Executive Summary

US Route 1 is a roadway of regional, state, and national significance that runs the entire length of the east coast of the United States. For much of its length it parallels Interstate 95 (I-95) and is a principal arterial providing local access to communities along the corridor. This study focused on a segment in Prince William and Stafford Counties in Virginia, bounded by Joplin Road/Fuller Road to the north to Telegraph Road to the south, including the interchange with Russell Road (see **Figure ES-1**). Within the study area, US Route 1 is less than half a mile from I-95 and also serves as diversion route during freeway incidents. It is also a primary commuter route to and from the National Capital Region and experiences congestion for several hours each weekday and on weekends, especially during summer.

The cross section of US Route 1 in this area has remained unchanged for many years while the population around it has grown significantly. Between 2000 and 2010, the population of both counties grew by approximately 40% and is expected to continue to grow at a similar pace for many years to come. The major employer within the study area is the Marine Corps Base Quantico (MCB Quantico), which is comprised of 6,700 military personnel, 6,900 civilians, and 2,500 family members. It is home to the Marine Corps Combat Development Command and numerous tenant organizations such as Manpower and Reserve Affairs, Marine Helicopter Squadron I, and the FBI Academy. The base population also continues to grow due to the Base Realignment and Closure (BRAC) recommendations and other expansions.

This Preliminary Engineering Report services as a comprehensive summary of the project process, findings, and recommendations. This project included the following tasks (the results of which are included in the chapters of the report):

- Peak Hour Traffic Analysis of Existing Conditions (Chapter 2)
- Long-Range Traffic Forecasting (Chapter 3)
- Peak Hour Traffic Analysis of Future No-Build Conditions (Chapter 4)
- Alternatives Analysis (Chapter 5)
- Peak Hour Traffic Analysis of Build Alternatives (Chapter 6)
- Analysis of the Recommended Alternative (Chapter 7)
- Environmental Consequences (Chapter 8)
- Public and Stakeholder Outreach (Chapter 9)
- Preliminary Engineering Concept Design Plans for the Recommended Alternative (Appendix A)

The US Route 1 Corridor at MCB Quantico project was initiated by Federal Highway Administration (FHWA) Eastern Federal Lands Highway Division (EFLHD) in June of 2011 to identify transportation needs and assess potential improvements to the US Route 1 corridor in Stafford and Prince William Counties. Funding was provided by the US Department of Defense Office of Economic Adjustment (OEA) and the two counties. The project and this report have been completed in conjunction with a number of stakeholders including MCB Quantico, Virginia Department of Transportation (VDOT), and Stafford and Prince William Counties.

Coordinated Planning

This corridor study is just one study in a large network of studies and plans that will impact the region. Multiple jurisdictions, agencies, and organizations are conducting transportation and land use plans to ensure the region is adequately prepared to handle the expected growth. Stafford County, Prince William County, and the Fredericksburg Area Metropolitan Planning Organization (FAMPO) all have documented the need for improvement to US Route 1 in northern Stafford and southern Prince William Counties.

Many studies and plans have examined development, roadway improvements, and transit in the area. Efforts were made to review the recommendations of completed study and coordinate with those that are ongoing. These studies include:

- Documentation and plans for development and growth at major points along the US Route 1 corridor
- Analyses for enhanced transit service along US Route 1 and I-95
- Environmental documentation for major developments
- Previous corridor studies assessing multimodal improvements to the US Route 1 corridor

Existing Conditions Traffic Analysis

The first step in the transportation analysis was to select the appropriate traffic analysis tool. The FHWA Traffic Analysis Toolbox Volume II: Decision Support Methodology for Selecting Traffic Analysis Tools was used to evaluate each category of available analysis tools based on several criteria. The highest scoring analysis category was microsimulation, followed closely by analytical (HCM). As a result, both tools were selected for use on the project. Synchro software was used to perform the intersection capacity analysis using HCM 2000 methodology, while VISSIM was used for the detailed microsimulation. Peak hour intersection turning movement counts and automated machine daily counts were collected in September 2011. The AM and PM peak hours were modeled in both Synchro and VISSIM and calibrated to field observations. Most study intersections operate at acceptable levels of service (C or better) during peak hours, with the exception of US Route 1 and Joplin/Fuller Roads which operates at level of service (LOS) E during the AM peak hour and LOS D during the PM peak hour.

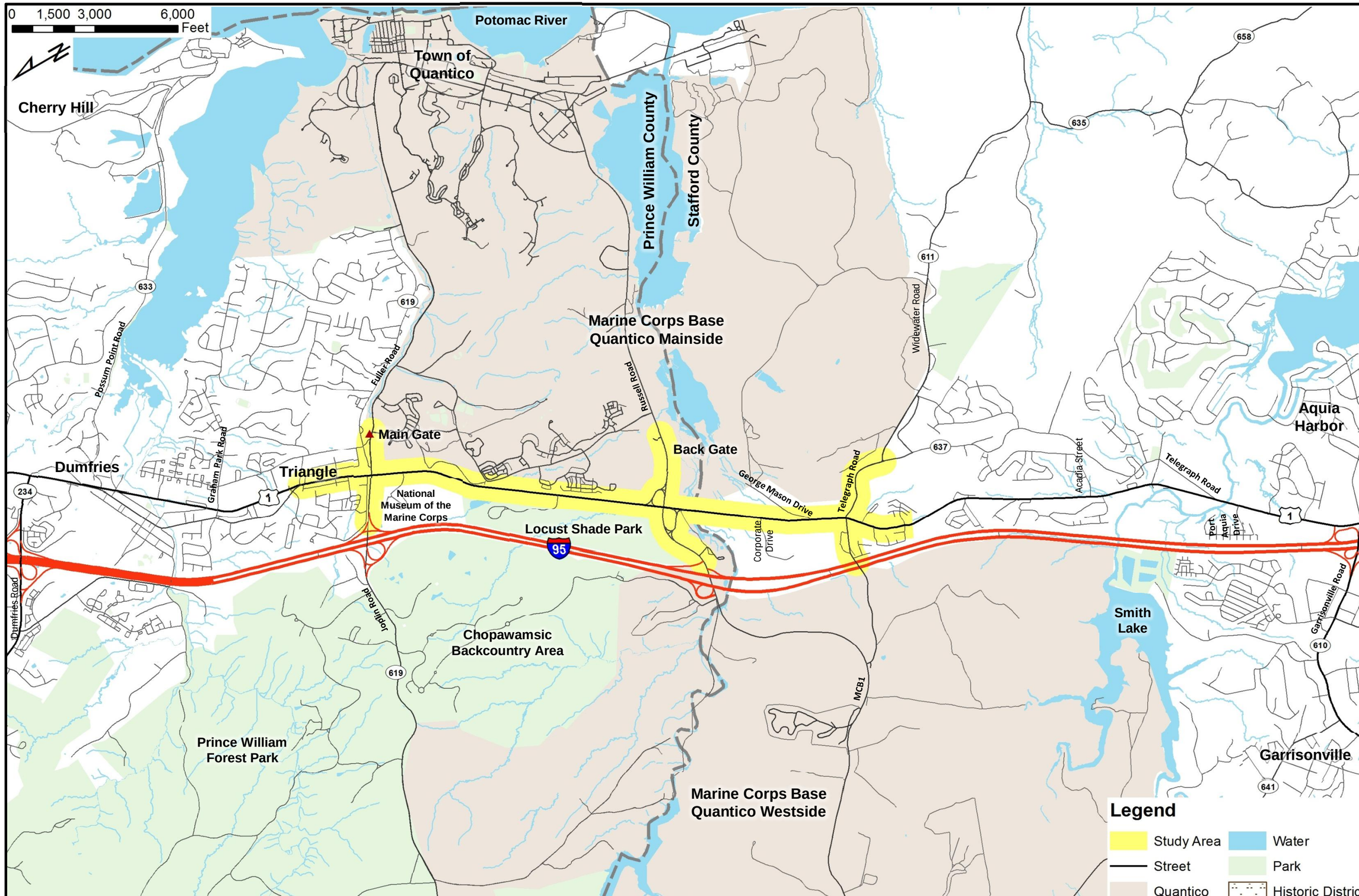
Long-Range Traffic Forecasting

The Metropolitan Washington Council of Governments (MWCOG) 2.3 model was used to develop traffic forecasts for an assumed opening year for the project of 2018 and a horizon year of 2040. Link volumes from the MWCOG model were used to calculate growth rates for each segment of US Route 1. These growth rates were applied to existing count data to estimate peak hour traffic for both 2018 and 2040. The link volumes were then converted to turning movement counts using National Cooperative Highway Research Project (NCHRP) Report 255 methodology and balanced between study intersections. Some traffic analysis zones (TAZs) did not appear to include planned growth in the area such as the expansion of MCB Quantico Westside and the Quantico Corporate Center. Peak hour traffic for those generators was added manually to adjacent intersections based on traffic projections from previous studies.

Future No-Build Analysis

The existing conditions Synchro models were updated with the peak hour turning movements developed in the previous step to create future no-build scenarios for both AM and PM peak hours in 2018 and 2040. All planned projects within the study area were included in this scenario, including the relocation of the Fuller Road/Fuller Heights intersection, the realignment of George Mason Drive, the widening of Russell Road, and the addition of turn lanes at the US Route 1/Telegraph Road intersection. The results of the HCM analysis are shown in **Table ES-1**.

While delay increases in 2018 when compared to existing conditions, most study intersections still operate at the same level of service as existing conditions. The US Route 1/Joplin Road/Fuller Road intersection degrades one LOS grade in each peak period. However, by 2040 nearly all study intersections are over capacity and operate at LOS F. These results demonstrate the need for additional capacity on US Route 1 to accommodate future traffic demand during peak hours.



Study Area Map

US Route 1 Corridor at Marine Corps Base Quantico
Planning/Preliminary Engineering Study
Federal Highway Administration
Eastern Federal Lands Highway Division

Kimley-Horn and Associates, Inc.

FIGURE
ES-1

Table ES-1: Summary of Existing 2011 and Future No-Build Intersection Capacity – Signalized Intersections (Synchro HCM Report)

Intersection	Level of Service		
	Existing	2018 No-Build	2040 No-Build
	AM (PM)	AM (PM)	AM (PM)
US Route 1 and Joplin Road/Fuller Road	E (D)	F (E)	F (F)
Fuller Road and Fuller Heights Drive	-	B (B)	B (C)
US Route 1 and Heritage Center Parkway	-	A (A)	A (C)
Russell Road and US Route 1 (Northbound) Ramps	-	B (E)	B (F)
Russell Road and US Route 1 (Southbound) Ramps	-	B (B)	B (F)
Russell Road and I-95 (Northbound) On Ramp	A (B)	A (B)	A (F)
Russell Road and I-95 (Northbound) Off Ramp	A (A)	A (A)	A (B)
Russell Road and I-95 (Southbound) Ramps	C (B)	B (B)	C (F)
US Route 1 and Corporate Drive/Business Driveway	B (D)	B (D)	F (F)
US Route 1 and George Mason Drive/Corporate Center	-	A (B)	F (F)
US Route 1 and Telegraph Road	B (C)	C (C)	F (F)

Alternatives Analysis – US Route 1

To accommodate design year 2040 peak hour traffic demand, several build alternatives were developed. Based on input from the stakeholders, various combinations of design elements were incorporated into each concept, including roadway widening, a transit/high-occupancy vehicle (HOV)-only lane, unconventional intersections, and replacing signalized intersections with grade-separated interchanges. These alternatives were evaluated and screened based on several criteria that fall under three categories:

- Traffic operations
- Potential impacts
- Construction cost

Each alternative was assigned a relative score for each criterion and ranked from highest to lowest. Based on this evaluation, the highest scoring alternative was to maintain the existing four-lane cross section but replace all signalized intersections with grade-separated interchanges. However, the numerous bridge structures in this alternative create sight obstructions through much of the corridor and limit local access to businesses. For these reasons, the grade-separated alternative was eliminated from consideration. It was agreed that the two build alternatives carried forward for further analysis would be:

- **Build Scenario 1:** Six-lane cross section throughout (Joplin Road/Fuller Road to Telegraph Road)

- **Build Scenario 2:** Combination of six-lane and eight-lane cross sections
  - Six-lane cross section north of Russell Road interchange (Joplin Road/Fuller Road to Russell Road)
  - Eight-lane cross section south of Russell Road (Russell Road to Telegraph Road)

Each build alternative was modeling using Synchro/HCM methodology. The results of this analysis are shown in **Table ES-2**. They indicate that all signalized intersections along US Route 1 would operate at LOS D or better with the six-lane alternative and LOS C or better with the eight-lane alternative. However, the queuing results from Synchro show that with the six-lane cross section there is potential for large queues on Route 1 at the signalized intersections south of Russell Road.

Table ES-2: US Route 1 Signalized Intersection Capacity Results (Synchro/HCM)

Signalized Intersections		Scenario		
		2040 No-Build	2040 Build Scenario 1	2040 Build Scenario 2
		Level of Service	Level of Service	Level of Service
		AM (PM)	AM (PM)	AM (PM)
US Route 1 Lanes (Joplin Road to Russell Road)		**4**	**6**	**6**
1	US Route 1 and Joplin Road/Fuller Road	F (F)	D (D)	D (D)
2	US Route 1 and Heritage Center Parkway	A (C)	A (B)	A (B)
US Route 1 Lanes (Russell Road to Telegraph Road)		**4**	**6**	**8**
3	US Route 1 and Corporate Drive/Business Driveway	F (F)	A (D)	B (C)
4	US Route 1 and George Mason Drive/Corporate Center Entrance	F (F)	B (D)	B (B)
5	US Route 1 and Telegraph Road	F (F)	D (D)	C (C)

Alternatives Analysis – US Route 1/Russell Road Interchange

The project also included developing design concepts to improve the interchange of Russell Road at US Route 1. The ramp from northbound US Route 1 to Russell Road currently experiences heavy delays during peak hours for traffic attempting to turn left towards the MCB Quantico Back Gate and requires manual traffic control on a daily basis. Six design alternatives were developed and evaluated using design year 2040 peak hour traffic volumes. The concepts ranged from adding traffic signals on Russell Road to a full cloverleaf interchange. These alternatives were screened using the same three categories as the US Route 1 alternatives analysis: 1) traffic operations, 2) cost, and 3) environmental impact. The highest ranking design concepts were Alternative E – full cloverleaf (**Figure ES-2**), followed by Alternative A – add a northbound to eastbound ramp and traffic signals on Russell Road (**Figure ES-3**).

Figure ES-2: Russell Road Alternative E

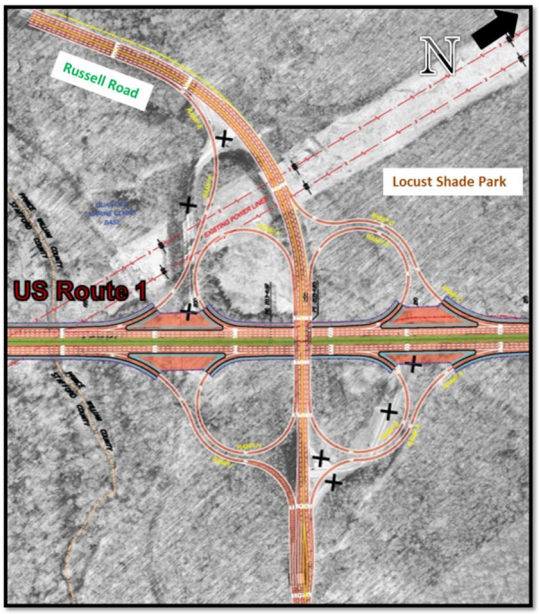
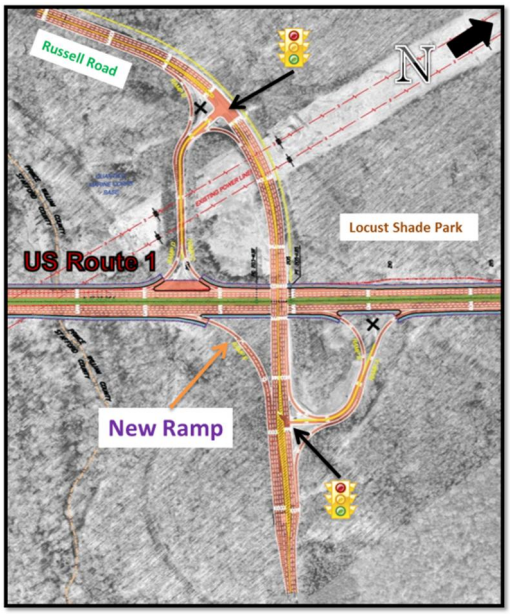


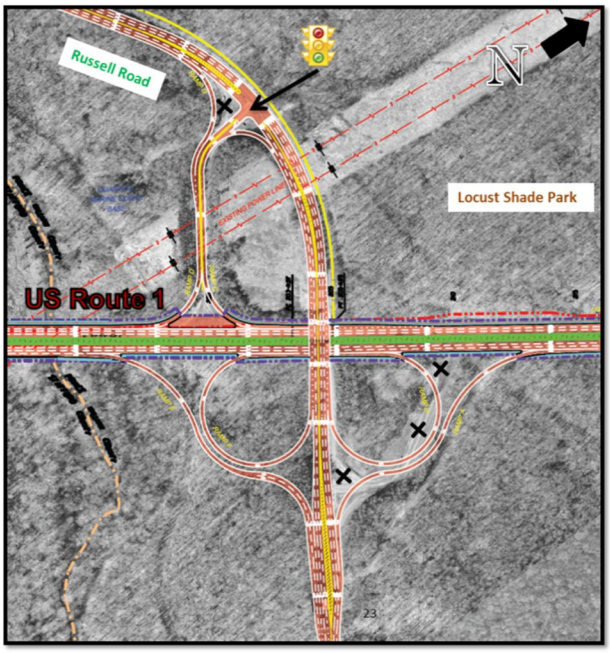
Figure ES-3: Russell Road Alternative A



Alternative A essentially keeps the existing footprint of the interchange; it scored highest in the evaluation due to its relatively low cost and smaller environmental impact. However, the proposed signalized intersection on Russell Road east of US Route 1 was determined to be too close to the MCB Quantico Back Gate. Stopping traffic at that location would create potential queue spillback that could affect gate operations and violate security standards. Alternative E creates free-flow traffic conditions for all movements at the interchange and eliminates all stop signs and traffic signals. However, the ramps on the northwest quadrant encroach on Locust Shade Park property, which would require additional environmental clearances before construction could be approved.

A hybrid solution was developed that takes advantage of the best features of both of the top-ranked alternatives. It combines the ramp configuration of Alternative A on the west side of US Route 1 and the cloverleaf configuration on the east side of US Route 1. This eliminates the concerns of the traffic signal adjacent to the Back Gate and the potential impacts to Locust Shade Park. The new Alternative G is shown in **Figure ES-4**.

Figure ES-4: Russell Road Alternative G



Outreach

Throughout the US Route 1 at MCB Quantico study process, the project team conducted extensive outreach to stakeholders from local jurisdictions, agencies, military organizations, and the general public. This kept the stakeholders and public up to date on the progress of the project and allowed opportunities to provide input to guide the decision-making process.

Stakeholders were given the opportunity to review documents and provide input to the project at six stakeholder meetings throughout the process which covered the following topics:

- Project introduction and understanding
- Alternative development and technical approach
- Existing conditions analysis and future traffic volume forecasting process
- Alternative screening process
- Recommended alternative

In addition to the stakeholder involvement, outreach was made to the general public. Many individuals live along, work near, or travel through this section of US Route 1 and their input is vital to a successful study. Three Citizen Information Meetings (CIMs) were held during the course of the study. These meetings provided large display boards, a presentation, and opportunity for discussion.

Citizen Information Meeting, May 2012

- **CIM 1 (May 2012) –** Introduction to the project and discussion regarding existing areas of concern
- **CIM 2 (October 2012) –** Project update and summary of existing and future conditions analysis. Discussion of potential alternatives
- **CIM 3 (March 2013) –** Presentation of final recommendations and discussion of next steps

Valuable input from the stakeholders and public were obtained through these meetings and other comment methods. Main themes of comments included:

- Incorporation of related planned and programmed US Route 1 construction projects
- Consistency with area comprehensive plans and redevelopment plans (Stafford County's Boswell's Corner Plan)
- Concern over potential impact to property owners, environmental features, and historic resources in the study area
- Opposition to an eight-lane cross section of US Route 1
- Additional improvements needed in the portion of US Route 1 south of this study area

Recommended Alternative

Roadway

Throughout the study process, multiple considerations were taken into account when developing alternatives. The alternative development process began with a universe of alternatives incorporating multiple combinations of traffic operations, transit, roadway, and environmental considerations. Through screening, modeling, and input from citizens and stakeholders, a final alternative was developed. The final alternative combines the traffic and operational needs of the forecast volumes and minimizes potential impacts to properties and environmental resources.

The recommended build alternative for US Route 1 is a six-lane cross section for the entire length of the study area - from Joplin Road/Fuller Road to Telegraph Road. Most intersection approaches at signalized intersections will have dual left-turn lanes and dedicated right-turn lanes. From Joplin Road/Fuller Road to George Mason Drive, the total recommended right-of-way is approximately 131 feet. From George Mason Drive to Telegraph Road, recommended right-of-way is approximately 143 feet. **Figure ES-5** shows the recommended typical cross section for US Route 1.

North of the Russell Road interchange, the proposed alignment maintains the existing centerline in efforts to minimize potential impacts to Locust Shade Park to the west and military housing to the east.

The hybrid alternative G is the recommended alternative for the US Route 1/Russell Road interchange. The traffic analysis indicated that it will operate at an acceptable level of service during peak hours in design year 2040 and minimally potential impacts the Locust Shade Park property on the northwest quadrant of the interchange. **Figure ES-6** shows the proposed Russell Road interchange.

South of Russell Road, three alternatives for alignments were studied. Based on analysis of potential impacts and input received from stakeholders and citizens, the final recommended alternative maintains the existing centerline as to balance impacts to businesses and residences along each side of the corridor. **Chapter 7** of this report contains two alternative concepts for the alignment of US Route 1 in vicinity of Telegraph Road that should be considered in future stages of design and environmental documentation.

An eight-lane alternative south of Russell Road was considered due to high projected traffic volumes. However, this was eliminated because final traffic microsimulation analysis did not justify the need for extra capacity and the additional impact to existing businesses along the corridor was not supported by the project stakeholders and local citizen.

Figure ES-5: Typical Section – Proposed Six-Lane Cross Section

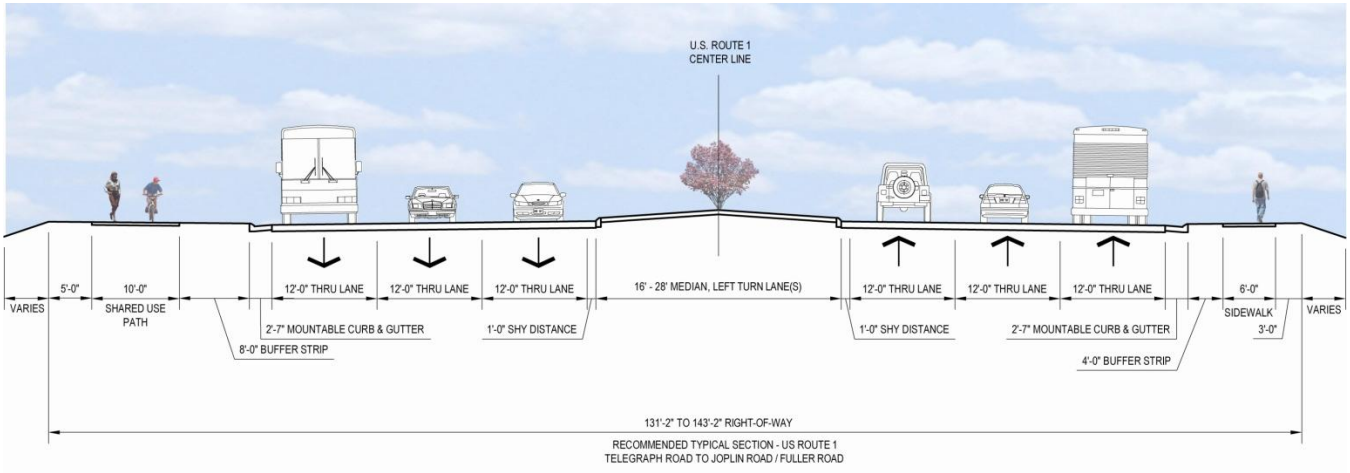
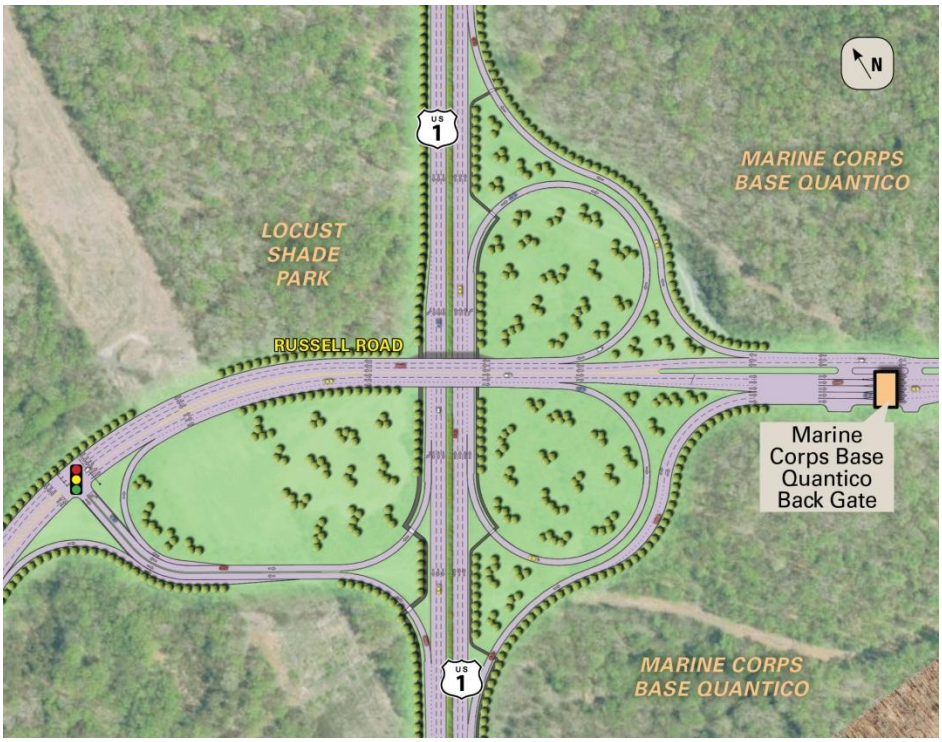


Figure ES-6: Recommended US Route 1/Russell Road Interchange Configuration



Pedestrian and Bicycle Accommodations

Throughout the project process, stakeholders and citizens provided feedback regarding the existing lack of safe and connected bicycle and pedestrian facilities throughout the corridor. As a result of this

input and to remain consistent with previous jurisdictional plans, a 10-foot multi-use path is recommended on the west side of US Route 1 and a six-foot sidewalk on the east side of US Route 1. In addition to these facilities, all intersections should be designed with pedestrian facilities that provide for connectivity and ensure safety. Examples of these improvements include:

- High-visibility crosswalks
- Pedestrian refuges
- Americans with Disabilities Act (ADA) compliant curb ramps
- ADA compliant pedestrian call buttons
- Count-down pedestrian signal heads
- Advance pedestrian warning signs

As part of a conceptual design for traffic signal layout, pedestrian connections at the study area intersections and the Russell Road interchange were developed. The concept plans can be found in **Appendix A**. Detailed design of these facilities will occur in future design of US Route 1.

Transit and Transportation Demand Management (TDM) Accommodations

During the preliminary analysis phase of this study (described in Chapter 5), the potential for a transit- and HOV-only lane as part of the roadway configuration was examined. It was determined that the transit and carpool ridership in this area was not sufficient to warrant a dedicated lane. A dedicated lane would also cause the general purpose lanes to become more congested.

However, with growth expected in the corridor area, it is vital to make accommodations for transit users, both local and long distance. Multiple transportation studies have recommended expansion of local regional bus service in this corridor connecting with the future I-95 Express Lanes. Future design should incorporate roadway modifications that include bus stops with appropriate amenities for riders.

Transportation demand management (TDM) is the application of strategies and policies to reduce travel demand (specifically that of single-occupancy private vehicles). A demand management approach to transportation has the potential to deliver better environmental outcomes, improved public health, stronger communities, and more prosperous and livable places. The following TDM strategies could improve travel demand and help to reduce congestion on US Route 1 and surrounding facilities:

- New park-and-ride lots for commuters
- Supporting shuttle service within MCB Quantico and surrounding facilities
- Neighborhood circulators
- Promoting knowledge and use of TDM and regional commuter services
- Encouraging employer incentives for carpooling/teleworking/transit use

Environmental

The project proposes potential impacts to prime farmland and farmland of statewide importance; some wetlands and surface waters, particularly around the US Route 1/Russell Road interchange; 100-year floodplains; Chesapeake Bay Protection Act (CBPA) mandated Resource Protection Areas; architectural and archaeological resources that are eligible for listing on the National Register of Historic Places (NRHP); and parks and recreational facilities. Further studies are required to determine impacts related to wildlife and habitat, endangered species, air quality, noise, and hazardous materials. No impacts to community services and facilities are anticipated.

Moving Forward

The high-level planning recommendations of this corridor study provide a framework for the improvement of the US Route 1 corridor in Stafford and Prince William Counties. This report identifies the transportation and safety needs of the corridor. It addresses the potential transportation and potential environmental impacts that the suggested improvements would have to the corridor and surrounding areas.

In May 2011, Stafford County approved a Redevelopment Plan for Boswell's Corner which envisioned the area surrounding US Route 1 in the area roughly from Telegraph Road to Corporate Center Drive as a target area for commercial and residential growth. The recommended alternative is consistent with the Boswell's Corner Redevelopment Plan, which proposes a high-quality development hub surrounding a six-lane boulevard with streetscaping. **Figure ES-7** (excerpted from the Redevelopment Plan) shows a rendering of the ultimate vision (US Route 1 looking south toward Telegraph Road).

Figure ES-7: Stafford County - Conceptual Rendering of US Route 1 at Boswell's Corner

Source: Stafford County Master Redevelopment Plan (2009)

The US Route 1 envisioned in this report serves as an interim step towards Stafford County's vision of US Route 1. Widening of the road from the existing four lanes to six lanes with pedestrian and bicycle facilities will begin the process of this ambitious yet achievable vision set by Stafford County.

In 2004, Prince William County approved a proposed cross section and alignment for US Route 1 that was developed as part of the Route 1 Location Study for Fairfax and Prince William Counties. A comparison of the recommendations of this study and the 2004 Location study can be found in **Chapter 7.**

Comprehensive and transportation plans for both Stafford County and Prince William County as well as FAMPO include the widening of US Route 1 in the study area from four to six lanes. Cooperation will be needed between local jurisdictions, transportation agencies, military organizations, and local citizens in order to move toward implementation of this report's recommendations.