluate, screening metrics, measures of effectiveness, and study deliverables. The Study Method and Assumptions document was approved by the Technical Committee on October 26, 2016 and is included in Appendix A.

1.5 STUDY GOALS AND KEY OBJECTIVES

STUDY GOALS

The study goals for the Route 28 Corridor Feasibility Study were to identify infrastructure improvements that will improve travel times and network reliability within the Route 28 Corridor through Prince William County, the City of Manassas, and the City of Manassas Park and to develop a plan to implement these improvement project(s).

KEY OBJECTIVES

The Route 28 Corridor Feasibility Study has the following key objectives in addition to the project goals. They are not listed in any purposeful order. Proposed alternatives were evaluated and screened against these key objectives.

- 1. Reduce congestion, and improve network reliability on Route 28 from Godwin Drive through Historic Downtown Manassas to Liberia Avenue.
- 2. Reduce congestion, and improve network reliability on Route 28, from Centreville Road between Liberia Avenue and Compton Road.
- 3. Facilitate the weekday peak period commuter flows between I-66 and the residential communities in Manassas Park, Manassas, and Prince William County.
- 4. Provide increased opportunities for alternative modes of travel such as travel by bicycles, walking, and carpooling/vanpooling.
- 5. Provide improved access to transit facilities.
- 6. Identify improvement project(s) that have public consensus.
- 7. Identify improvement project(s) that avoid or minimize environmental impacts.
- 8. Identify improvement project(s) that avoid or minimize impacts to existing development.
- 9. Identify improvement project(s) that complement other Route 28 improvements currently being implemented by VDOT, Fairfax County, the City of Manassas, the City of Manassas Park, and Prince William County.
 - a. Widening of Route 28 to six lanes between Godwin Drive and Pennsylvania Avenue. Improvements include adding a dual-turn lane on northbound Route 28.
 - b. Route 28 Phase III Widening of Route 28 to a six-lane divided facility between Linton Hall Road and Pennsylvania Avenue.

Widening of Route 28 to six lanes in Fairfax Cou improvements and pedestrian/bicycle facilities.

1.6 PUBLIC INVOLVEMENT

Two public informational meetings were held to present the results of the Route 28 Corridor Feasibility Study to the public:

September 7, 2017	September 11, 201
6:30-8:30 p.m.	6:30-8:30 p.m.
Manassas Park Community Center	Centreville Elemen
99 Adams Street, Manassas Park, VA 20111	14339 Green Trails

Each of the meetings were held using the same setup and study materials. Each meeting began as an open house with display boards located around the meeting space describing the study area, study process, goals and objectives, existing and future No Build conditions, evaluation of alternatives and study results. Project staff members were stationed around the room to address citizen's questions. A brief PowerPoint presentation was given to the public. A question and answer session followed the presentation. Handouts and comment sheets were available. Approximately 165 people attended the first meeting, while another 65 people attended the second meeting. All material presented at the public informational meetings including the PowerPoint presentation, handouts, comment sheet, and display boards can be viewed and downloaded at: http://route28study.com.

c. Widening of Route 28 to six lanes in Fairfax County between Bull Run and Route 29 including intersections

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tary School 5 Blvd, Centreville, VA 20121





CHAPTER 2 EXISTING CONDITIONS

2.1. DATA COLLECTION

Data was collected from multiple agencies including VDOT, Prince William County, Fairfax County, City of Manassas, City of Manassas Park, and JMT.

TRAFFIC COUNTS

Traffic data used and developed for the VDOT Route 28 Corridor Safety and Operations Study in 2015 was used for this study. The data gathered in this previous study included peak weekday period turning movement counts at locations shown in Table 2-1. Spot checks of the turning movement data were conducted at signalized intersections for verification purposes. The data was collected in May 2014.

Table 2-1. Peak Period Turn Movement Count Locations

1.	Route 28 (Centreville Road) and Route 29 Grade Separation (2 Ramp Movements)
2.	Route 28 (Centreville Road) and Upperridge Drive (Route 898) Old Centreville Road
3.	Route 28 (Centreville Road) and Machen Road
4.	Route 28 (Centreville Road) and New Braddock Road (route 620)
5.	Route 28 (Centreville Road) and Old Mill Road/Green Trails Boulevard
6.	Route 28 (Centreville Road) and Tallavast Drive
7.	Route 28 (Centreville Road) and Bradenton Drive
8.	Route 28 (Centreville Road) and Compton Road/Ordway Road
9.	Route 28 (Centreville Road) and Median Opening (North of Bull Run)
10.	Route 28 (Centreville Road) Patton Lane
11.	Route 28 (Centreville Road) and Yorkshire Lane
12.	Route 28 (Centreville Road) and Rugby Road
13.	Route 28 (Centreville Road) and Brooks Lane
14.	Route 28 (Centreville Road) and Leland Road
15.	Route 28 (Centreville Road) and Oak Street
16.	Route 28 (Centreville Road) and Spruce Street
17.	Route 28 (Centreville Road) and Birch Street
18.	Route 28 (Centreville Road) and Maplewood Drive
19.	Route 28 (Centreville Road) and Browns Lane/Shoppers Square North Entrance
20.	Route 28 (Centreville Road) and Shoppers Square South Entrance
21.	Route 28 (Centreville Road) and Old Centreville Road/Blooms Quarry Lane
22.	Route 28 (Centreville Road) and Manassas Drive (Route 213)
23.	Route 28 (Centreville Road) and Conner Drive
24.	Route 28 (Centreville Road) and Breeden Drive
25.	Route 28 (Centreville Road) and Phoenix Drive
26.	Route 28 (Centreville Road) and Kinchloe Drive
27.	Route 28 (Centreville Road) and Liberia Avenue
28.	Mathis Avenue and Liberia Avenue
29.	Mathis Avenue and Kincheloe Drive
30.	Mathis Avenue and Breeden Avenue
31.	Mathis Avenue and Conner Drive
32.	Mathis Avenue and Hardees Drive
33.	Mathis Avenue and Manassas Drive

In addition, 24-hour traffic counts available from the VDOT Study are shown in Table 2-2.

	Table 2-2. 24-Hour Traffic Count Locations
1.	Route 28 (Centreville Road) between I-66 and Route 29
2.	Route 28 (Centreville Road) between Machen Road and New Braddock Road
3.	Route 28 (Centreville Road) south of Old Mill Road/Green Trails Boulevard
4.	Route 28 (Centreville Road) between Compton Road and Bull Run
5.	Route 28 (Centreville Road) between Yorkshire Lane and Chestnut Street
6.	Route 28 (Centreville Road) between Spruce Street and Birch Street
7.	Route 28 (Centreville Road) between Old Centreville Road and Manassas Drive
8.	Route 28 (Centreville Road) between Breeden Avenue and Phoenix Drive

As part of this study, additional 24-hour counts were collected along roadway corridors that were anticipated to be impacted by the alignment alternatives (see Chapter 4). This effort included total vehicle and classification counts. The 24-hour counts were collected in May 2016 and include:

- I-66 near the Compton Road crossing
- Godwin Drive near Business Route 234
- Godwin Drive near Route 28 •
- Compton Road north of the Upper Occoquan water treatment facility •
- Yorkshire Lane •
- Parkland Street
- Bull Run Road •
- June Street •
- Boundary Avenue •
- Garrison Road •
- Allegheny Road •
- Albemarle Drive
- Amherst Drive between Lomond Drive and Allegheny Road
- Lomond Drive near the Flat Branch crossing

Additional weekday peak period turning movement data was also collected in May 2016. The counts were collected using Miovision video cameras during the peak periods of 6-9AM and 3:30-6:30PM during the middle of a week (Tuesday-Thursday). The counts were not collected on days adjacent to the Memorial Day holiday weekend. The counts included pedestrian and bicyclist volumes. The intersections counted are shown in Table 2-3.





TRAVEL TIME RUNS

Travel time runs were used to calibrate the Synchro models that were used to evaluate the alternatives. Travel time runs were collected along the following routes during the AM (6-9) and PM (3:30-6:30) peak periods:

- 1. Route 28 between Liberia Avenue to Route 29 (two runs to compare with the *VDOT Route 28 Corridor Safety and Operations Study*)
- 2. Route 28 between Hornbaker Road to Liberia Avenue (10 runs for each peak period)
- 3. Godwin Drive between Route 28 (Nokesville Road) to Route 234 Business (10 runs for each peak period)
- 4. Old Centreville Road between Route 28/Old Centreville intersection to Compton Road (10 runs for each peak period)
- 5. Mathis Avenue between Liberia Avenue and Manassas Drive (10 runs for each peak period)

Data was collected using an iPhone and a GPS data recording app between May 19, 2016 and June 2, 2016. This was during the Prince William County and City of Manassas school year and reflect normal traffic conditions. Results from the travel time runs are included in Appendix B.

The travel time runs for Route 28 between Liberia Avenue and Route 29 were compared to the *VDOT Route 28 Corridor Safety and Operations Study.* The two runs collected during the AM and PM peak periods fell within the range of travel times observed in that study. This adds to the confidence in the methodology used to collect the data and the utilization of the data collected as part of the *VDOT Route 28 Corridor Safety and Operations Study.*

GIS DATA

GIS-based aerial and data mapping from Prince William County, the cities of Manassas and Manassas Park, and Fairfax County was used to identify environmental features, parcel information, right-of-way assessment information, property lines, available utility information, and contours.

	Table 2-3. Turning Moven			
Corridor				
	Orchard Bridge Drive			
	Route 234 Interchange – Ramp from Route 234 NB to			
	Wellington Road			
Route 28	Stonewall Road			
	Grant Avenue (one-way pair)			
	Main Street (one-way pair)			
	Center Street/Zebedee Street			
	Prescott Avenue/Sudley Road			
	Route 28 (Nokesville Road)			
	University Boulevard			
Godwin Drive	Lockheed Martin Access			
	Wellington Road			
	Ashton Avenue			
	Sudley Road			
	Cabbel Drive			
	Polk Drive/Maplewood Drive			
	McLean Way			
	Yost Street			
	Spruce Street			
Old Centreville Road/	Park Place			
Ordway Road	Rugby Road			
	Yorkshire Lane			
	Stoneridge Drive/Somerswor			
	Parkland Street			
	Somersworth Drive (N)			
	Compton Road			

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ment Count Locations
Intersections
Route 28 NB and ramp from Route 28 SB to Route 234
)
t
d
rth Drive (S)





ENVIRONMENTAL DATA

The environmental data collected and its associated source(s) are listed below.

Environmental feature/data	Source			
Wetlands and other waters of the U.S.	National Wetland Inventory and National Hydrologic Dataset			
Archaeology and historic architectural structures	Virginia Dept. of Historic Resources database			
Hazardous materials	Virginia Dept. of Environmental Quality databases			
Environmental Justice	US Census Information and Prince William County and City of			
	Manassas GIS data			
Public Recreation Areas, Wildlife Refuges, and Conservation	Virginia Dept. of Conservation and Recreation and Prince			
Easements	William County, Fairfax County, and City of Manassas			
	databases			
Floodplains and floodways	FEMA Flood Hazard maps and City of Manassas, Fairfax			
	County, and Prince William County database			

2.2 EXISTING ROADWAY NETWORK

The study area consists of four roadway segments: Godwin Drive, Mathis Avenue, Old Centreville Road, and Route 28, as shown in Figure 2-1. The name assigned to Route 28 changes from Nokesville Road, to Center Street/Church Street (one-way pair in Manassas), and to Centreville Road as it passes through the study area. The characteristics of these four corridors are summarized in Appendix C.

EXISTING TRAFFIC VOLUME DEVELOPMENT

The traffic data within the study area was collected by multiple sources on different days and years, per Section 2.1 of this report. As a result, the traffic volumes between intersections did not balance, reflecting normal traffic variation. To evaluate the operations of the corridor as a whole, the traffic volumes between intersections needed to be balanced. This was done using the following methodology:

- The different data sets were combined to get an overall picture of the traffic volumes and patterns on the corridor.
- At certain locations, turning volumes were adjusted to match existing lane configurations or to balance with adjacent crossstreet intersections, while maintaining the general turning proportions.
- There were three signalized intersections that were originally assumed to have insignificant minor street traffic but, during the balancing process, were identified as making considerable differences in the inbound and outbound volumes on Route 28. These intersections were Route 28/Cockrell Road, Route 28/Brinkley Lane, and Route 28/Court House Road.
- Spot counts were collected during the AM and PM peak hours for these three intersections. •
- The data from the spot counts were retrofitted into the network. •

The balanced existing network is shown in Appendix D.









2.4 EVALUATING EXISTING CONDITIONS

Evaluation of existing conditions was compared using the Synchro/SimTraffic traffic software tools. This section describes the simulation tools and the calibration techniques that were used for developing the existing AM and PM models.

SYNCHRO

The existing model for the Route 28 corridor study was created using Synchro (version 9.1) and the SimTraffic microsimulation module of Synchro. Separate models for the AM and PM peak hours were developed using 2000 HCM methodologies. SimTraffic was used to analyze the travel time and speeds for the study area intersections.

MODEL CALIBRATION

Calibration of a simulation model is a critical step to ensure that model results reflect field conditions to the extent possible and can be relied upon when testing alternative concepts with future traffic volumes. The existing calibrated Synchro models received from VDOT were used as the basis for the current study; however, the models received did not include the limits of the study corridors in their entirety. Therefore, the models were expanded to include additional coverage with necessary inputs such as existing roadway geometry, traffic volume data, existing signal timings (which were received from VDOT and the City of Manassas), and posted speeds. To ensure that the revised models were still reflecting the existing field conditions, the models were once again calibrated using the travel times and average speed thresholds as listed in VDOT's *Traffic Operations and Safety Analysis Manual (TOSAM)*.

CALIBRATION PARAMETERS

The existing conditions AM and PM models were calibrated based on three calibration parameters: travel times, average speeds, and vehicle throughput. VDOT's *TOSAM* lists the following calibration criteria for simulated average speed and simulated travel time on arterials.

- Simulated average speed (miles per hour mph) should be within ± 5 mph of average observed speeds.
- Simulated travel time (seconds) should range within ± 30% for average observed travel times.
- Simulated throughput (vehicles per hour) should range within the following thresholds:
 - \pm 15% for ≥100 vph to < 300 vph
 - \pm 10% for ≥300 vph to < 1,000 vph
 - ± 5% for ≥1,000 vph

CALIBRATION OUTPUT SUMMARY

Adjustments were made to default Synchro values of turning speeds, positioning, and mandatory distances to calibrate existing condition models. At all free-flowing channelized right turns, drivers typically turn right at speeds approximately 5 to 8 mph higher than a typical non-channelized right turn (NCHRP 208). Therefore, the free-flowing channelized right-turn speeds were changed to 15 mph.

Traffic flow in SimTraffic is based on a series of lane changing and car following algorithms. There are 10 different driver types to provide various driver behaviors, including both aggressive and passive drivers. As vehicles are added to the network, the drivers have a predetermined path and already know several of their upcoming movements. This pre-determined path and the driver type influences each driver's lane-change behaviors.

The decision on when a driver changes lanes is based on two key parameters. The first is the Mandatory Distance and is defined as the distance from an intersection that a vehicle must have changed lanes to complete a required movement. If the vehicle has not changed lanes by this point, the vehicle will stop and wait for a gap. The second parameter is the Positioning Distance and is defined as the distance from the location of the Mandatory Distance that a vehicle will attempt to make a lane change to avoid being forced to complete a mandatory lane change. Both these values were logically adjusted at link level along Godwin Drive based on engineering judgement.

Field observations indicated that the traffic pattern along Route 28 is directional to a certain extent as significant queuing was observed, specifically from Liberia Avenue to New Braddock Road. AM observations indicated queuing in the northbound direction along Route 28 and PM observations indicated queuing in the southbound direction. It was also mentioned in the *VDOT Route 28 Corridor Safety and Operations Study* that was completed in 2015 that the 2014 traffic counts collected did not provide an indication of the demand volumes along Route 28 between Liberia Avenue and New Braddock Road. The study documents that the 2014 counts show a volume reduction along Route 28 compared to the historic data. This reduction is attributed to the significant queuing impeding traffic flow along the corridor. Therefore, the study adjusted the saturation flow rates along Route 28 in the simulation models based on the historic counts to replicate the field conditions.

The saturation flow rate is based on a variety of geometric and operational factors such as number of lanes, trucks, grade, bus operations, area type, left and right turns in the lane group, and pedestrian movements. Generally, the saturation flow rate is calculated in Synchro, but it can also be manually inputted based on field observations and data. A similar approach of adjusting saturation flow rates is taken for the current study, and adjustments were made to the northbound direction in the AM model and along southbound direction in the PM model to match the field conditions. Upon examining the traffic counts and from the green time allocated for the mainline movements, the saturation flow rate is calculated as 2,600 vehicles per hour for two lanes along Route 28 if 100% green time is available. Several test scenarios were run in Synchro using these adjustments to calibrate the existing model.

Tables 2-4 and 2-5 summarize existing condition average speeds and average travel times from both field measurements and simulated models for the AM and PM peak hours. Field average speeds and average travel times that were compiled for each route by direction and by each peak period were gathered from the *Travel Time Runs Memorandum* developed for the current study and populated in the tables below. It is to be noted that the field collected data for Route 28 between Liberia Avenue and Old Centreville Road was taken from the *VDOT's Route 28 Safety and Operations Study.* The difference between the field and simulated parameters is presented and any deviation beyond the threshold limits is highlighted. Table 2-6 summarizes the throughput volumes from the existing traffic volumes and the simulated models for the AM and PM peak hours.

As shown in the tables below, the average field and simulated travel times have less than 30% difference for each of the travel routes during both AM and PM peak hours. The average field and simulated speeds have less than 5 mph difference for each of the travel routes during both AM and PM peak hours. Also, the average field and simulated throughput is within the thresholds established by traffic volumes apart from the PM peak period at Route 28 and New Braddock Road, where the travel time difference was 5.2%. It was determined





that since this was a feasibility study, the time required to modify and rebalance volumes to account for 3 vehicles at this location was not worthwhile. Hence, these calibrated models were used as basis for any of the alternative analysis required for the current study.

Table 2-4. Average Travel Times Comparison by Route for the AM Peak Period									
Route	Distance <i>(miles)</i>	Field Speed <i>(mph)</i>	¹ Simulated Speed <i>(mph)</i>	Speed Difference <i>(mph)</i>	Field Travel Time <i>(min:sec)</i>	¹ Simulated Travel Time <i>(min:sec)</i>	Travel Time Difference (%)		
² NB Route 28 (Liberia Ave to Old Centreville Rd)	5.47	7.2	8.5	-1.4	45:46	38:25	16%		
² SB Route 28 (Old Rd to Liberia Ave)	5.46	31.4	29.4	2.0	10:25	11:7	-7%		
NB Route 28 (Godwin Dr to Liberia Ave)	3.45	25.4	21.1	4.3	8:08	9:49	-21%		
SB Route 28 (Liberia Ave to Godwin Dr)	3.44	23.3	27.3	-4.0	8:51	7:33	15%		
NB Godwin Drive (Route 28 to Route 234 Business)	2.06	35.0	30.2	4.8	3:32	4:06	-16%		
SB Godwin Drive (Route 234 Business to Route 28)	2.07	33.0	28.0	5.0	3:46	4:26	-18%		
NB Old Centreville Road (Route 28/Old Centreville intersection to Compton Rd)	2.82	10.3	14.4	-4.1	16:26	11:46	28%		
SB Old Centreville Road (Compton Rd to Route 28/Old Centreville intersection)	2.76	31.9	27.7	4.2	5:12	5:59	-15%		
NB Mathis Avenue (Liberia Ave to Manassas Dr)	0.72	11.8	10.2	1.6	3:40	4:14	-15%		
SB Mathis Avenue (Manassas Dr to Liberia Ave)	0.72	25.0	20.2	4.8	1:44	2:08	-24%		

¹ Average of 10 simulation runs

² Field travel times and field speeds are taken from VDOT's Route 28 Safety and Operations Study

Table 2-5. Average Travel Times Comparison by Route for the PM Peak Period									
Route	Distance <i>(miles)</i>	Field Speed (mph)	¹ Simulated Speed <i>(mph)</i>	Speed Difference <i>(mph)</i>	Field Travel Time <i>(min:sec)</i>	¹ Simulated Travel Time <i>(min:sec)</i>	Travel Time Difference (%)		
² NB Route 28 (Liberia Ave to Old Centreville Rd)	5.47	25.0	22.5	2.5	13:8	14:36	-11%		
² SB Route 28 (Old Centreville Rd to Liberia Ave)	5.46	18.0	17.2	0.9	18:10	19:5	-5%		
NB Route 28 (Godwin Dr to Liberia Ave)	3.45	23.5	27.9	-4.5	8:49	7:24	16%		
SB Route 28 (Liberia Ave to Godwin Dr)	3.44	22.1	26.6	-4.5	9:20	7:45	17%		
NB Godwin Drive (Route 28 to Route 234 Business)	2.06	30.1	25.2	4.9	4:06	4:54	-20%		
SB Godwin Drive (Route 234 Business to Route 28)	2.07	26.6	24.8	1.8	4:40	5:00	-7%		
NB Old Centreville Road (Route 28/Old Centreville intersection to Compton Rd)	2.82	32.1	27.2	4.9	5:16	6:13	-18%		
SB Old Centreville Road (Compton Rd to Route 28/Old Centreville intersection)	2.76	25.8	21.4	4.4	6:25	7:45	-21%		
NB Mathis Avenue (Liberia Ave to Manassas Dr)	0.72	21.6	17.0	4.6	2:00	2:33	-27%		
SB Mathis Avenue (Manassas Dr to Liberia Ave)	0.72	19.6	18.3	1.4	2:12	2:22	-8%		

¹ Average of 10 simulation runs

² Field travel times and field speeds are taken from VDOT's Route 28 Safety and Operations Study





				AM Exisitng			PM Exisitng	
Corridor	Intersection	Approach	Input Volumes (vph)	Simulated Throughput (vph)	Throughput Difference (%)	Input Volumes (vph)	Simulated Throughput (vph)	Throughput Difference (%)
	din Dr	Route 28 (WB)	710.0	692.0	2.5%	537.0	534.0	0.6%
	Godv	Route 28 (EB)	987.0	980.0	0.7%	528.0	534.0	-1.1%
	House e Ave	Route 28 (WB)	857.0	801.0	6.5%	707.0	696.0	1.6%
	Court I Rd/Le	Route 28 (EB)	939.0	941.0	-0.2%	655.0	665.0	-1.5%
	ant inter St	Route 28 (WB)						
ie 28	Gra Ave/Ce	Route 28 (EB)	799.0	790.0	1.1%	527.0	531.0	-0.8%
Rout	ain nter St	Route 28 (WB)						
	Ma St/Cer	Route 28 (EB)	1004.0	1000.0	0.4%	723.0	719.0	0.6%
	lley escott /e	Route 28 (NB)	973.0	945.0	2.9%	506.0	498.0	1.6%
	Suc Rd/Pr	Route 28 (SB)	418.0	414.0	1.0%	641.0	604.0	5.8%
	sw ock Rd	Route 28 (NB)	1798.0	1708.0	5.0%	1324.0	1255.0	5.2%
	Ne Braddo	Route 28 (SB)	977.0	966.0	1.1%	1620.0	1615.0	0.3%
	ersity vd	Route 28 (NB)	532.0	534.0	-0.4%	685.0	694.0	-1.3%
/in Dr	Unive BI	Route 28 (SB)	320.0	320.0	0.0%	680.0	668.0	1.8%
Godw	lton Rd	Route 28 (NB)	385.0	388.0	-0.8%	464.0	462.0	0.4%
	Welling	Route 28 (SB)	467.0	471.0	-0.9%	498.0	485.0	2.6%
ld eville d	nire Ln	Old Centreville Rd (NB)	427.0	415.0	2.8%	247.0	247.0	0.0%
0 Centr R	Yorkst	Old Centreville Rd (SB)	175.0	174.0	0.6%	683.0	651.0	4.7%

Table 2-6. AM and PM Existing Input and Output Volume Comparison

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NUMBER OF MODEL RUNS

Per the TOSAM guidelines, the VDOT Sample Size Determination Tool (Version 2.0) was used to determine the number of simulation runs required for the current study. Average travel speed was selected as the Measure of Effectiveness (MOE) and was used in this tool. Eastbound speed was captured on Route 28 at Stonewall Road, and southbound speed was captured on Route 28 at Yorkshire Lane for 10 individual runs and used as input for the tool. As shown in Figure 2-2 and Figure 2-3 below, a minimum of 10 runs were required to run both AM and PM existing conditions models.

Figure 2-2. Screen Capture from VDOT Sample Size Determination Tool for the Eastbound Speed on Route 28 at Stonewell Road during AM and PM Peak Periods



Figure 2-3. Screen Capture from VDOT Sample Size Determination Tool for the Southbound Speed on Route 28 at Yorkshire Lane during AM and PM Peak Periods

VDC	J Virg of T	inia Dep ransport	artment ation	San	nple Size	Det	termiı
	User Inputs Constants Outputs		Sample Siz Sample Me Sample Sta Sampling E Confidenc % of Samp Sample Siz	ze (N) = I ean (X _s) : andard E Error = Z e Level : ile Mean ze Need	Number of M = $(1/N) (X_1 + 2)$ eviation (S_s) (S_s/VN) = $X_s \pm Z (S_s/VI)$ (E) = % Toler ed = $[(Z)^2 * (S_s)$	odel R $X_2 + X_3$ = $\sqrt{(\Sigma)}$ N) rance * $(S_3)^2 / (R_3)^2$	uns + X _N) (X-X _s) ²)/(1 ⁵ X _s E) ²
Model Iteratio	ns				Sample	Size O	utputs
Neasure of Effe onfidence Inte olerance Error: lumber of Mod	ctiveness (M rval: el Runs:	1OE):	Speed 95% 10% 10		N = X _s = S _s = E =	10.0 21.5 0.7 2.2	
Run Number	Speed				2 -	1.50	
1 2 3 4	21 22 21 21				Sampling 95% Conf Percenta Sample S	Error idence ge of N ize Ne	e Interval Nean eded
5 6 7 8	21 21 23 21				Z is the nul correspond	mber of ling to t	standard o the required
9 10 11 12	22 22	AM Pea	k		Measure Confide Tolerand	e of Effe nce Inte ce Error:	ectiveness erval:
13					Number	of Moo	lel Runs:
14				I	Run Nur	nber	Speed
					1 2 3		14 13 14
					4		14 14
					6		14
					7		14
					8		15
					10		14
					11		
					10		
					12 13		







MEASURES OF EFFECTIVENESS

VDOT's TOSAM lists 95th Percentile Queue Length, Average Control Delay, Average Travel Speed and Volume to Capacity (v/c) Ratio as appropriate Measures of Effectiveness (MOEs) to evaluate the operations for an arterial network. Average control delay and 95th percentile queue lengths were captured from Synchro output data for all the signalized intersections for both existing AM and PM models. Ten simulation runs from SimTraffic were completed and averaged to gather additional MOEs pertaining to arterial performance such as average travel speeds for the existing models.

Synchro 9 software has limitations in generating reports and analyzing the signalized intersections using the Highway Capacity Manual - 2010 edition (HCM 2010) module that is embedded in the software. The HCM 2010 module strictly expects signals to run on standard NEMA phasing with standard NEMA quad ring-barrier structure. The module does not support multiple barriers. Therefore, MOEs for signalized intersections were captured from the Highway Capacity Manual - 2000 edition (HCM 2000) module that is also embedded in Synchro 9 software.

LEVELS OF SERVICE

Levels of service (LOS) were defined per the Highway Capacity Manual (HCM), 2000 edition, to provide a quantitative measure to characterize operational conditions within a traffic stream, generally in terms of such service measures as speed and travel time, freedom to maneuver, traffic interruptions, and comfort and convenience. Six (6) LOS are defined for each type of facility. Letters designate each level, from A to F, with LOS A representing the best operating conditions and LOS F the worst. Each level of service represents a range of operating conditions and the driver's perception of those conditions. For signalized intersections, LOS is directly related to the average control delay per vehicle in seconds. The following table from the HCM define the criteria for signalized intersections.

Table 2-7 Level of Service Criteria for Signalized Intersections							
Level of Service	Average Control Delay (sec/veh)						
А	≤ 10						
В	> 10 - 20						
С	> 20 – 35						
D	> 35 – 55						
E	> 55 – 80						
F	> 80						

All the signalized intersections within the study area were analyzed. LOS's were determined for signalized intersections for AM and PM peak hours based on the HCM - 2000 edition that is embedded in the Synchro 9 software. A total of 34 signalized intersections were analyzed in the Existing Conditions.

While the intersection LOS results include the effects of signal progression along Route 28 corridor, there are other potential issues such as excessive queuing, blocking, and system volatility that may result in periodic heavy congestion that may not be fully reflected in individual intersection LOS from the analysis results. The travel time analysis results may indicate heavy congestion along an entire corridor while the reported intersection LOS for some intersections along the corridor may be better than expected.

According to the VDOT standards, any intersection that operates at or below a LOS E is considered to have operational deficiencies. Eight signalized intersections during AM peak hour and nine signalized intersections during PM peak hour operate at a LOS E and/or worse within the project limits. Appendix E provides a list of the approach and intersection LOS for all signalized intersections in the study (with the LOS highlighted that are currently operating at LOS E and/or LOS F) during peak hours. A graphical representation showing the intersection LOS for both AM and PM conditions, specifically for the intersections along Route 28, was developed for additional clarity as seen in Figure 2-4. As seen in this figure, the majority of Route 28 is operating at capacity or at failing LOS in the northbound direction in the AM peak from Liberia Avenue to New Braddock Road. The operations improve as the traffic passes through the signalized intersections with low-volume minor streets. A similar pattern is observed in the southbound direction for the PM conditions. The 95th percentile queue lengths and the v/c ratios for each of these intersections are found in the Synchro reports in Appendix F.





Figure 2-4 Existing Levels of Service and Queuing



*See Appendix E for level of service and delay details





CHAPTER 3 NO BUILD CONDITIONS AND TRAVEL DEMAND FORECASTING

3.1. BASE MODEL (MWCOG MODEL)

The Metropolitan Washington Council of Governments (MWCOG) regional travel demand forecasting model was used to support the planning process as part of this Route 28 Corridor Feasibility Study. A travel demand model includes components such as roadway and transit networks combined with population and employment data to calculate the anticipated travel demand for transportation facilities. The socio-economic data is developed based on the transportation analysis zones (TAZs). The highway network of the model is a representation of all major roads in the region, and the transit network represents the public transportation service in the region such as bus, Metrorail, and commuter rail. The MWCOG model comprises Northern Virginia including Fairfax County, Loudoun County, Prince William County, the City of Manassas, and the City of Manassas Park.

Travel demand forecasts were developed for this study. The forecasts were based on the MWCOG regional travel demand model Version 2.3.66, which was the most recent model available at the time of this report. The model included proposed roadway and transit improvements as part of the 2016 Amendment to the Constrained Long-Range Transportation Plan (CLRP) and 2017-2022 Transportation Improvement Program (TIP). The model was run with approved regional socio-economic data as defined in the MWCOG Round 9.0 Cooperative Forecasts. The model version used was agreed upon by the Technical Committee. The MWCOG regional model used for this study includes the following projects that may influence the study area:

- VRE Haymarket Extension Manassas to Gainesville/Haymarket
- Crystal City Transitway Northern Extension Crystal City Metro Station to Pentagon City Metro Station
- I-66 Multimodal Improvements inside the Capital Beltway Widen in both directions for HOT/Express Lanes
- I-66 Corridor Improvements outside the Capital Beltway Add/Widen for HOT/Express Lanes with ramp movements modifications
- Route 28 Widening I-66 to Route 7
- Route 28 HOV lanes I-66 to Dulles Toll Road
- Bi-County Parkway

The year 2040 was selected as the design year for the forecasts since this was the furthest out year of socio-economic data in the MWCOG model. This model included the proposed modifications to the roadway network plus the projected growth anticipated in the socio-economic data. A sensitivity analysis was conducted to determine the impact on the study area with and without two of the major proposed roadway and transit projects; the VRE Haymarket extension and the Bi-County Parkway. The results of this analysis showed only inconsequential changes to the study area. Therefore, as directed by the Technical Committee, forecasting efforts proceeded with these projects included in the MWCOG model.

Appendix G summarizes the increase in the number of households and employment between the base year (2010) and design year (2040) utilized for TAZs along the Route 28 corridor. These projections show approximately 21,100 more households and 18,900 more people working in the corridor.

Volumes were developed for the area roadway network to include the Route 28 corridor from Route 234 (Prince William Parkway) to south of the US 29 interchange, Godwin Drive, Old Centreville Road, Mathis Avenue, and Euclid Avenue. Traffic volumes for points north of Bull Run along Route 28 for the No Build alternative were taken directly from the recently approved volumes for the Fairfax County's Route 28 widening project. The No Build volumes for this project were tied into the volumes at Bull Run. The remaining volumes for the No Build and build alternatives were based on the trips generated from known approved development, e.g. Towns at Falls Grove: 110 townhomes located to the north of Falls Grove Drive across from Yorkshire Lane; Property to the south of Falls Grove Drive: 28,000-SF of office space, and 9,400-SF of specialty retail; Orchard Bridge Apartments located on Mangrove Circle with access from Orchard Bridge Drive: 400 units. The volumes were refined by pivoting from the changes between the No Build and build alternatives while maintaining consistency between the approved forecasts north of Bull Run.

3.2. NO BUILD CONDITIONS ANALYSIS

The operations in the study corridor deteriorate with the increased traffic volumes in 2040. Figures 3-1 and 3-2 summarize the traffic operations of the study corridor under the No Build scenario, as derived through Synchro and SimTraffic. A total of 29 signalized intersections on the four roadway segments in the 2040 No Build scenario were analyzed. As shown in Figure 3-2, showing the Route 28 intersections, 16 intersections out of the 29 (55%) are operating at capacity (LOS F) in either AM or PM or both peak hours. Those intersections are highlighted in red in the figures.

The 2040 No Build forecasts show an annual growth of 1.4% per year and the addition of approximately 20,000 vehicles to the study corridor daily when compared to existing conditions. The travel times on the study corridor are compared to the existing conditions as shown in Figure 3-1. It is to be noted that the travel time in the northbound direction during the AM peak hour (peak direction) remains essentially the same compared to the existing conditions due to the Route 28 widening in Fairfax County mitigating the northbound delays. Southbound delays increase due to the No Build condition south of Compton Road.







ROUTE 28 CORRIDOR FEASIBILITY STUDY





Figure 3-2 2040 No Build Levels-of-Service and Queuing

Manassas









CHAPTER 4 FIRST SCREENING OF ALTERNATIVES

4.1 PRELIMINARY ALTERNATIVES

Ten preliminary alternatives were evaluated as part of this study. These alternatives were concepts that were developed through local knowledge of the corridor and its surroundings, and conversations with elected officials, local transportation staff, and citizens to address the congestion problems on Route 28. One of the alternatives is the No Build alternative, against which the other alternatives were compared. Several of the alternatives; Alternative 2, Alternative 9, and Alternative 10 have portions of their alignment where there are optional alignments. These are labeled A, B, and/or C.

The preliminary alternatives carried through the first screening of alternatives are shown in Figure 4-1 and include:

Alternative 1: 2040 No Build Alternative

This alternative assumes that the planned improvements in the region, except for the widening or alternative alignments for Route 28 in Prince William County and Manassas, will be in place. These include improvements to I-66 inside and outside of the Beltway and the extension of New Braddock Road across I-66. This alternative also includes the widening of Route 28 to up to four lanes in each direction in Fairfax County from the Prince William County line to Route 29.

Alternative 2: Godwin Drive extended to existing Route 28

This alternative will create a bypass to the west of existing Route 28, west of the City of Manassas and the City of Manassas Park. The alignment will extend Godwin Drive north from the existing Godwin Drive/Sudley Road intersection, parallel to Flat Branch, then turn east until joining existing Route 28. Alternative 2A joins existing Route 28 south of the existing Bull Run crossing. Alternative 2B follows the Old Centreville Road bridge over Bull Run and then joins existing Route 28 north of the Bull Run crossing. Route 28 would be widened from this point north to tie into the improvements planned by Fairfax County. The bypass would be designed to parkway standards with two lanes in each direction and a 40-foot wide raised landscaped median. Curb and gutter would be provided as well as a 10-foot shared use path on the east side of the roadway. The proposed typical section is shown in Figure 4-2 and would require 128' of right-of-way. Access would be restricted along the bypass to signalized intersections at Sudley Road, Lomond Drive, Old Centreville Road, and existing Route 28 which would "tee" into the new bypass. For the purposes of this study, this alternative will tie into the existing Route 28 at an at-grade signalized intersection. The actual configuration of the tie-in point will be determined during subsequent phases when traffic operations and intersection/interchange configurations will be studied in more depth.

Alternative 3: Godwin Drive extended to I-66 near the existing Compton Road crossing (the former Tri-County Parkway alignment)

This alternative will extend Godwin Drive north from the existing Godwin Drive/Sudley Road intersection parallel to Flat Branch, then cross Bull Run and continue across Bull Run Regional Park to tie into I-66. The bypass would be designed to parkway standards with two lanes in each direction and a 40-foot wide raised landscaped median. Curb and gutter would be provided as well as a 10-foot shared use path on the east side of the roadway. The proposed typical section is shown in Figure 4-2 and would require 128' of right-of-way.

Figure 4-1: Preliminary Alternatives







Figure 4-2: Typical Section for Alternatives 2A, 2B, and 3

Alternative 4: Widening Route 28 on existing alignment between Liberia Avenue and the Fairfax County line

The widening would be designed to urban principal arterial standards with three lanes in each direction and a 16-foot wide raised landscaped median. Curb and gutter would be provided as well as a five-foot sidewalk on the west side of Route 28 and a 10-foot shared use path on the east side. The proposed typical section is shown in Figure 4-3 and would require 128' of right-of-way. The widening would begin just south of Liberia Avenue to provide an additional through lane through the Route 28/Liberia Avenue intersection in each direction and continue north to tie into the improvements planned by Fairfax County. Widening will shift along the corridor to the side of Route 28 opposite of the existing high-voltage power lines. Reconstruction of existing pavement would occur the length of the widening. Access to existing cross streets and properties would remain; however, some existing turn movements may be restricted as a raised median with access break will replace the existing flush two-way left turn lane.



Figure 4-3: Typical Section for Alternative 4

Alternative 5: Reversible lanes between Liberia Avenue and the Fairfax County Line

This alternative consists of providing a barrier separated reversible center lane on existing Route 28 between Manassas Drive and the Prince William County Line. During the morning peak period, the center lane would be dedicated for northbound traffic providing a total of three lanes in that direction. During the afternoon/evening peak period, the direction of travel would switch, and the center lane would be open for southbound traffic only providing a total of three lanes in that direction. Due to the median barriers, no left

turns from Route 28 would be permitted just north of Manassas Drive to Bull Run. Between Liberia Avenue and Manassas Drive an additional lane would be added in each direction instead of a barrier separated reversible lane due to the high number of vehicles turning off and on Route 28 at Manassas Drive and Liberia Avenue. The existing roadway would need to be widened to handle the additional shoulders and barriers associated with the reversible lane. Curb and gutter would be provided as well as a five-foot sidewalk on the west side of Route 28 and a 10-foot shared use path on the east side. The proposed typical section is shown in Figure 4-4 and would require 111' of right-of-way.



Figure 4-4: Typical Section for Alternative 5

Alternative 6: Widening Old Centreville Road/Ordway Road throughout its length

Old Centreville Road/Ordway Road would be widened by one lane in each direction. Furthermore, one lane will be added in each direction on Route 28 between Liberia Avenue and Old Centreville Road. The widening on Old Centreville Road/Ordway Road would be designed to urban arterial standards with two lanes in each direction and a 16-foot wide raised landscaped median. Curb and gutter would be provided as well as a five-foot sidewalk on the west side of Route 28 and a 10-foot shared use path on the east side. The proposed typical section is shown in Figure 4-5 and would require 104' of right-of-way.









Alternative 7: Converting Old Centreville Road/Ordway Road to a reversible facility

This alternative would convert Old Centreville Road/Ordway Road from the Route 28/Blooms Quarry Road intersection to Compton Road to a reversible facility. During the morning peak period, both lanes of the two-lane road would be open for northbound traffic only. During the afternoon/evening peak period, the direction of travel would switch and both lanes would be open for southbound traffic only. During off-peak hours two-way traffic would occur with one lane in each direction. Reversible flow would be controlled by signing and potentially overhead signals. The typical section for the southern portion of Old Centreville Road between Route 28 north to Maplewood Drive, is shown in Figure 4-6. Within this section a 10-foot shared use path would be added to the east side of Old Centreville and a five-foot sidewalk where missing on the east side. The typical section for the northern portion of Old Centreville Road/Ordway Road between Maplewood Drive and Compton Road, is shown in Figure 4-7. Within this section a 10-foot shared use path would be added to the west side of Old Centreville/Ordway Road. Furthermore, one lane will be added in each direction on Route 28 between Liberia Avenue and Old Centreville Road.



Figure 4-6: Typical Section for Alternative 7 – Southern Portion



Figure 4-7: Typical Section for Alternative 7 – Northern Portion

Alternative 8: Transit Alternatives to include BRT and/or VRE expansion along the corridor This alternative involves providing a dedicated right of way or lane for Bus Rapid Transit (BRT) on Route 28 and/or extension of Virginia Railway Express.

Alternative 9A, 9B, 9C: Euclid Avenue extension north to Route 28 near Bull Run and south to Downtown Manassas. This alternative would create a bypass of existing Route 28 that passes through Prince William County, the City of Manassas Park, and the City of Manassas. The alignment of Alternative 9 would extend Euclid Avenue to the south from Quarry Road to Downtown Manassas. The alignment would also extend Euclid Avenue north from near Manassas Park High School along the west bank of Bull Run until joining with existing Route 28, which would "tee" into the new bypass. Route 28 would be widened from this point north to tie into the improvements planned by Fairfax County. The only difference between the Alternative 9 options, 9A, 9B, and 9C is the alignment used to extend Euclid Avenue south from Quarry Road to Downtown Manassas. Since the differences between 9A, 9B, and 9C are slight, they were evaluated collectively as 'Alternative 9'.

The southern portion of the bypass between Historic Downtown Manassas and Manassas Park High School would be designed and widened to urban principal arterial standards with two lanes in each direction and a 16-foot wide raised landscaped median. Curb and gutter would be provided as well as a five-foot sidewalk on the west side of Route 28 and a 10-foot shared use path on the east side. Reconstruction of existing pavement along Euclid Avenue would occur the length of the southern portion. Access to existing cross streets and properties would remain; however, some existing turn movements may be restricted as a raised median with limited access





breaks will replace the existing sections of two-lane road. The proposed typical section is shown in Figure 4-8 and would require 104' of right-of-way.

The bypass north of Manassas Park High School would be designed to parkway standards with two lanes in each direction and a 40foot wide raised landscaped median. Curb and gutter would be provided as well as a 10-foot shared use path on the east side of the roadway. Access would be restricted along the northern portion of the bypass to Lake Drive. The proposed typical section for the northern portion is shown in Figure 4-9 and would require 128' of right-of-way.



Figure 4-8: Typical Section for Alternatives 9A, 9B, and 9C – Southern Portion



Figure 4-9: Typical Section for Alternatives 9A, 9B, and 9C – Northern Portion

Alternative 10A, 10B, and 10C: A new southern alignment (Hasting Drive/Signal View Drive)

This alternative would create a bypass of existing Route 28 that passes through Prince William County, the City of Manassas Park, and the City of Manassas. The three option alignments of Alternative 10 would follow Godwin Drive/Hastings Drive from Route 28 to Liberia Avenue. A shared use path would be added and some improvements to the roadway would be required to bring it up to arterial standards. At Liberia Avenue, the three option alignments diverge as they head north. Alternative 10A follows Liberia Avenue north past Signal Hill Road and then turns northeast crossing the Manassas Drive/Signal View Drive intersection. Alternative 10A then follows Manassas Drive north to the General's Ridge Golf Course. Alternative 10B crosses Wellington Road and continues north crossing the Birmingham Drive/Signal Hill Road intersection and ties into Signal View Drive. Alternative 10B then follows Signal View Drive and Manassas Drive north to the General's Ridge Golf Course. Alternative 10C crosses Wellington Road continues north and ties into Birmingham Drive following it north at the east edge of Manassas Park to the General's Ridge Golf Course.

The alignments of the three options of Alternative 10 then cross General's Ridge Golf Course and come together. Next, the alignments will cross the railroad tracks and then traverse along the west bank of Bull Run until joining with existing Route 28. Route 28 would be widened from this point north to tie into the improvements planned by Fairfax County.

The bypass would be designed to parkway standards with two lanes in each direction and a 40-foot wide raised landscaped median. Curb and gutter would be provided as well as a 10-foot shared use path on the east side of the roadway. Access would be restricted along the northern section of the bypass to Lake Drive. The proposed typical section for the northern portion is shown in Figure 4-10 and would require 128' of right-of-way. Since the differences between 10A, 10B, and 10C are slight, they were evaluated collectively as 'Alternative 10'.





SCREENING CRITERIA

The identification of a highest ranked alternative was determined using two screening processes. The first screening process described in this section and the results are summarized in Table 4-1 identified the alternatives that best met the study's key objectives and were deemed appropriate to study in more detail. The first screening compared all ten preliminary alternatives against four evaluation criteria.

SCREENING CRITERIA FOR ALTERNATIVES

Four screening criteria were used to compare the ten preliminary alternatives:

- Traffic Impacts
- Policy Considerations





- Environmental Impacts
- Socioeconomic/ROW Impacts

As shown in the alternative evaluation matrix in Table 4-1, each screening criterion has one or more metrics that are used to evaluate the alternatives versus the key objectives. The key objective that each metric is evaluating is listed under the metric heading. A list of all the key objectives is shown in Table 4-1 for reference. Definitions of each alternative is provided for reference.

The Alternative Screening Criteria Rating Metrics for the four criteria are attached in Appendix H and provide the general rating scale that assisted in the development of Table 4-1.

As shown in the Legend in Table 4-1, the alternative rating includes both Positive Benefits and Negative Impacts. Positive Benefits scoring is categorized into four levels;

Neutral/Minimal/No Benefits (0 points), Low Benefits (1 point), Medium Benefits (2 points) and High Benefits (3 points).

Similarly, the Negative Impacts are:

Neutral/Minimal/No Impact (0 points), Low Negative Impact (-1 point), Medium Negative Impact (-2 points) and High Negative Impact (-3 points).

4.2.1 TRAFFIC IMPACTS

The MWCOG, described in section 3.1, was used in this traffic impact assessment for each alternative. Five metrics for the traffic impacts were evaluated for all alternatives:

- Peak Periods (AM and PM) Traffic Served by Alternative
- Change in Peak Periods (AM and PM) Traffic per Lane on Route 28 (Historic Downtown Manassas)
- Change in Peak Periods (AM and PM) Traffic per Lane on Route 28 (Liberia Avenue to Compton Road)
- Annual Travel Time Savings per Vehicle
- Multimodal Compatibility

PEAK PERIODS (AM AND PM) TRAFFIC SERVED BY ALTERNATIVE

The potential maximum total amount of AM and PM peak period traffic served in 2040 was used as a metric to evaluate which alternatives best meet Key Objective 3: Facilitate Peak Period Commuter Flow. Traffic volume forecasts generated in Section 3 of this study were used. The highest total peak period volumes served in 2040 at any point along the preliminary alternatives' alignments compared to No Build alternative were used to rate the metric. All alternatives received a positive rating as they served peak period

traffic. Alternatives 2B, 3, and 6 served higher volumes of peak period traffic and thus received a higher positive rating. Alternatives 4, 5, and 9 served lower volumes of peak period traffic and received a lower positive rating.

CHANGE IN PEAK PERIODS (AM AND PM) TRAFFIC PER LANE ON ROUTE 28 (HISTORIC DOWNTOWN MANASSAS)

The difference of the AM and PM peak period (6-9 AM and 3-7 PM) traffic volumes between the 2040 No Build and the preliminary alternatives, determined per lane on Route 28 in Historic Downtown Manassas was used to evaluate how well the alternatives met Key Objective 1: Reduce Congestion (Downtown Manassas). Alternatives 2A, 2B and 3 removed the highest levels of traffic from Route 28 in Downtown Manassas and thus received a positive rating. Alternative 10 increased traffic on Route 28 in Downtown Manassas the most and received a low negative rating. The other alternatives had minimal impact on Route 28 traffic in Downtown Manassas and received neutral ratings.

CHANGE IN PEAK PERIODS (AM AND PM) TRAFFIC PER LANE ON ROUTE 28 (LIBERIA AVENUE TO COMPTON ROAD)

The difference of the AM and PM peak period traffic volumes served between the 2040 No Build and the preliminary alternative, determined per lane on Route 28 from Liberia Avenue to Compton Road was used to evaluate how well the alternatives met Key Objective 2: Reduce congestion (Liberia Avenue to Compton Road). Alternatives 9 and 10 removed higher volumes of peak period traffic from Route 28 in this section and thus received a high positive rating. Alternative 7 results in slightly increased traffic on Route 28 due to the traffic being restricted from Old Centreville Road in one direction during the peak periods and thus received a low negative rating.

ANNUAL TRAVEL TIME SAVINGS PER VEHICLE

The difference in travel times between Godwin Drive and the US 29 ramps along Route 28 compared to the No Build alternative during both AM and PM peak periods was used as a metric to evaluate Key Objective 3: Facilitate Peak Period Commuter Flow. The travel time savings for each vehicle were summed for a complete year. Alternatives received a positive rating as they resulted in annual travel timing savings over the No Build Alternative. Alternatives 9 and 10 resulted in the highest annual travel time savings and thus these alternatives received a high positive rating. Building Alternatives 4, 6, and 7 resulted in the lowest annual travel time savings and they received a low positive rating.

MULTIMODAL COMPATIBILITY

A qualitative assessment was made for each preliminary alternative on compatibility with other modes of transportation including pedestrians, bicycles, and transit. This metric is evaluating how the alternatives meet Key Objective 4: Increase Opportunities for Alternative Modes of Travel, and Key Objective 5: Increase Access to Transit Facilities. Positive ratings for this metric are based on the alternative including any combination of a sidewalk, a shared use path or transit connections. Alternatives 2A, 2B, 3, and 10 received a low positive rating for including both a shared use path. Alternatives 4, 5, 6, 7, and 9 received a medium positive rating for including both a sidewalk and a shared use path. The bypass alternatives with the wider medians do not preclude the potential for future transit options.





Table 4-1: Preliminary Screening Results

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Notes:									1	Pr	eliminary Alternat	ives		
* Based on Exe	ecutive Commit	tee input, these alt	ernatives may be ad	lvanced.				Alt. 1	No Build					
								Alt. 2A	Godwin Dr exten	ded to existing R	oute 28 south of B	ull Run		
* Alternative	s is not recomm	ended to move for	ward due to significe	ant environmental in	mpacts and the unlik	dihood		Alt. 2B	Godwin Dr exten	ded to Existing Re	oute 28 north of B	ull Run		
of the altern	ative to be app	roved by Federal A	gencies based on ou	itcome of previous N	IEPA studies.			Alt. 3	Godwin Dr exten	ded to match I-60	5 near existing Con	npton Rd crossing	(former Tri-Count	y Pkwy alignment
								Alt. 4	Widening Route	28 on existing ali	gnment between L	iberia Avenue and	the Fairfax Coun	ty line
Alternative 8	: Exclusive BRT	option along Route	28 is not currently p	planned nor included	f in the MWCOG mo	del. Therefoi	re, this	Alt. 5	New Route 28 Re	versible Lanes be	etween Manassas	Drive and the Fair	fax County Line	
unternutive is	enninatea jio	inguruner evuluuri	<i></i>					Alt. 6	Widening Old Ce	ntreville Rd/Ordv	vay Rd throughout	its length		
Objective 6 (I	Public Consensu	ıs) will be evaluate	d under second scre	ening process.				Alt. 7	Converting Old C	entreville Rd/Ord	lway Rd to a rever	sible facility		
								Alt. 8	Transit Alternation	ves to include BR	T and/or VRE expa	nsion along the co	orridor (Not Show	n)
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•	0 pts.	Neutral / Minim	al / No Negative	Impact	•	0 pts.	Neutral / Minimal / N	Positive Impact	1	Obj. 3	Increased Opport	tunities for Altern	ative Modes of Tr	avel
	-1 pts.	Low Negative In	npact			1 pts.	Low Positive Impact			Obj. 5	Improved Access	to Transit Facilitie	25	
	-2 pts.	Medium Negati	ve Impact			2 pts.	Medium Positive Imp	ict	1	Obj. 6	Improvement Pro	jects with Public	Consensus	
-	-3 pts.	High Negative In	npact			3 pts. High Positive Impact Obj. 7 Improvement Projects with Minimal Environmental Impa					mpacts			
										Obj. 8	Improvement Pro	pjects with Minima	al Existing Condition	ons Impacts
										Obj. 9	Improvement Pro	jects that Comple	ment Route 28 O	perations
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4.2.2 **POLICY CONSIDERATIONS**

Federal, state, and local policies and transportation plans play a vital role in the ultimate approval and constructability of an alternative.

CONSISTENCY WITH LOCAL AND REGIONAL PLANS

The transportation planning process identifies transportation system needs and, to the extent that funds will be available, cooperatively and officially produces a plan to respond to the long- and short-range needs with appropriate projects. For a proposed improvement to receive funding for study, design, and/or construction, it must first be included in the adopted Locality Comprehensive Plan and/or a transportation agency's long-range plan. The inclusion of a proposed improvement in local and regional transportation plans is an indication of project support and reflects the likelihood of receiving state and/or federal funding.

For this screening, the alternatives were evaluated considering their inclusion or absence in a local and/or regional transportation plan. Current Comprehensive or Long-Range Plans from the NVTA, the counties of Prince William and Fairfax, the cities of Manassas and Manassas Park, the Virginia Railway Express (VRE), and the Potomac and Rappahannock Transportation Commission (PRTC) were used in this evaluation.

Alternative 3 is included in the NVTA Long-Range Transportation Plan and City of Manassas Comprehensive Plan and therefore was rated highest for this criterion. Since Alternatives 2A and 2B follow the Alternative 3 alignment and serves similar traffic patterns they were considered to be consistent with both the NVTA and City of Manassas Plans as alternative alignments for Alternative 3 and received a medium positive rating. Although it is not specifically listed in the Prince William County Comprehensive Plan, Alternative 4 is consistent with the plan's transportation goals and received a medium positive rating. Likewise, Alternative 9 would be considered consistent with the City of Manassas Park Comprehensive Plan, though not specifically mentioned in the plan, since the City of Manassas Park has indicated a desire to improve the Euclid Avenue corridor. Thus, Alternative 9 received a low positive rating. Alternative 10 is not listed in any plan and received a neutral rating. Alternatives 5 and 7 were considered to be not consistent with any plans since they would harm economic development and would likely increase cut-through traffic through neighborhoods which is counter to the stated goals of the local agencies. These alternatives received a low negative rating for this criterion.

ENVIRONMENTAL IMPACTS 4.2.3

Two metrics for the environmental impacts criterion were evaluated:

- 4f Properties / Conservation Easements / Historic Site Impacts
- Floodway / Floodplains / Streams / Wetlands Impacts •

These metrics were used to evaluate how well the alternatives met Key Objective 7: Improvement Projects with Minimal Environmental Impacts. Recorded or known environmental resources were mapped within a 250-foot wide study corridor for each of the candidate build alternatives, although the corridor was widened at intersections to allow for intersection improvements and at a few locations where known topography would expand the construction limits.

JMT gueried available databases to determine environmental resources and constraints that may be present within the study area. Due to scope limitations, none of the environmental information presented in this study has been field verified. More detailed environmental analysis and discussion is presented in Chapter 5 for the alternatives carried through the second screening.

4f Properties / Conservation Easements / Historic Sites Impacts

To determine the potential for Section 4(f) resource impacts, a review of available geographic information systems (GIS) was completed by accessing the Natural Heritage Data Explorer (NHDE) mapping tool maintained by the Virginia Department of Conservation and Recreation (VaDCR) and the Prince William County, Fairfax County, and City of Manassas GIS systems. Properties that gualify as 4(f) resources include public parks, significant recreation areas, and wildlife or waterfowl refuges, and historic sites listed or eligible for listing on the National Register of Historic Places. The database maintained by the Virginia Department of Historic Resources (DHR) was used to identify potential historic resources that could be impacted by the preliminary alternatives. Alternatives 3 and 10 received a high negative rating because they would likely impact the largest amount of 4f properties / conservation easements particularly the Bull Run Regional Park and Ben Lomond Regional Park for Alternative 3 and the General's Ridge Golf Course for Alternative 10 which has deed restrictions. Alternatives 2A and 2B received a medium negative rating because they could impact large amounts of 4f properties / conservation easements / historic sites such as the Ben Lomond Regional Park and Bull Run Regional Park. Alternative 9 received a low negative rating since it likely has a low impact on 4f properties compared to other alternatives. Alternatives 4, 5, 6, and 7 are expected to have a minimal impact on 4f / conservation easements / historic sites and therefore received a neutral rating.

Floodway / Floodplains / Streams / Wetland Impacts

National Wetlands Inventory (NWI) and National Hydrology Dataset (NHD) databases were used to identify possible wetlands and streams impacted by the preliminary alternatives. The FEMA National Flood Hazard Layer was used to identify the 100-year floodplain and floodway within the Study Corridors. Alternatives 3 and 10 received a high negative rating because they could impact the overall largest amount of wetlands, floodways and streams. Alternatives 2A, 2B, and 9 received a medium negative rating because they could impact large amounts wetlands, floodways and streams. Alternatives 4, 5, and 6 received a low negative rating since they could impact wetlands, floodways and streams but at a significant lower amount than the other alternatives. Alternative 7 is expected to have a minimal impact on wetlands, floodways and streams and therefore received a neutral rating.

SOCIOECONOMIC / RIGHT OF WAY IMPACTS 4.2.4

Two metrics for the socioeconomic / right of way impacts criterion were evaluated: • ROW Impacts to Businesses / Residential / Churches / Schools

- Access Management Issues

These metrics were used to evaluate how well the alternatives met Key Objective 8: Improvement Projects with Minimal Existing Conditions Impacts.





ROW Impacts to Businesses / Residential / Churches / Schools

Aerial mapping and GIS property databases from Prince William County, the City of Manassas Park, the City of Manassas, and Fairfax County were used to identify the number of potential businesses, residential houses, churches, and schools that could be impacted by the alternatives. All alternatives would likely impact some existing businesses and/or residential properties. Alternatives 2A, 2B, 9, and 10 may impact large numbers of residential properties and thus received a high negative rating. Alternatives 4 and 5 could impact large numbers of businesses and also received a high negative rating. Alternative 6 received a medium negative rating for potentially impacting many residences. Alternatives 3 and 7 received a low negative rating for potentially impacting a few residences and businesses respectively.

Access Management Issues

A qualitative assessment was made for each preliminary alternative on how it may impact access to existing development and affect current traffic circulation patterns. Alternatives 2A, 2B, 3, and 10 all received a medium positive rating since all provide an additional route for commuters which improves circulation in the study area. Alternative 9 also provides an additional route however, the alternative will add turn restrictions along Euclid Avenue due to the raised median so it received a low positive rating. Alternative 6 received a neutral rating as it would have minimal effect on access and circulation within the study area. Alternatives 5 and 7 received a high negative rating since they would have significant impacts on access and circulation with the study area. Due to the barrier on Alternative 5, left turns from Route 28 would be restricted from just north of Manassas Drive to Bull Run. Under Alternative 7, nonpeak direction travel is prohibited between Route 28 and Compton Road and thus would likely increase cut-through traffic on neighborhood streets as significant portions on the route do not have a parallel street to handle the non-peak direction traffic. Bus circulation for schools is also impacted with Alternative 7.

PRELIMINARY SCREENING RESULTS

The alternative evaluation matrix shown in Table 4-1 summarizes the ratings provided for each metric of each criterion that was evaluated. The positive and negative points associated with each rating were totaled for each alternative. The highest ranked alternatives were advanced for further, more involved evaluation. The preliminary screening identified some significant issues with many of the alternatives and, as a result, those alternatives were removed from further evaluation by the Technical Committee. These alternatives and the reasons they were not carried forward to the secondary screening are shown below.

- Alternative 3 follows the previously studied Tri-County Parkway alignment that would result in significant environmental impacts. Although it scored well in the first screening, in the past, it was deemed non-permittable by the US Army Corps of Engineers because of the wetland, 4f, and floodway impacts. The study team and the Technical Committee determined that reopening this alternative to the same type of review would be futile. Thus, the alternative was removed from further evaluation.
- Alternative 5 was not consistent with local and regional plans and there were significant access management issues and • safety impacts associated with its operation. Alternative 5 was removed from further consideration.
- Alternative 6 would have significant neighborhood impacts including relocations by converting a collector street to a principal arterial within the neighborhoods that border Old Centreville Road. The new road configuration would create a

barrier and disrupt the continuity of neighborhoods in Prince William County and the City of Manassas Park. There was significant political opposition to this alternative by the Executive Committee. As a result, this alternative was removed from further consideration.

- 7 was not considered for further evaluation.
- PRTC did not have a master plan on the Route 28 corridor at the time of this report. BRT was determined to not be an the Route 28 Corridor will be explored by the project team and local transit providers.
- eliminated from further consideration.

4.4 ALTERNATIVES RECOMMENDED FOR FURTHER STUDY

Based on the evaluation of the preliminary alternatives, four were deemed feasible and advanced for further study. These alternatives best met the key objectives of the study and showed the greatest benefits to traffic operations along existing Route 28. These alternatives also were deemed to be long-term solutions for Route 28 that best met the future traffic demands of the corridor. In addition to the No Build Alternative, the four alternatives recommended for further study by both the Technical and Executive Committees are:

- Alternative 2A Godwin Drive extended to existing Route 28 south of Bull Run
- Alternative 2B Godwin Drive extended to existing Route 28 north of Bull Run
- Alternative 4 Widening Route 28 on existing alignment between Liberia Avenue and the Fairfax County line
- Alternative 9 Euclid Avenue extension north to Route 28 near Bull Run and south to Sudley Road/Route 28 intersection

Alternative 7 had significant access and circulation impacts during the peak periods due to the reversible lanes. Alternative

optimal choice for the corridor since it does not have the population density required to attract enough ridership to warrant a dedicated travel lane for transit. Adding capacity to the Route 28 Corridor with one of the other alternatives would provide opportunities to increase express/limited stop service within the corridor. Therefore, Alternative 8 was removed from further consideration. As the project development process advances, opportunities to incorporate compatible transit within

Alternative 10 had significant environmental, socioeconomic, and right-of-way impacts in addition to increasing traffic in Historic Downtown Manassas. There also are deed restrictions on the General's Ridge Golf Course making a road through the golf course challenging. The combination of low corridor benefits with high impacts resulted in Alternative 10 being





CHAPTER 5 SECOND SCREENING OF ALTERNATIVES

5.1 ALTERNATIVES ADVANCED FOR FURTHER EVALUATION

The first screening of preliminary alternatives resulted in both the Technical and Executive Committees recommending four alternatives plus the No Build alternative to be advanced for more detailed evaluation. Each of the advanced alternatives was compared to one another to determine the highest ranked alternative.

The alternatives carried forward through the second screening of alternatives are shown on Figure 5-1 and include:

- Alternative 1: 2040 No Build Alternative
- Alternative 2A: Godwin Drive extended to existing Route 28 • south of Bull Run
- Alternative 2B: Godwin Drive extended to existing Route 28 north of Bull Run
- Alternative 4: Widening Route 28 on existing alignment • between Liberia Avenue and the Fairfax County line
- Alternative 9: Euclid Avenue extension north to Route 28 • near Bull Run and south to Sudley Road/Route 28 intersection

There were very minor modifications made to most of the remaining alternatives following the first screening that reduced either environmental or right-of-way impacts. They were simple improvements and the changes were imperceptible from the planning level. There were two alternatives for which the improvements were slightly more perceptible. These were for Alternatives 2B and 9, described below.



Figure 5-2. Alternative 2B Northern Terminus

The northern terminus of Alternative 2B was modified slightly to reduce right-of-way impacts after the first screening. The original northern terminus followed Ordway Road to Route 28. This northern terminus was shifted after the first screening to form a new alignment north of Bull Run between Ordway Road and the current Route 28 alignment. See Figure 5-2.

Alternatives 9A, 9B and 9C, evaluated within the first screening, were eliminated in favor of one southern terminus at Sudley Road and the extension of Euclid Avenue. The alignment of Alternative 9 will extend Euclid Avenue to the south from Quarry Road to the Route 28/Sudley Road intersection. See Figure 5-3. Prescott Avenue will be disconnected from Route 28 via a cul-de-sac. The alignment will also extend Euclid Avenue north from near Manassas Park High along the west bank of Bull Run until joining with existing Route 28, which would "tee" into the new bypass. Route 28 would be widened from this point north to tie into the improvements planned by Fairfax County.

Figure 5-3: Alternative 9 Southern Terminus













SCREENING CRITERIA

The screening criteria is divided into the Project Benefits, Environmental Impacts, and Socioeconomic/ROW Impacts. The following section describes each category in detail.

Four screening level criteria are used to compare the advanced alternatives.

- Planning Level Costs •
- Traffic Benefits
- Environmental Impacts •
- Socioeconomic/ROW Impacts

5.2.1 **PLANNING LEVEL COSTS**

Planning level cost estimates were calculated for year 2017 for each of the four build alternatives. The planning level costs were the total construction cost plus right of way costs, utility relocation costs, and environmental mitigation costs. A ten percent contingency was added to the total cost based on VDOT Project Cost Estimating System (PCES) guidance. PCES spreadsheets for fiscal year 2018 were used to calculate the construction costs for each alternative. Right of way costs were calculated by parcel using GIS data and the latest on-line assessed values (either 2016 or 2017) from Prince William County, City of Manassas, Fairfax County, and the City of Manassas Park.

Table 5-1 shows the breakdown of costs for each alternative. The notes following the table provide some of the key assumptions used to generate the costs. The total costs are rounded to the nearest \$5 million.

5.2.2 **TRAFFIC BENEFITS**

The Project/Traffic Benefits include changes in the 2040 ADT, Peak Hour Travel Time, Peak Hour Travel Time savings on Route 28, Number of Intersections Operating over Capacity in 2040, and Multimodal Capability. Table 5-2 shows the rating scoring of each category.

AVERAGE DAILY TRAFFIC (ADT)

The MWCOG Model was used to develop ADT volumes on the existing roadway network for Alternatives 1 (no build), 2A, 2B, 4 and 9.

Alternative 1 – No Build

The 2040 no build forecasts showed traffic volumes are anticipated to increase along the Route 28 corridor to approximately 80,000 vehicles per day north of Bull Run which will be the highest volume along the study corridor. From that point south, volumes are expected to decrease to approximately 78,000 vehicles per day at Bull Run, 60,000 vehicles per day north of Liberia Avenue, 29,200 vehicles per day north of Grant Avenue in Manassas, and 33,000 vehicles per day north of Godwin Drive.

Table 5-1. Comparison of Planning Level Costs



Notes:

- Construction Costs developed using VDOT PCES worksheets. Includes preliminary engineering and CEI. Estimate includes roadway, bridge, 1. landscaping, lighting, MOT, SWM, drainage and traffic items.
- 2.
- 3. Utility Costs based \$3.5 million/mile in developed corridors + \$1 million per transmission power pole.
- for investigation, potential noise walls at \$50/SF with 15' height. Also includes (1) Phase 3 cultural resource investigation.
- Based on VDOT PCES system guidelines, a contingency of 10% was added. 5.

2	017	Planni	ing Le	evel	Costs										
(circuitate)	Environmental Mitigation Cost (\$Millions) ⁴ Subtotal Estimated Cost (\$Millions)		Contingency ⁵		Total Estimated Cost (\$Millions)			Rounded up to Nearest \$5 Million							
								10%							
-	\$		-	\$		-	\$		-	\$		-	\$		-
6	\$		16	\$		218	\$		22	\$		240	\$		240
4	\$		13	\$		172	\$		17	\$		189	\$		190
17	\$		2	\$		223	\$		22	\$		245	\$		245
12	\$		8	\$		240	\$		24	\$		264	\$		265

ROW Costs based on current assessed values for property + 40%. Estimate includes utility easements, building demolition, relocation costs, damages, asbestos removal and administrative costs. Unit costs for ROW additional costs derived from VDOT PCES worksheets. Assumed 20% condemnations.

Environmental Mitigation Costs based on \$600 / linear foot of impacted stream, \$60,000 / acre of wetlands impacted, \$15,000 / hazardous material site





	ه #		ost								(when co	Traffi ompare	c Benefi d to 204	ts 40 No-E	Build)					
	nceptual Alternativ	Alignment Color	L7 Planning Level C (\$Millions) ²	Length in Miles	e in 2040 ADT in rical Downtown	e in 2040 ADT in rical Downtown Manassas ³		e in 2040 ADT in ical Downtown Manassas ³ 2040 ADT Served by Alternative + Route 28 (Liberia Ave to Compton Rd) ⁴				of 2040 ADT to ning Level Cost	oo Million) ⁵ 00 Million) ⁵ Peak Hour Travel Time in 2040 using Alternative (Minutes) ⁶			Peak Hour Travel Time Savings in 2040 on Route 28			2040 on Route 28 (Minutes) ⁶	(0000) IIIAI)
	°		20:		Chang Histo		Bypass Alt	Route 28	Total		Ratio Plan	(The \$1	NB AM Peak Hr	SB PM Peak Hr		Total	NB AM Peak Hr	SB PM Peak Hr		Total
	Ке	y Objectives A	ttainable 1		1			2			1, 2	, 3		3	3			2 ,	, 3	
	2040 No-Build				0	•	0	76,200	76,200	•	N/A	•	46	54	100	•	N/A	N/A	N/A	•
	Alt 2A		\$240 M	4.25	-7700		37,200	59,300	96,500		40.2		20	31	50		24	14	38	
	Alt 2B		\$190 M	4.0	-7700		37,200	59,400	96,600		50.8		17	31	48		23	16	40	
	Alt 4		\$245 M	3.5	2700		0	82,400	82,400		33.6		34	43	77		12	12	23	
	Alt 9		\$265 M	4.75	3400		35,000	51,900	86,900		32.8		30	36	66		20	18	38	
<u>Notes</u>	<u>:</u>																			
1.	Objective 6 (Pul	olic Consensus	s) will be eva	luated base	ed on input fro	om publie	c meetings a	nd be consider	ed prior to se	electing a p	oreferred a	lternativ	е.							
	Objective 9 is m	et by all the b	ouild alterna	tives and no	ot included as	part of t	his screening	1												
2.	Cost includes co	nstruction, ri	ght of way, i	utility reloca	ation, environ	mental n	nitigation an	d 10% contigei	ncy.											
3.	Change in Avera	age Daily Traf	fic (ADT) sho	own on Rout	te 28 betwee	n Grant S	treet and Mo	ain Street.												
4.	Average Daily T	raffic (ADT) sl	hown for hig	hest volum	e between Lib	eria Ave	nue and Com	pton Rd												
5.	Total ADT (Alter	rnative + Rout	te 28) is used	1						Prelimir	nary Altern	atives								
6.	Travel time is su	um of NB AM	peak hour p	lus SB PM p	eak hour tim	es betwe	en			Alt. 1	No Buila	1								
	Rte 28/Godwin	and Rte 28/R	te 29 inters	ections.						Alt. 2A	Godwin	Dr exten	ded to ex	isting Ro	oute 28	south of	f Bull Run	l.		
7.	Intersection is c	onsidered op	erating over	capacity if l	LOS F in eithe	r the AM	peak hour,			Alt. 2B	Godwin	Dr exten	ded to Ex	isting Ro	oute 28	north of	[•] Bull Run			
	PM peak hour o	or both.								Alt. 4	Widenin	g Route	28 on exi	sting ali	gnment	betweer	n Liberia	Avenue (and the F	airfax C
8.	See rating scori	ng definitions	and points	in box to the	e right.					Alt. 9	Euclid A	venue ex	tension n	orth to I	Route 2	8 near B	ull Run a	nd south	to Sudle	y Road/
9.	\checkmark	This alternat	ive is highes	t ranked by	Technical Cor	nmittee	based on ber	nefits, impacts,	and cost.											
								Rating Scori	ng											
								Positive Ben	efits		• •				·					
								•	0 pts.		Neutral,	/ Minima	l / No Be	nefits					Obj. 1	Redu
									1 pt.			Low Ber	nefits						Obj. 2	Redu
									2 pts.		Ν	Aedium E	Benefits						Obj. 3	Facili
									3 pts.			High Be	nefits			_			Obj. 4	Increa
								Negative Im	pacts			1							Obj. 5	Impro
								•	0 pts.		Neutral	/ Minim	al/ No Im	pact					Obj. 6	Impro
									-1 pt.		Lov	w Negativ	/e Impact						Obj. 7	Impro
									-2 pts.		Medi	um Nega	tive Impa	act					Obj. 8	Impro
									-3 pts.		Hig	n Negati	ve Impac	t					Obj. 9	Impro

Table 5-2: Second Screening Traffic Benefits

No. of Intersections Operating over Capacity in 2040 ⁷	Multimodal Capatibility (SW = Existing or Added Sidewalk, SUP = Added Shared use Path, T =	Enhanced Opportunity for Transit)	Alternative Rating ⁸						
1, 2, 3	4, 5								
16 of 29 (55%) •	N/A	•	0						
6 of 32 (19%)	SUP + T		19						
6 of 33 (18%)	SUP + T		20						
7 of 29 (24%)	SW + SUP +T		8						
5 of 31 (16%)	SW + SUP +T		12						
unty line									
Route 28 Intersection									
Key Objectives S	ummary	l							
e Congestion (Historical Do	conaestion (Historical Downtown Manassas)								
c Congestion (Liberia Ave to Compton Rd)									
ite Peak Period Commute Flows									
ed Opportunities for Alternative Modes of Travel									
ed Access to Transit Facilities									
ement Projects with Public Consensus									
ement Projects with Minimal Environmental Impacts									
vement Projects with Minin	nal Existing Condi	tions Imp	oacts						
vement Projects that Comp	lement Route 28	Operatio	ns						





Volumes along Godwin Drive, Old Centreville Road, Mathis Avenue, and Euclid Avenue are expected to grow in 2040 under the No Build condition. Godwin Drive volumes are expected to increase to approximately 30,000 vehicles per day north of University Boulevard and 25,000 vehicles per day south of Sudley Road. Anticipated volumes along Old Centreville are approximately 16,000 vehicles per day north of Yorkshire Lane and 14,000 vehicles per day north of Compton Road. Mathis Avenue volumes are expected to increase to approximately 20,000 vehicles per day north of Liberia Avenue and 12,000 vehicles per day south of Liberia Avenue. Volumes on Euclid Avenue are anticipated to grow to approximately 20,000 vehicles per day.

Model runs were performed for four (4) build alternatives 2A/2B, 4, and 9. See section 4.1 for a detailed description of the proposed alternatives. The model roadway networks were revised to include two new roadway alignments (Alt 2A and Alt 9) plus an alternative for widening Route 28 from Liberia Avenue to Bull Run to six lanes (Alt 4).

Alternative 2A/2B – Extension of Godwin Drive

The traffic volumes carried by these two alternatives will be the same. Therefore, separate model runs were not performed for Alternatives 2A and 2B. The extension of Godwin Road is projected to carry approximately 35,000 vehicles per day. This alternative will reduce traffic volumes all along the existing Route 28 corridor from the existing tie in of Godwin Drive to Bull Run. In general, this alternative provides for about a 20% reduction in traffic along Route 28. Volumes in the Downtown Manassas area are projected at approximately 21,000 vehicles per day from 29,000 vehicles per day. Volumes south of Yorkshire Lane are projected at approximately 59,000 vehicles per day from 76,000 vehicles per day. Points north along the study corridor are expected to increase under Alternative 2 to approximately 97,000 vehicles per at Bull Run and approximately 92,000 vehicles per day along existing Godwin Drive. South of Godwin Drive will increase traffic volumes from approximately 10,000 to 15,000 vehicles per day along existing Godwin Drive. South of Sudley Road is anticipated to experience an increase in traffic volumes from approximately 37,000 to 40,000 vehicles per day. This is an increase of approximately 35 to 45% on Godwin Drive versus the No Build alternative. Alternative 2A will also reduce traffic volumes along Old Centreville Road and Mathis Avenue. Old Centreville Road is expected to experience a 25 to 35% reduction in volumes under Alternative 2A versus the No Build traffic volumes in 2040 are projected to be approximately 9,000 vehicles per day north of Maplewood Drive and approximately 12,000 vehicles north of Yorkshire Lane. Up to a 20% reduction in traffic volumes are projected on Mathis Drive. Volumes are anticipated to be approximately 10,000 vehicles per day south of Liberia Avenue and 17,000 vehicles per day north of Liberia Avenue.

Alternative 4 – Route 28 Widening

Traffic volumes are expected to increase along Route 28 under this alternative versus the No Build alternative. A less than 10% increase in volume is expected in the Downtown Manassas area with approximately 32,000 vehicles per day, and a 20% increase in volume is expected north of Liberia Avenue. At Bull Run and points north, volumes are projected to be approximately 84,000 vehicles per day. Godwin Drive is expected to experience little to no change in traffic volumes with this alternative with approximately 25,000 vehicles per day south of Sudley Road. Traffic volumes along Old Centreville Road are expected to decrease by up to 20% versus the No Build alternative with approximately 11,000 vehicles per day north of Maplewood Drive and 14,000 vehicles per day north of Yorkshire Lane. Mathis Avenue is expected to experience approximately a 15 to 20% reduction in traffic volumes from the No Build alternative with approximately 10,000 vehicles per day south of Liberia Avenue and 17,000 vehicles per day north of Liberia Avenue.

Alternative 9 – Extension of Euclid Avenue

The extension of Euclid Avenue is projected to carry approximately 34,000 to 37,000 vehicles per day north of Liberia Avenue. Under this alternative, traffic volumes along Route 28 are anticipated to experience approximately a 15 to 30% reduction from north of Liberia

Avenue to south of Bull Run where the Euclid Ave extension would tie into Route 28. For example, Route 28 south of Yorkshire Lane is projected to have approximately 52,000 vehicles per day or approximately 24,000 vehicles per day less with the extension of Euclid Avenue. All the other major roadways that were studied (Godwin Drive, Old Centreville Road, and Mathis Ave) would experience decreases in the projected volumes from 2,000 to 4,000 vehicles per day with this alternative versus the No Build alternative.

Tables 5-3 through 5-7 depict the existing and projected traffic volumes for locations along the Route 28 corridor and adjacent roadways in the study area. The peak hour volumes are shown in Appendix D.

Table 5.3 – Route 28 Existing and Future Average Daily Traffic Volumes

	Route 28											
Alternative	North of Godwin Dr	Between Grant Ave and Main St	North of Sudley Rd	Between Liberia Ave and Manassas Dr	South of Yorkshire Rd	At Bull Run	North of Compton Rd	North of New Braddock Rd				
Existing	20,200	21,300	29,000	46,000	56,800	57,300	59,600	57,800				
Alt 1 - No Build	33,000	29,200	35,200	60,800	76,200	77,600	80,300	74,500				
Alt 2 – Extension of Godwin Dr.	26,100	21,500	28,700	53,500	59,300	97,100	92,400	83,000				
Alt 4 – Widening of Rte. 28	33,700	31,900	39,500	72,900	82,400	84,100	83,500	76,200				
Alt 9 – Extension of Euclid Ave	35,500	32,600	28,000	52,700	51,900	89,600	88,100	79,500				





	Godwin Drive									
Alternative	Between University Blvd and Wellington Rd	Between Ashton Ave and Sudley Rd	Between Sudley Rd and Liberia Ave	Between Liberia Ave and Old Centreville Rd	Between Old Centreville Rd and Route 28					
Existing	16,200	15,300	N/A	N/A	N/A					
Alt 1 - No Build	30,100	25,500	N/A	N/A	N/A					
Alt 2 – Extension of Godwin Dr.	40,500	37,400	35,500	37,200	36,400					
Alt 4 – Widening of Rte. 28	29,900	24,900	N/A	N/A	N/A					
Alt 9 – Extension of Euclid Ave	27,900	21,700	N/A	N/A	N/A					

Table 5.5 – Old Centreville Road Existing and Future Average Daily Traffic Volumes

Old Centreville Road						
Alternative	Between Maplewood Dr and Yorkshire La	Between Yorkshire La and Dogan La	North of Compton Rd			
Existing	10,000	13,300	9,500			
Alt 1 - No Build	13,500	16,500	14,000			
Alt 2 – Extension of Godwin Dr.	9,200	12,500	6,000			
Alt 4 – Widening of Rte. 28	11,200	14,400	15,000			
Alt 9 – Extension of Euclid Ave	10,700	13,400	13,800			

 Table 5.6 – Mathis Avenue Existing and Future Average Daily Traffic Volumes

	Mathis Avenue								
Alternative	Alternative South of Liberia Ave Between Liberia Ave and Manassas D								
Existing	8,800	16,000							
Alt 1 - No Build	12,400	19,900							
Alt 2 – Extension of Godwin Dr.	9,700	17,200							
Alt 4 – Widening of Rte. 28	10,400	17,100							
Alt 9 – Extension of Euclid Ave	11,100	18,000							

Table 5.7 – Euclid Avenue Existing and Future Average Daily Traffic Volumes

Euclid Avenue											
Alternative	North of Prescott Ave	Between Liberia Ave and Manassas Dr	Between Manassas Dr and Owens Dr	North of Owens Dr	North of Industry Dr						
Existing	5,900	16,900	17,800	11,400	7,000						
Alt 9 – Extension of Euclid Ave	20,600	36,100	37,700	33,900	35,000						

DELAY AND LEVELS OF SERVICE

Table 5-8 shows the overall intersection delay and LOS for all signalized intersections for the 2040 No Build, Alternative 2A, Alternative 2B, Alternative 4 and Alternative 9, respectively. LOS's were determined for signalized intersections for AM and PM peak hours based on the HCM - 2000 edition that is embedded in the Synchro 9 software. A total of 29 signalized intersections in the 2040 No Build and Alternative 4, 32 for Alternative 2A, 33 for Alternative 2B and 31 for Alternative 9 were analyzed.

TRAVEL TIME SAVINGS

Peak hour travel time savings calculated the difference of the summation of the AM northbound and PM southbound travel time on Route 28 between the No Build and the different Alternatives. SimTraffic was used for this assessment. The highest savings in travel time is with Alternative 2B, while the least savings is with Alternative 4. The summary of travel times for each alternative are shown in Table 5-9.





Table 5-8: Intersection Delay and LOS Comparison for the 2040 Alternatives

		2040 No-Build				2040 Alte	rnative 2A			2040 Alte	rnative 2B			2040 Alto	ernative 4		2040 Alternative 9				
Corridor	Intersection	AM	Peak	PM	Peak	AM	Peak	PM	Peak	AMI	Peak	PM F	Peak	AM	Peak	PM	Peak	AM	Peak	PM I	Peak
		Inter. Delay (s/veh)	Inter. LOS	Inter. Delay (s/veh)	Inter. LOS	Inter. Delay (s/veh)	Inter. LOS														
	Godwin Dr	162.4	F	181.9	F	177.9	F	186.2	F	177.9	F	182.6	F	99.9	F	172.2	F	90.8	F	131.5	F
	Wellington Rd	15.2	В	17.3	В	17.6	В	18.7	В	17.6	В	18.9	В	15.7	В	15.8	В	15.7	В	16.1	В
	Cockrell Rd	36.3	D	19.0	В	22.4	с	21.9	С	21.2	С	20.5	С	31.5	С	17.1	В	48.9	D	20.5	С
	Brinkley Ln	12.5	В	20.7	с	14.7	В	21.0	с	8.3	А	21.2	С	11.2	В	18.4	В	17.1	В	23.8	С
	Stonewall Rd	24.1	с	9.6	А	14.6	В	10.9	В	17.1	В	8.6	А	20.6	С	8.4	А	18.9	В	20.9	С
	Court House Rd/Lee Ave	13.6	В	16.3	В	11.7	В	13.9	В	12.9	В	14.3	В	15.7	В	18.3	В	13.2	В	41.7	D
	Grant Ave/Center St	56.0	E	20.7	с	24.6	с	18.1	В	25.1	С	18.1	В	44.8	D	31.9	С	48.5	D	21.4	С
	Main St/Center St	12.9	В	9.2	A	10.7	В	8.8	А	10.7	В	8.8	А	15.1	В	10.0	А	15.3	В	9.9	А
	Grant Ave/Church St	47.4	D	33.4	С	27.0	С	28.0	С	26.4	С	28.0	С	30.8	С	31.9	С	31.5	С	34.5	С
	Main St/Church St	9.2	А	10.1	В	8.4	A	9.0	А	8.4	А	9.0	Α	9.5	А	10.5	В	9.4	А	10.4	В
	Zebedee St	8.0	А	5.0	А	6.5	А	5.1	A	6.5	А	5.1	А	9.2	А	5.0	А	9.4	А	5.1	А
tte 28	Sudley Rd/Prescott Ave	140.2	F	116.6	F	51.0	D	69.7	E	51.0	D	69.7	E	111.1	F	118.1	F	89.5	F	102.9	F
Rot	Liberia Ave	183.7	F	121.2	F	74.7	E	76.6	E	72.9	E	76.7	E	155.6	F	101.5	F	62.2	E	71.4	E
	Manassas Dr	121.0	F	108.5	F	70.1	E	68.9	E	69.6	E	68.6	E	78.8	E	86.2	F	62.9	E	59.9	E
	Browns Ln	127.9	F	153.1	F	19.2	В	13.6	В	19.2	В	13.6	В	14.2	В	10.2	В	17.0	В	11.5	В
	Maplewood Dr	155.3	F	158.8	F	65.3	E	54.0	D	64.7	E	54.0	D	54.1	D	43.0	D	46.5	D	43.4	D
	Leland Rd	191.7	F	215.5	F	18.9	В	75.4	E	22.9	С	75.1	E	17.2	В	59.1	E	17.7	В	35.6	D
	Grove Dr	210.0	F	185.6	F	73.2	E	68.3	E	71.7	E	64.4	E	70.8	E	172.7	F	51.3	D	38.7	D
	Orchard Bridge Dr	159.9	F	123.0	F	42.5	D	7.4	A	14.4	В	9.9	A	12.9	В	10.2	В	8.8	A	12.3	В
	Rd/Compton Rd	225.5	F	194.7	F	48.5	D	131.4	F	33.9	C	104.6	F	37.2	D	106.5	F	62.7	E	129.8	F
	Green Trails Rd	174.4	F	223.9	F	26.2	С	68.4	E	27.1	С	68.6	E	24.6	С	56.7	E	37.4	D	54.6	D
	New Braddock Rd	326.1	F	220.5	F	111.1	F	87.3	F	109.7	F	77.8	E	137.4	F	77.3	E	109.1	F	76.5	E
	Machen Rd	71.2	E	35.4	D	73.3	E	31.0	С	34.9	C	31.5	C	65.5	E	36.1	D	37.1	D	30.7	C
	Upperridge Dr	39.1	D	43.9	D	57.4	E	49.1	D	50.6	D	46.3	D	49.5	D	43.4	D	39.0	D	54.4	D
	University Blvd	96.2	F	88.0	F	49.3	D	61.7	E	49.3	D	61.7	E	34.6	C	44.9	D	33.1	С	40.7	D
Ď	Access	7.2	A	12.1	В	11.6	В	13.5	В	10.3	В	14.4	В	7.2	A	11.9	В	7.4	A	11.5	В
Godw	Wellington Rd	66.3	E	108.9	F	83.0	F	111.6	F	83.0	F	111.6	F	48.7	D	68.8	E	45.5	D	63.5	E
	Ashton Avenue	31.2	С	55.1	E	43.4	D	61.5	E	43.4	D	61.0	E	29.1	C	52.5	D	27.1	C	44.3	D
	Sudley Road	21.6	С	55.0	D	56.1	E	81.7	F	56.1	E	83.0	F	16.8	В	41.4	D	14.9	В	35.0	С
Ext.	Liberia Ave					61.6	E	66.0	E	57.1	E	64.8	E								
vinDr	Old Centreville Rd					55.7	E	43.1	D	22.3	C	47.5	D								
Godv	Route 28					42.9	D	122.7	F	42.6	D	115.6	-								
e	Urdway Road									11.5	В	40.0	D					100.0		00.2	
clid Av	Manassas Dr																	160.6	-	80.2	-
a Territ	Liberia Ave											2						//./		b3.3	E
Total Int			2	.9			3	6			3	3		29			31				
Tota			-					0				,						5			
%			5	5			1	.9			1	8			2	.4		16			

ROUTE 28 CORRIDOR FEASIBILITY STUDY





Table 5-9: Travel Time and ADT

Travel Times (Minutes) using the Alternative

Alternative	NB AM Peak Hr	SB PM Peak Hr	Total
2040 No-Build	47	55	102
Alt 2A	20	31	51
Alt 2B	18	31	49
Alt 4	35	43	78
Alt 9	30	36	66

Travel Times Saving (Minutes) **On Business Route 28***

Alternative	NB AM Peak Hr	SB PM Peak Hr	Total
Alt 2A	24	15	39
Alt 2B	24	17	41
Alt 4	12	12	24
Alt 9	20	19	39

* Savings when compared to the 2040 No-Build condition.

5.2.3 **ENVIRONMENTAL IMPACTS**

This section discusses the potential environmental resources and potential environmental impacts within the study area for the four Build Alternatives and the No Build Alternative for the Route 28 Improvement Project.

METHODS AND ASSUMPTIONS

For the feasibility study, recorded, or known, environmental resources were mapped within a 250-foot wide study corridor for each of the candidate build alternatives, although the corridor was widened at intersections to allow for intersection improvements and at a few locations where topography would push out the construction limits. The 250-foot wide study corridor is wider than the footprint that would be needed for the roadway and the right-of-way; however, this wider study corridor was used so that the roadway alignment can be shifted to avoid and minimize impacts to environmental resources within the corridor. As part of the feasibility analysis, each of the Build Alternatives was ranked based on whether it had the lowest negative impact, moderate negative impact, or highest negative impact for the six environmental resources.

JMT gueried available databases to determine environmental resources and constraints that may be present within the study area. Due to scope limitations, none of the environmental information presented in this study has been field verified. Therefore, the environmental information presented in this feasibility study should be considered preliminary because no field studies were performed and existing databases include information only where studies have been completed. Additional environmental resources will need to be considered for future phases of this project that were not considered in this feasibility study due to scope constraints.

EXISTING ENVIRONMENTAL RESOURCES AND POTENTIAL IMPACTS

The Study Area is predominately developed with residential, commercial and some industrial development, interspersed with parkland and wooded stream corridors and floodplains.

For the environmental analyses, the feasibility study evaluated preliminary environmental information for the following resources:

- 4(f) properties including recorded historic sites, public recreation area, and wildlife and waterfowl refuges
- Wetlands and streams
- Floodplains and floodways
- Hazardous substances and solid waste
- Environmental justice
- Noise and potential noise receptors •

The sections below discuss the environmental characteristics for the four Build Alternatives in greater detail.





4(f) Properties

Section 4(f) of the U.S. Department of Transportation Act of 1966 established a requirement for consideration of impacts to park and public recreational lands, wildlife and waterfowl refuges, and historic properties/historic districts for transportation project development that is federally funded. Because this Route 28 Improvement Project will likely use federal funds, potential 4(f) resources were identified in this feasibility study. To determine the potential for Section 4(f) resources, a review of available geographic information systems (GIS) was completed by accessing the Natural Heritage Data Explorer (NHDE) mapping tool maintained by the Virginia Department of Conservation and Recreation (VaDCR) and the Prince William County, Fairfax County, and City of Manassas GIS systems. Properties that gualify as 4(f) resources include public parks, significant recreation areas, and wildlife or waterfowl refuges, and historic sites/historic districts listed or eligible for listing on the National Register of Historic Places. Additional research and coordination with VDOT, FHWA, the City of Manassas, and Prince William and Fairfax Counties will be conducted during the EIS process to determine which resources qualify as regulated 4(f) resources.

The database maintained by the Virginia Department of Historic Resources (DHR) was used to identify known historic resources within the Study Corridors of the proposed build alternatives (see Appendix I). This database includes properties that are eligible and potentially eligible for listing on the National Register of Historic Places and sites which have been recorded that are not eligible for the National Register or not yet evaluated. Additional work will be necessary to identify which properties are listed or eligible for the National Register of Historic Places and how impacts to those historic properties could be avoided or minimized. This feasibility study included all recorded sites in the DHR database.

The No Build alternative would have no direct impact on historic sites. There are no historic sites on the Register of Historic Places that are within the Study Corridors.

Because federal funding and federal permit actions would be required, the Route 28 improvements project would need to be compliant with Section 106 of the National Historic Preservation Act (NHPA). At a minimum, Phase I archaeological surveys and historic architecture surveys will be required as part of the NEPA process to identify historic properties. Given the rich cultural resources in the area, it is likely that some Phase II surveys and possibly Phase III data recovery could be required for the Build alternatives. Coordination with Federally recognized Native American Tribe's State Historic Preservation Officer (SHPO) will also be required to determine if the project could have an impact on Native American cultural resources.

Alternative 4 has the least impact to public recreation areas, with a total of 1.05 acres within the study corridor. Alternative 2B has the greatest impact to public recreation areas, with a total of 30.31 acres within the study corridor. The No Build alternative would not directly impact public recreation resources.

The VaDCR NHDE system was used to determine the existence and location of wildlife and waterfowl refuges, and conservation easements in the Study Area. No wildlife and waterfowl refuges were identified in any of the study corridors.

Of the build alternatives, Alternative 4 has the lowest negative impact to 4(f) resources. Alternates 2A and 2B were determined to have the highest negative impact to 4(f) resources. The No Build alternative would not directly impact 4(f) properties.

Battlefields

Because good information on the boundaries of civil war battlefields was not available initially for the environmental analysis for the second screening, the information was not included in the total scoring in the alternative matrix shown in Table 5-12 and presented to the public. However, since that time, information on battlefields has been collected and is included in Table 5-10 and in Appendix I. As can be seen in the table, Alternative 4 has the highest level of potential impacts to battlefields while Alternative 2B has the lowest. Based on this data, the highest ranked alternative from the second screening would not change if this data is added to the evaluation. The impacts to and significance of battlefields will be analyzed in more detail during the next phase of the project.

	rubie 9 10. Potential impacts to Battlenetas										
	Alt 2A	Alt 2B	Alt 4	Alt 9							
	(Acres Impacted)	(Acres Impacted)	(Acres Impacted)	(Acres Impacted)							
First Manassas											
Battlefield Boundary	105	82	62	89							
First Manassas Core											
Area	12	13	28	10							
Second Manassas Study											
Area	47	26	110	27							
Second Manassas Core											
Area	0	0	0	0							
Previously Recorded											
Sites	5	0	2	0							
Total	168	121	202	127							

Table 5-10 Potential Impacts to Battlefields

Wetlands and Streams

National Wetlands Inventory (NWI) and National Hydrology Dataset (NHD) databases were used to map possible wetlands and streams within the Study Corridors. NWI mapping indicates multiple freshwater forested/shrub wetlands, emergent wetlands, open water, and riverine systems within the Study Corridors especially for build alternatives 2A, 2B, and 9. NWI mapping is based on desktop analysis, without ground truthing, and experience has shown that the NWI data typically underestimates the number of wetlands.

NHD mapping indicates the presence of multiple unnamed and unclassified streams, and several large streams within the study area including Flat Branch and Bull Run. As shown in Appendix J, all build alternatives would have the potential to directly impact wetlands and streams in the study area. Alternative 4 has the least amount of NWI mapped wetlands (0.89 acres) within the study corridor. Alternative 2B has the greatest amount of NWI mapped wetlands (6.23 acres) within the study corridor. Alternative 9 has the least





amount of NHD mapped streams (2,031 linear feet) within the study corridor. Alternative 2A has the greatest amount of NHD mapped streams (7,370 linear feet) within the study corridor. The No Build alternative would have no direct impact to wetlands and streams.

Alternative 4 was determined to have the least negative impacts to streams and wetlands. Alternatives 2A and 2B were determined to have the highest negative impact to streams and wetlands. Impacts to wetlands and streams will be one of the environmental consequences evaluated in the EIS that will be prepared as the next step for the project. If one of the build alternatives is selected, it will be important to avoid and minimize impacts to wetlands and streams to ensure that the Least Environmental Damaging and Practicable Alternative (LEDPA) is selected. Prior to construction, a formal wetlands and Waters of the U.S. delineation will need to be completed in accordance with the <u>Wetland Delineation Manual (1987) and subsequent Regional Supplement</u> and supplemental regulatory guidance. This delineation report will be submitted to the Army Corps of Engineers for confirmation through a Jurisdictional Determination (JD). Permits from the U.S. Army Corps of Engineers (USACE), Virginia Department of Environmental Quality (DEQ), and Virginia Marine Resources Commission (VMRC) would be required for impacts to wetlands and streams from a selected build alternative.

The permit type(s) and length of time needed to secure the permit would depend on the wetland and stream impacts associated with the project. The permit application (Joint Permit Application) would be developed and submitted to the VMRC for distribution to the regulatory agencies for comment and completeness and technical review.

If impacts to wetlands and waters of the U.S. are unavoidable, mitigation or compensation for impacts will be required which may include one or more of the following:

- Purchase of wetland mitigation and stream bank credits at an approved mitigation bank,
- Stream restoration/stream re-location,
- Contributing to a DEQ-approved in-lieu fee fund, or
- Wetland creation or restoration.

The scope of any required mitigation must be approved by DEQ, USACE and/or VMRC as part of the permitting process.

Floodplains and Floodways

The FEMA National Flood Hazard Layer was used to identify the 100-year floodplain and floodway within the Study Corridors for the four build alternatives (Appendix J). Floodplains and floodways are important environmental resources that are regulated at the County, City, State, and Federal level.

The No Build alternative would not have a direct impact on floodways and floodplains. As shown in Table 5-12, Alternative 4 would have the least impact of the build alternatives on floodplains and floodways. Alternative 4 has a total of 5.01 acres of floodway and 9.27 acres of floodplain within the study corridor and was determined to have a low negative impact to floodplains and floodways. Alternative 2A has the highest negative impacts and greatest number of floodplains (66.66 acres) and floodways (23.4 acres) within the study corridor.

The EIS will further evaluate the potential impacts to floodplains and floodways from the alternatives considered in the document. If one of the build alternatives is selected, it will be important to avoid and minimize impacts to floodways and floodplains to ensure that

flooding is not exacerbated by the project. Flood models will likely be developed to evaluate the impact of the selected alternative on regulated floodplains and floodways and to demonstrate that the proposed improvements do not have an adverse impact.

Hazardous Substances and Solid Waste

To identify potential hazardous materials sites within the Study Corridors, a database records search was conducted of the following available Virginia DEQ databases: Hazardous Waste Generators (2016), Petroleum Releases, RCRA Corrective Action (2016), Registered Tank Facilities, Virginia Solid Waste Facilities, and Voluntary Remediation Program locations. Potential hazardous material sites were mapped using these databases within the 250-foot wide study corridor for each build alternative. Additional studies will be required to determine the risk to the build alternatives from these sites, to identify if other hazmat sites exist, and determine the nature and extent of contamination. Environmental screening of hazmat sites will be part of the EIS evaluation. In addition, a Phase I Environmental Site Assessment would be required to satisfy due diligence requirements for proposed right-of-way to comply with the EQ121 requirements of the <u>VDOT LAP Manual and the EPA's Due Diligence requirements</u>.

As shown in Table 5-11 and Appendix I, Alternative 2B has the least impact and lowest negative impact due to hazardous material sites, with only one site identified in the Study Corridor. Alternative 4 has the greatest number of hazardous materials sites and highest negative impact, with 50 sites identified within the study corridor. The No Build alternative would not have a direct impact on hazardous material sites.

Environmental Justice

Potential Environmental Justice issues were evaluated for each of the build alternatives and the No Build alternative as part of the environmental analyses. Environmental Justice, as defined by the Executive Order on Environmental Justice, is a two-step analysis that first requires identification of whether there is a minority population present or a population of impoverished individuals present within the study area. The second step evaluates whether there is a disproportionate and adverse impact to those populations from the proposed project. Environmental Justice would be evaluated in more detail as part of the EIS process in accordance with FHWA regulations. This feasibility study evaluated whether potential minority populations and potential impoverished populations are present within the study corridor by comparing minority and poverty rates from the census tracts within the study area to that of Prince William County. Potential minority populations and impoverished populations were found within the study corridor of all four build alternatives. The limited scope of the feasibility study did not allow analysis of whether a disproportionate impact would occur to those populations from the build alternatives.

Alternative 4 has the least number of minority and impoverished households within the study corridor, when compared to the other build alternatives. Alternative 2A has the highest number of minority and impoverished households within the study corridor. The No Build alternative would not have a direct impact on minority or impoverished households.





Noise

The Route 28 Improvement Project would use federal funding; therefore, it would be subject to the FHWA noise abatement policy and VDOT noise analysis guidance. The project would be deemed a Type 1 noise project because new through travel lanes would be created, which may result in noise sensitive receptors (including residences, schools, churches etc.) experiencing increased noise levels if the project is constructed. As a Type 1 noise project, VDOT's Highway Traffic Noise Impact Analysis Guidance Manual (Version 7) would be used and noise modeling would be required to determine if noise adversely impacts sensitive receptors according to the FHWA criteria and whether noise barriers are warranted, feasible, and reasonable according to the VDOT Guidance Manual. Although the JMT Team did not perform any noise modeling as part of this feasibility study, we did apply our experience with the noise model and knowledge of the regulations to the project to identify where noise impacts may occur and where noise barriers might be required. Given the conceptual nature of this analysis, there is potential for a different outcome when actual modeling is performed.

For the noise analysis, JMT identified clusters of sensitive receptors within 500 feet of the conceptual alignment for each Build Alternative. These clusters represent potential locations where noise impacts may occur and noise abatement may be warranted, feasible, and reasonable.

Alternative 4 has the least number of potential areas impacted by noise, with 33 clusters identified within the Study Corridor. Alternative 9 has the greatest number of potential clusters impacted by noise, with 65 areas identified. Alternative 4 was determined to have the lowest negative impact for noise and Alternative 9 was determined to have the highest negative noise impact of the Build alternatives.

SUMMARY OF ENVIRONMENTAL IMPACTS, MITIGATION, AND PERMITS

This section analyzes possible environmental compliance and environmental permits that would likely be required for the proposed Route 28 improvement project. The feasibility study is intended to serve as a preliminary analysis and a first step in the planning process and not a comprehensive analysis. Further steps are required to ensure compliance with local, state and federal environmental regulations in the planning, design, and construction process. Table 5-11 summarizes the approvals and permits that may be required during the planning, design and construction process.

Environmental Document/Permit	Issuing/Approving Agency
NEPA Analysis- Environmental Impact Statement and Record	VDOT/FHWA
of Decision approved by VDOT/FHWA	
Section 7 Consultation and Compliance with the Federal	US Fish & Wildlife Service
Endangered Species Act	
Chesapeake Bay Resource Protection Area Confirmation and	Prince William County, City of Manassas, and
compliance with the Chesapeake Bay Preservation Act	Fairfax County
Phase I Environmental Site Assessment for right-of-way	Prince William County and VDOT
Phase I, II and possibly III Cultural Resources Survey and	Virginia Dept. of Historic Resources
Section 106 NHPA Compliance	

Table 5-11. Summary of Environmental Requirements and Permits

Noise Study	FHWA, VDOT
Air Quality Analysis	FHWA, VDOT
Stormwater Management Plan and Erosion and Sediment	Prince William County, City of Manassas and
Control Plan	Fairfax County
Coastal Zone Management Act Consistency Determination	Virginia Dept. of Environmental Quality
Virginia Endangered Species Act Compliance	Virginia Dept. of Game & Inland Fisheries,
	Virginia Dept. of Conservation & Recreation
Federal Farmland Protection Act Compliance	Natural Resources Conservation Service
Section 4(f) Compliance	VDOT/FHWA
Wetlands and Waters of the U.S. Preliminary Jurisdictional	US Army Corps of Engineers
Determination	
Section 404 Permit for Impacts to Waters of the U.S.	US Army Corps of Engineers
Virginia Water Protection Permit	Virginia Dept. of Environmental Quality
Subaqueous Bed Permit	Virginia Marine Resources Commission
VPDES Construction General Permit and SWPPP	Prince William County, City of Manassas, and
	Fairfax County

5.2.4 SOCIOECONOMIC AND RIGHT OF WAY IMPACTS

This section discusses the potential socioeconomic and right-of-way impacts within the proposed Study Area for the four Build Alternatives and the No Build Alternative for the Route 28 Improvement Project. To assess these impacts, the feasibility study evaluated

- Potential Relocations to Businesses (#)
- Potential Relocations to Residential (#) / Churches (#) / Schools (#)
- Conservation Easements (Acres)

Socioeconomic and right of way impacts were mapped within a 250-foot wide study corridor for each of the candidate build alternatives as was the environmental resources. The corridor was widened at intersections to allow for intersection improvements and at a few locations where topography would expand the construction limits. The 250-foot wide study corridor is wider than the footprint that would be needed for the roadway and the right-of-way; however, this wider study corridor was used so that the roadway alignment can be shifted to avoid and minimize impacts within the corridor. As part of the feasibility analysis, each of the Build Alternatives was ranked based on whether it had the lowest negative impact, moderate negative impact, or highest negative impact for each of the criteria listed above.

POTENTIAL RELOCATIONS TO BUSINESSES

Aerial mapping and GIS property databases from Prince William County, the City of Manassas Park, the City of Manassas, and Fairfax County were used to identify the number of potential businesses that would be impacted by the Build Alternatives. Potential business relocations for each alternative are shown in Table 5-12. Along the corridors, there are many buildings that house multiple businesses. The total relocations capture the multiple tenants in the impacted buildings.





The No Build Alternative will have no negative impact to existing businesses. Alternative 4 is anticipated to have the greatest negative impacts to businesses, potentially requiring the relocation of 96 businesses. Alternative 2B is anticipated to have the least negative impact to businesses with no relocations.

POTENTIAL RELOCATIONS TO RESIDENTIAL/CHURCHES/SCHOOLS

Aerial mapping and GIS property databases from Prince William County, the City of Manassas Park, the City of Manassas, and Fairfax County were used to identify the number of potential residential houses, churches, and schools that would be impacted by the Build Alternatives. Potential relocations for each alternative are shown in Table 5-12.

The No Build Alternative will have no negative impact to existing residences, churches, or schools. Alternative 2A is anticipated to have the greatest negative impacts to businesses and residences with the potential to require the relocation of 96 businesses and 112 residences. Alternative 2B was determined to have the least negative impact to businesses and residences with no relocations required. None of the Build Alternatives would require relocations to churches or schools.

CONSERVATION EASEMENTS

GIS property databases from Prince William County, the City of Manassas Park, the City of Manassas, and Fairfax County were used to identify the acreage of conservation easements that would be impacted by the Build Alternatives. Potential impacts for each alternative are shown in Table 5-12.

No conservation easement impacts were identified for the No Build or the Build Alternatives.

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Table 5-12. Environmental and Socioeconomic / Right of Way Impacts - 250-foot NEPA Boundary

# 0		ost			Environmental Impacts ¹											Socioeconomic / F		
Conceptual Alternative	Alignment Color	2017 Planning Level Cc (\$Millions)	Length in Miles	4f Properties: Historic Sites (acres) / Public Recreation Areas / Wildlife or Waterfowl	Refuges	Floodway (Acres) / Floodplains (Acres)		Streams (Linear Feet) / Wetlands (Acres)		Hazardous Materials (# Sites)		Environmental Justice Concern (#homes in tract with higher minority percentage/#homes in	uract with higher percentage of impoverished)	Noise Impacts (# of Potential Impacted	Areas	Relocations to Businesses (#)		Relocations to Residential
	Key Objectives	Attainable ³		7		7		7		7		7		7		8		
2040 No-Build				0/0/0	•	0/0	•	0/0	•	0	•	No	•	0	•	0	•	0/0/
Alt 2A		\$240 M	4.25	7.0 / 16.4 / 0		23.4 / 66.7		7370 / 5.4		9		Yes/155/116		53		13		112/0
Alt 2B		\$190 M	4.0	0.7 / 30.3 / 0		21.2 / 55.7		7050 / 6.2		1		Yes/70/30		52		0	•	70/0/
Alt 4		\$245 M	3.5	3.9/1.1/0		5.0 /9.3		2050 / 0.9		50		Yes/6/2		33		96		5/0/
Alt 9		\$265 M	4.75	0.6 / 8.3 / 0		16.9 / 47.8		2030 / 2.8		16		Yes/36/17		65		24		51/0/

<u>Notes:</u>

1. Impacts based on a 250 foot corridor width

2. Impacts based on a preliminary property acquisition lines.

3. Objective 6 (Public Consensus) will be evaluated based on input from public meetings.

Objectives 9 are met by all the build alternatives and not included as part of this screening

4. ✓ This alternative is highest ranked by Technical Committee based on benefits, impacts, and cost.

Socioeconomic / Right of Way Imp						Impacts ²			ive by e ⁴		
impoverished)	Noise Impacts (# of Potential Impacted Areas)		Relocations to Businesses (#)		Relocations to Residential (#) / Churches (#) Schools (#)		Conservation Easements (Acres)		Alternative Rating	Highest Ranked Alternati Technical Committe	
	7		8		8		8				
	0	•	0	٠	0/0/0	•	0	٠	0		
	53		13		112/0/0		0	•	-20		
	52		0	٠	70/0/0		0	٠	-15	\checkmark	
	33		96		5/0/0	•	0	•	-11		
	65		24		51/0/0		0	•	-16		
	Alt. 1 Alt. 2A	Preliminary Alternatives Alt. 1 No Build Alt. 2A Godwin Dr extended to existing Route 28 couth of Bull Run									
ŀ	Alt. 2B	Godwir	n Dr extended to e	xisting Rc	oute 28 north of Bi	ıll Run					
ľ	Alt. 4	Wideni	ng Route 28 on ex	isting alig	gnment between L	iberia Ave	enue and the Fairf	ax Count	y line		
Ī	Alt. 9	Euclid A	Avenue extension	north to F	Route 28 near Bull	Run and	south to Sudley Ro	ad/Rout	e 28 Intersectio	n	
					Key Obje	ctives Sur	nmary				
			Obj. 1	Reduce	Congestion (Histo	orical Dov	vntown Manassas,)			
	Obj. 2 Reduce Congestion (Liberia Ave to Compton Rd)										
		Obj. 3 Facilitate Peak Period Commute Flows									
			Obj. 4	Increas	ed Opportunities j	for Altern	ative Modes of Tro	avel			
		Obj. 5 Improved Access to Transit Facilities									
			Obj. 6	Improv	ement Projects wi	th Public	Consensus	100 00 00 - ± -			
			Obj. /	Improv	ement Projects wi		ai Environmental l	mpacts	oto		
			Obj. 8 Obj. 9	Improv	ement Projects Wi	ui IVIINIM at Comel	ui EXISTING CONditio	uns impa			
			00j. 9	mpiov	cinent ribjetts th	at comple	inem noute 28 Of	perutions			

lenu			
		Positive Benefits	
•	0 pts.	Neutral / Minimal / No Benefits	
	1 pts.	Low Benefits	
1	2 pts.	Medium Benefits	
	3 pts.	High Benefits	
		Negative Impacts	
•	0 pts.	Neutral / Minimal / No Negative Impact	
	-1 pts.	Low Negative Impact	
	-2 pts.	Medium Negative Impact	
	-3 pts.	High Negative Impact	





5.3 HIGHEST RANKED ALTERNATIVE

To determine the highest ranked alternative each of the alternatives were ranked for each category of screening criteria, and then the average rating across the three categories was used to identify the highest ranked alternative.

For example, Alternative 2B has the lowest cost and therefore was ranked best (1) while Alternative 9 has the highest cost and therefore was ranked the lowest (4) under "2017 Planning Level Costs". Similarly, Alternative 2B was again ranked best; Alternative 4 was ranked the lowest for "Project Benefits". Alternative 4 ranked highest for environmental / socioeconomic / right of way impacts and Alternative 2A the lowest. Overall Alternative 2B was ranked the highest when the three categories were averaged. Table 5-13 shows the ranking of each alternative for each category of screening criteria.

Based on the analysis and evaluation of alternatives, the Study's Technical and Executive Committees' have confirmed Alternative 2B as the highest-ranking alternative to move forward towards implementation.

Alternative 2B was ranked the highest due to:

- \checkmark The alternative with the greatest project benefits including:
 - Greatest reduction in traffic in Historic Manassas
 - Shortest Travel time between Godwin Drive and Route 29 in 2040.
 - Greatest travel time savings on Business Route 28 in 2040.
- \checkmark The alternative with the second least environmental impacts.
- \checkmark The alternative with the least socioeconomic and right of way impacts. No required business relocations.
- \checkmark The alternative with the lowest estimated cost.

Table 5-13 Ranking of Alternatives



* Ranking Best (1) to Worse (4)

ject Be	enefits	Environm Socioeconon Impa	ental / nic / ROW cts		native by ittee
	Ranking*	Points	Ranking*	Average Ranking*	Highest Ranked Alter Technical Comm
ts.	2	-20 pts.	4	2.7	
ts.	1	-15 pts.	2	1.3	\checkmark
ts.	4	-11 pts.	1	2.7	
ts.	3	-16 pts.	3	3.3	





CHAPTER 6 CONCLUSIONS

6.1 **RECOMMENDATIONS**

This study was undertaken by Prince William County and the City of Manassas to identify a long-term solution for the Route 28 Corridor. The project team began the study by establishing goals and objectives that any feasible solution would need to meet. Next, 10 preliminary alternatives were developed to meet the existing and future congestion along the Route 28 Corridor. The 10 preliminary alternatives were screened down to four alternatives which were further developed and evaluated. A second screening of those four alternatives identified a highest ranked alternative. The highest ranked alternative is Alternative 2B.

This alternative will create a bypass of the existing Route 28 corridor that passes through Prince William County, the City of Manassas Park, and the City of Manassas. The alignment of Alternative 2B will extend Godwin Drive north from the existing Godwin Road/Sudley Road intersection parallel to Flat Branch, then turn east following the south side of Bull Run to Old Centreville Road where it will cross Bull Run at the existing crossing of Old Centreville Road on a new widened bridge, and tie in to existing Route 28 north of Bull Run. Route 28 would be widened from this point north to tie into the improvements planned by Fairfax County. A 10-foot shared use path is proposed on the east side of Route 28 within the project limits.

The bypass would be designed to parkway standards with two lanes in each direction and a 40-foot wide raised landscaped median. Curb and gutter would be provided as well as a 10-foot shared use path on the east side of the roadway. Two major bridges would be required along the alignment: one crossing over Flat Branch and the replacement of the Centreville Road bridge over Bull Run with a wider and longer bridge across the floodway. Access management along Route 28 would be evaluated during the design phase. The bypass would tie in to existing Route 28 north of Bull Run at an at-grade signalized intersection.

NEXT STEPS

There are many more steps before the project can be constructed. Prince William County and the City of Manassas will begin the National Environmental Policy Act (NEPA) process to complete an EIS and select a preferred alternative that can then proceed to design and construction. During the NEPA process, Prince William County and the City of Manassas will identify potential funding strategies. If a preferred alternative is identified through the NEPA process, funding will be sought and, if secured, design and construction of the preferred alternative will commence. Funding will be sought from local, regional, state, and federal sources. NVTA funding and VDOT Smart Scale funding are the most likely sources to fund the project.

Because federal funds will likely be used for some portion of the project, a NEPA document will be required for the project in accordance with VDOT guidance and FHWA regulations. For the proposed Route 28 improvements, an Environmental Impact Statement (EIS) will likely be required by FHWA. An EIS will refine the purpose and need for the project, refine the alternatives evaluated for the project, identify environmental resources and environmental impacts and evaluate avoidance/minimization of impacts to those resources, and identify a preferred alternative. A comprehensive traffic analysis will also be included. The EIS process will include public and stakeholder

involvement. A Record of Decision (ROD) will be needed from the Federal Highway Administration to conclude the NEPA process. The EIS will address project alternatives, including the build alternatives and no build alternative, along with other possible traffic management and transit alternatives. The environmental information presented in this feasibility study should be considered preliminary and is subject to change once field work and field verification is completed as part of the NEPA analysis. The NEPA document will trigger analysis and avoidance, minimization, and mitigation measures for other resources that were not considered in this feasibility study such as air quality, socio-economic, geologic, and soils. The NEPA documentation process is likely to require several years to complete.

Following a Record of Decision from FHWA, Prince William County and the City of Manassas could proceed with funding and design and construction of the preferred alternative. Construction of the project will require right of way acquisition, utility relocations and the securing of additional environmental permits and approvals. To speed up the timeframe for completing the project, the County and City are considering using design-build procurement for the project.

A preliminary project schedule is shown in Figure 6-1. The project could take at least seven years before being open to traffic. Potential dates and time frames for the activities shown are subject to change as the project moves through the project development process. Alternative 2B is expected to cost \$190 million in 2017 dollars. Total project costs will be higher to account for inflation as most of the activities to implement the project would occur between 2020 and 2025.





Note: Dates subject to change as the project progresses through the project development process.

0	2021	2022	2023	2024	2025
42 1	month durati	ion			
10					
18	duration				
	48 to 6	0 month dur	ation		
				V	

