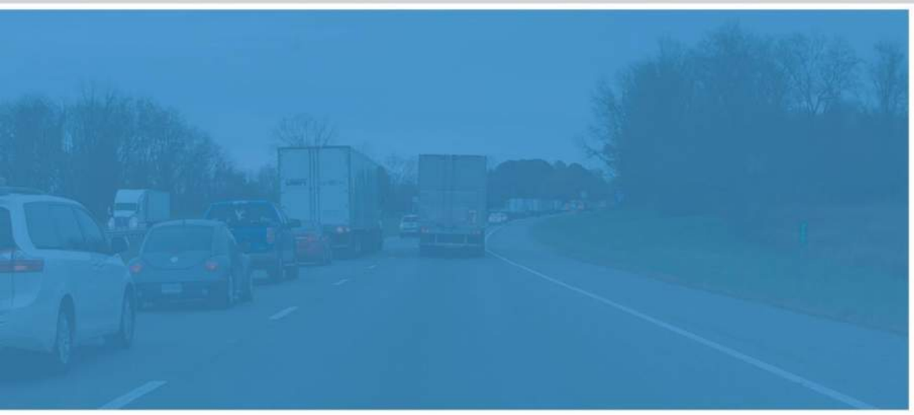
APRIL 2020

FINAL
INTERSTATE 81 EXIT-7 TO EXIT-22
FRONTAGE ROAD CORRIDOR STUDY



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1.0 Executive Summary

The Virginia Department of Transportation (VDOT) in the Bristol District is continuing to review and evaluate ways to improve the safety and flow of traffic through the region, specifically between Exits 7 and 22 along Interstate 81 (I-81). Designated as a Corridor of Statewide Significance (CoSS), I-81 is the primary northeast to southwest highway that serves both local and regional traffic within the Bristol District. Additionally, approximately 40% of Virginia statewide interstate truck vehicle miles traveled (VMT) utilizes the I-81 corridor making it one of the Commonwealth's key freight corridors. Given the nature of the corridor and limited parallel route alternatives available between interchanges, a significant number of locally-based trips utilize I-81 for generally short distances between interchanges (e.g., between Exit 14 and Exit 17 or Exit 17 and Exit 19). The relatively heavy usage of the interstate for local traffic mobility has created a challenge to being able maintain the safe and efficient movement of people and goods at the regional level along this segment of the I-81 corridor.

In response to the operational issues along I-81, VDOT has been in the process of identifying, prioritizing, and implementing improvements along the entire length of the interstate in the Commonwealth of Virginia. This includes the widening of some of the existing four-lane segments to six-lanes. However, the section of I-81 within the Bristol District (i.e., between Exits 7 and 22) was not identified as a high priority segment for any of these widening improvements due relatively lower traffic volumes and cost limitations. Therefore, staff within the VDOT Bristol have been considering alternatives to widening I-81 and instead focused on ways to improve and/or develop alternative route options for local traffic to avoid usage of I-81 for local trips altogether. Currently, the only other option for local traffic to travel through the Bristol District is U.S. Route 11 (Lee Highway), which operates mainly as a two-lane highway primarily north of I-81. U.S. Route 11 also serves as a parallel route to I-81 and periodically is relied upon to operate as a "relief" valve to I-81 when an incident occurs on the interstate. The District has also entertained various options to improve/widen sections of U.S. Route 11, but has had limited success due to available funding, cost to implement (i.e., overall project construction costs are impacted by significant right-of-way costs), and right-of-way (ROW) constraints (i.e., the portion that traverses through Historic Downtown Abington).

To address these challenges, a secondary contiguous frontage road could be built primarily to the south of I-81 between Exit 7 and Exit 22 based on existing segments of two-lane local roadways that are already present, but limited by their connectivity (i.e., gaps in the network). By constructing relatively short (i.e., approximately 1 mile in length) roadway connections to "close" these gaps, a new parallel route to I-81 could be provided to primarily serve local traffic and protect the function of the corridor in the absence of widening (i.e., U.S. Route 11 or I-81) at this time. This could also be accomplished in phases, providing needed network connectivity at relatively lower costs. The frontage road would functionally help reduce local traffic demand on the interstate facility, offer the opportunity to create improved accessibility to/from otherwise unavailable land along the corridor, and most importantly result in a more resilient roadway network capable of supporting local traffic that diverts from U.S. Route 11 when an incident occurs on the I-81 corridor.

The *I-81 Frontage Road Corridor Study* identifies potential locations/alignments of a frontage road network and intersection improvements/upgrades. The study will ultimately be used as a planning tool by the VDOT Bristol District, the Bristol Metropolitan Planning Organization (MPO), Washington County, and the Town of Abingdon to manage growth and assess the transportation network impacts created by regional influences internally and externally to the study corridor. It will also be used as a guide to determine future planning activities and levels of funding needed to support proposed improvements that will enhance network resiliency. It is anticipated that this will include a list of SMART Scale, Commonwealth Transportation Board (CTB) approved I-81 Corridor Improvement Plan, and/or other alternative funding eligible projects.

The study area consists of approximately 15.5 miles along I-81 within Washington County, VA, as illustrated in **Figure 1**. The study area corridor consists of a variety of roadway typical sections (e.g., two-lane, three-lane, and four-lane divided facilities) and a range of functional classifications (e.g., major collector, minor arterial, principal arterial, and Interstate). Additionally, U.S. Route 11 is designated as a Corridor of Statewide Significance (CoSS), as well as a Mobility Enhancement Segment (MES) per the VDOT Arterial Preservation Program (APP), further emphasizing the importance of this corridor at the local, regional, and state levels. The study area for the *I-81 Frontage Road Study* consists of the following roadways and intersections, organized into groups by nearby interchanges:

Exit 7

1. Old Airport Road at U.S. Route 11 (Lee Highway)
2. Old Airport Road at I-81 Southbound Off/On-Ramp
3. Old Airport Road at I-81 Northbound Off/On-Loop
4. Old Airport Road at Stagecoach Road

Exit 10

5. F-310 at U.S. Route 11 (Lee Highway)
6. F-310 at I-81 Southbound Off/On-Ramp
7. F-310 at I-81 Northbound Off/On-Loop
8. F-310 at Majestic Drive (F-021)

Exit 13

9. Spring Creek Road (State Route 611) at U.S. Route 11 (Lee Highway)
10. Spring Creek Road at I-81 Southbound Off/On-Ramp
11. Spring Creek Road at I-81 Northbound Off/On-Ramp
12. Spring Creek Road at Hubbard Lane
13. Spring Creek Road at Old Jonesboro Road (State Route 647)

Exit 14

14. Old Jonesboro Road (SR 647) at U.S. Route 11 (Lee Highway)
15. Old Jonesboro Road at VHCC Drive/French Moore Jr. Boulevard
16. Old Jonesboro Road at I-81 Southbound Off/On-Ramp
17. Old Jonesboro Road at I-81 Northbound Off/On-Loop
18. Old Jonesboro Road at Dennison Drive (F-024)

Exit 17

19. Cummings Street (SR 75) at U.S. Route 11 (Lee Highway)
20. Cummings Street at Cook Street/Realigned Green Spring Road
21. Cummings Street at I-81 Southbound Off/On-Ramp
22. Cummings Street at I-81 Northbound Off/On-Ramp
23. Cummings Street at Vances Mill Road (State Route 670)

Exit 19

24. Lee Highway (U.S. Route 11/58) at Hillman Highway (State Route 609)
25. Lee Highway at Empire Drive (F-030)
26. Lee Highway at I-81 Southbound Off/On-Ramp/On-Loop
27. Lee Highway at I-81 Northbound Off/On-Ramp/On-Loop
28. Lee Highway (U.S. Route 11) at U.S. Route 58

Exit 22

29. Enterprise Road (State Route 704) at Hillman Highway (State Route 609)
30. Enterprise Road at Newbanks Road
31. Old Trail Road (State Route 879) at Hillman Highway
32. Old Trail Road at Harrison Road (F-274)
33. Enterprise Road at I-81 Southbound Off/On-Ramp
34. Enterprise Road at I-81 Northbound Off/On-Ramp
35. Enterprise Road at Lee Highway (U.S. Route 11)

The purpose and need for the proposed I-81 frontage road network are three-fold:

- I-81 continues to experience increased demand associated with truck/freight for Virginia and the east coast combined with continued economic growth in the City of Bristol, the Town of Abingdon, and the Washington County area
- "Local traffic" continues to use the interstate for otherwise local mobility (i.e., adjacent interchange trips) rather than the surface street network, further increasing demand on the I-81 corridor
- During incidents along this segment of the I-81 corridor significant volumes of traffic are often diverted to alternate parallel routes (i.e., primarily U.S. Route 11) resulting in substantial operational impacts to the local street network for extended periods of time.

The process to develop the corridor study, recommendations, and implementation strategy consisted of the following efforts and are detailed in the sections contained within this document:

- Existing Conditions Analysis
- Environmental Assessment along the Corridor
- Future Traffic Volume Projections
- Travel Demand Model Traffic Assignment/Sensitivity Analysis
- Frontage Road Alignment and Intersection Concepts
- Recommendations and Prioritization
- Planning Level Cost Estimates

Improvements identified through this evaluation process consist of the following:

- Frontage road network connections that parallel the I-81 and U.S. Route 11 corridors
- Operationally efficient and safe supplemental frontage roadway network connections
- Intersection capacity improvements where frontage road connections exist today
- Conventional or innovative intersection improvements where applicable
- Access management and safety improvements
- Bringing select roadways and intersections up to current VDOT design standards

Five alternative scenarios were considered as a part of the study and consisted of the following:

1. Alternative #1 – No Build
2. Alternative #2 – Frontage Road Alignments (Northern Connections)
3. Alternative #3 – Frontage Road Alignments (Southern Connections)
4. Alternative #4 – Widen Existing U.S. Route 11
5. Alternative #5 – Widen Interstate 81

The project Study Work Group (SWG) was asked to select a preferred alignment and/or intersection improvements that are feasible (e.g., affordable, permittable, constructible), and consistent with the intent of providing an operationally safe and efficient supplemental roadway network. Through the evaluation exercise the SWG selected a "hybrid" preferred alternative which was based primarily on the Southern Connections identified in Alternative 3, and the French Moore Jr. Boulevard Extension to Cummings Street as identified in Alternative 2.

The scale, function, and prioritization of the recommended improvements are a reflection of the feedback received during this study process (to include two public information meetings and on-line survey/questionnaire) as well as extensive coordination with the VDOT project team members. This includes consideration of the operational benefits of the proposed improvements (i.e., the potential to attract local traffic away from/off of the study area segment of I-81), feasibility of construction, and estimated implementation costs.

Recommendations for specific improvements to the study area roadways and intersections correlate with the priority or time frame in which the proposed improvements need to be constructed and open for public use (i.e., short-term (five to ten years), mid-term (ten to fifteen years), and long-term (fifteen to twenty years)). This approach allows VDOT, the Bristol MPO, and local communities to prioritize and program projects in the near term that are anticipated to mitigate more immediate needs and have a higher return on investment. versus segments that are a less immediate need but are ultimately necessary to achieve the intent of the purpose and need for the proposed I-81 frontage road network.

Short-term recommendations were identified for the frontage road network to help address existing and/or more immediate needs along the corridor. These recommendations primarily represent improvements that will fill in the "gaps", have a high probability of attracting local traffic off of I-81 and/or U.S. Route 11, and result in enhanced connectivity for local traffic. Short-term priorities/recommendations consist of the following improvements:

Exit 7 to Exit 10

Phase I – Stage Coach Road Improvements

- Reconstruct existing typical section of Stagecoach Road from Bristol Flooring intersection to Hickory Drive to consist of:
  - Two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder
- From existing Terminus/Cul de Sac of Stage Coach Road to Flame Leaf Drive
  - Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder)
  - Existing northbound approach of Flame Leaf Drive will become STOP controlled
- From Flame Leaf Drive tie-in to Old Dominion Road intersection
  - Reconstruct two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder)
  - Realign/reconfigure Flame Leaf Drive/Old Dominion Road intersection to create 4-legged intersection
  - Implement 4-Way STOP
- Flame Leaf Drive at Old Dominion Road
  - Realign/reconfigure to create 4-legged intersection
  - Implement 4-Way STOP

Phase II – Stage Coach Road Improvements

- Stagecoach Road/Saul Drive at Old Airport Road (Exit 7)
  - Signalize intersection
- Stagecoach Road
  - New Alignment from Old Airport Road to Villages Circle Intersection
  - Mill and overlay from Villages Circle intersection to Bristol Flooring Entrance
- From the Flame Leaf Drive at Old Dominion Road Intersection to Majestic Drive (Private Road)
  - Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder)
  - Remove/replace existing private driveway/gateway
  - Existing northbound approach of Majestic Drive will become STOP controlled
- Majestic Drive
  - Mill and overlay from cul de sac (End of State Maintenance) to intersection with F-310
- Majestic Drive at F-310 (Exit 10)
  - Maintain STOP control on eastbound/westbound Majestic Drive approaches

Exit 13 to Exit 14

- From the New Alignment Frontage Road at Spring Creek Road (Exit 13) to tie in point along existing Dennison Drive
  - Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder)
  - Westbound approach of New Alignment Frontage Road at Spring Creek Road will be STOP controlled
  - Install box culvert to accommodate creek crossing
- Dennison Drive
  - Mill and overlay from the New Alignment Frontage Road at Dennison Drive tie in point to the Old Jonesboro Road intersection (Exit 14)
- Dennison Drive at Old Jonesboro Road will be served by existing traffic signal

The mid-term recommendations are intended to address the next tier of frontage road improvements implementation. These segments fill important gaps in the network, however they address a less immediate need than those identified as short-term priorities. These segments will also have some select implementation challenges (i.e., right-way, environmental permitting, and/or construction cost), that will likely result a longer time period otherwise associated with short-term improvements. Mid-term priorities/recommendations consist of the following improvements:

Exit 10 to Exit 13

- Majestic Drive (Exit 10)
  - Mill and overlay from F-310 intersection to Stables Road
- Majestic Drive at Stables Road
  - Northbound Stables Road approach will be STOP controlled
- From the Majestic Drive at Stables Road intersection to the Majestic Drive at Carson Lane intersection
  - Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder)
  - Northbound approach of Carson Lane will be STOP controlled
- From the Majestic Drive at Carson Lane intersection to the New Alignment Frontage Road at Halls Bottom Road intersection
  - Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder)
  - Eastbound approach of New Alignment Frontage Road will be STOP controlled
- Halls Bottom Road
  - Mill and overlay from the New Alignment Frontage Road at Halls Bottom Road intersection to the Halls Bottom Road at Singing Wood Lane intersection
- Singing Wood Lane - From the Halls Bottom Lane intersection to the Black Wolf Drive intersection
  - Reconstruct/Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder)
  - Northbound/Southbound approaches of Black Wolf Drive will be STOP controlled

- Singing Wood Lane/New Alignment Frontage Road – From the Black Wolf Drive intersection to the Spring Creek Road intersection
  - Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder)
  - Eastbound approach of New Alignment Frontage Road will be STOP controlled at Spring Creek Road intersection

Exit 14 to Exit 17 "North" – (French Moore Jr. Boulevard and Cook Street Extension)

- French Moore Jr. Boulevard Extension
  - Construct new two-lane roadway from existing cul de sac to new intersection with Stone Mill Road
  - Traffic control for the French Moore Jr. Boulevard Extension at Stone Mill Road will be a single lane roundabout
- Cook Street Extension – From the French Moore Jr. Boulevard Extension at Stone Mill Road intersection to the tie in point with Cook Street (i.e., vicinity of the Towne Center Drive intersection)
  - Construct new two-lane roadway from intersection with Stone Mill Road to tie-in point with existing Cook Street
  - Two-lane typical section with curb and gutter
  - 5-foot sidewalk to 10' Shared-Use Path along one side of the roadway

Long-term improvements are intended to address the remaining "gaps" in the frontage road network. Although not as significant a priority as those identified for short-term and mid-term implementation, these final frontage road improvements help fulfill the intent of the frontage road system network. These final segments will be a part of a frontage road network that provides enhanced connectivity and mobility for local traffic, helps reduce local traffic demand on the I-81 study area corridor, and allows more throughput for the safe and efficient movement of people and goods at the regional level.

Exit 17 to Exit 19

- Cummings Street to Glenview Drive intersection
  - Mill and overlay from Cummings Street intersection to Glenview Drive intersection
- New Alignment Frontage Road – from the existing Country Club Drive at Glenview Drive intersection to the identified tie-in point with Wycoff Drive
  - Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder)
  - Northbound approach of Glenview Drive at Country Club Drive/New Alignment Frontage Road intersection will be STOP controlled
  - Westbound approach of Country Club Drive will be STOP controlled
  - This segment of roadway will include a bridge aligned adjacent to I-81 over the Creeper Trail to minimize potential environmental impacts
- Wycoff Drive – From the New Alignment Frontage Road tie-in point to the intersection with Trigg Street
  - Reconstruct/improve the existing two-lane typical section to match the proposed Frontage Road typical (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder)
  - Southbound approach of Trigg Street will be STOP controlled at the Wycoff Drive intersection
- New Alignment Frontage Road (Berry Creek Drive) at the Trigg Street intersection to the location of the New Frontage Road alignment tie-in point
  - Reconstruct/improve the existing two-lane typical section to match the proposed Frontage Road typical (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder)
  - Reconstruct two private driveway approaches at New Alignment Frontage Road
  - Northbound approach of Private Driveway shared access will become STOP controlled
- New Alignment Frontage Road from vicinity of Berry Creek Drive to the JEB Stuart Highway (U.S. Route 58)/Lee Highway (U.S. Route 11) intersection
  - Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder)
  - Traffic control for the New Alignment Frontage Road at JEB Stuart Highway will be a combination two-lane/single-lane roundabout
  - Realign U.S. Route 11 to tie into proposed roundabout
- Construct roundabout at the JEB Stuart Highway (U.S. Route 58)/Lee Highway (U.S. Route 11) intersection

Exit 14 to Exit 17 "South"

- From the New Alignment Frontage Road at Old Jonesboro Road intersection to the Bonneycastle Drive at Glenwood Drive intersection
  - Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder)
  - Westbound approach of New Alignment Frontage Road at Old Jonesboro Road will be STOP controlled
  - Northbound approach of Glenwood Drive at New Alignment Frontage Road intersection will be STOP controlled
- From the New Alignment Frontage Road at Glenwood Drive intersection to the Bonneycastle Drive at Stone Mill Road intersection
  - Reconstruct/improve the existing two-lane typical section to match the proposed Frontage Road typical (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder)
  - Eastbound/Westbound approaches of New Alignment Frontage Road will be STOP controlled at Stone Mill Road intersection
- From the New Alignment Frontage Road at Stone Mill Road intersection to the New Alignment Frontage Road at the Future Commerce Drive/Gravel Lake Road intersection
  - Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder)
  - Eastbound approach of New Alignment Frontage Road at Future Commerce Drive/Gravel Lake Road intersection will be STOP controlled

Exit 19 to Exit 22

- From the New Alignment Frontage Road/Lee Highway (U.S. Route 11) at JEB Stuart Highway (U.S. Route 58) intersection to vicinity of the Lee Highway (U.S. Route 11) at Johnston Memorial Hospital "East" intersection
  - Widen existing Lee Highway (U.S. Route 11) to a four-lane divided typical section
- Lee Highway at Johnston Memorial Hospital "West" Intersection
  - Signalize the improved intersection
  - Install necessary exclusive turn-lanes at the improved intersection
- From vicinity of the Johnston Memorial Hospital "East" intersection to the Lee Highway (U.S. Route 11) at Enterprise Road intersection
  - Widen existing Lee Highway (U.S. Route 11) to a four-lane divided typical section
- Lee Highway at Enterprise Road
  - Signalize the improved intersection
  - Install necessary exclusive turn-lanes at the improved intersection.

The preferred alternative recommendations and planning-level cost estimates, expressed in year 2020 dollars, are summarized in **Table ES 1** through **Table ES 1,** and are illustrated in **Figure ES 1**. The recommendations have been organized into a general prioritization format (i.e., near-term to long-term). However, it is recommended that the proposed improvements be further prioritized into standalone or individual projects based on input and/or involvement from VDOT, the Bristol MPO, Washington County, and the Town of Abingdon. Each project should be thoroughly evaluated then identified for priority order, time frame for implementation, and potential funding sources.

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Table ES 1: Summary of Short-Term I-81 Frontage Road Priorities/Recommendations Exit 7 to Exit 10

Improvement	Description	Planning Level Costs PE/RW/CN
Short-Term Recommendations (5 to 10 years)		
Exit 7 to Exit 10	**Stagecoach Road Phase I** ○ Reconstruct existing typical section of Stagecoach Road from Bristol Flooring intersection to Hickory Drive to consist of: ○ Two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder	$4,298,0000
	From existing Terminus/Cul de Sac of Stage Coach Road/Hickory Drive to tie-in with Flame Leaf Drive ○ Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder) ○ Existing northbound approach of Flame Leaf Drive will become STOP controlled	$9,143,000
	From Flame Leaf Drive tie-in to Old Dominion Road intersection ○ Reconstruct two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder) ○ Realign/reconfigure Flame Leaf Drive/Old Dominion Road intersection to create 4-legged intersection ○ Implement 4-Way STOP	$3,532,000
	Stagecoach Road Phase II ○ Install signal at Stagecoach Road/Saul Drive at Old Airport Road intersection ○ New Alignment from Old Airport Road to Villages Circle intersection ○ Mill and overlay from Villages Circle intersection to Bristol Flooring Entrance	$5,248,000
	From the Flame Leaf Drive at Old Dominion Road Intersection to Majestic Drive (Private Road) intersection ○ Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder) ○ Remove/replace existing private driveway/gateway ○ Existing northbound approach of Majestic Drive will become STOP controlled Majestic Drive ○ Mill and overlay from cul de sac (End of State Maintenance) to intersection with F-310 (Exit 10) ○ Maintain STOP control on eastbound/westbound Majestic Drive approaches	$11,286,000
	TOTAL	**$33,507,000**

Table ES 2: Summary of Short-Term I-81 Frontage Road Priorities/Recommendations Exit 13 to Exit 14

Improvement	Description	Planning Level Costs PE/RW/CN
Short-Term Recommendations (5 to 10 years)		
Exit 13 to Exit 14	• From the New Alignment Frontage Road at Spring Creek Road (Exit 13) to tie in point along existing Dennison Drive ○ Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder) ○ Westbound approach of New Alignment Frontage Road at Spring Creek Road will be STOP controlled ○ Install box culvert to accommodate creek crossing.	$12,815,000
	• Dennison Drive ○ Mill and overlay from the New Alignment Frontage Road at Dennison Drive tie-in point to the Old Jonesboro Road intersection (Exit 14) • Dennison Drive at Old Jonesboro Road will be served by existing traffic signal	$3,060,000
	TOTAL	**$15,875,000**

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Table ES 3: Summary of Mid-Term I-81 Frontage Road Priorities/Recommendations Exit 10 to Exit 13

Improvement	Description	Planning Level Costs PE/RW/CN
Mid-Term Recommendations (10 to 15 years)		
Exit 10 to Exit 13	• Majestic Drive (Exit 10) ○ Mill and overlay from F-310 intersection to Stables Road • Majestic Drive at Stables Road ○ Northbound Stables Road approach will be STOP controlled • From the Majestic Drive at Stables Road intersection to the Majestic Drive at Carson Lane intersection ○ Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder) ○ Northbound approach of Carson Lane will be STOP controlled	$2,808,000
	• From the Majestic Drive at Carson Lane intersection to the New Alignment Frontage Road at Halls Bottom Road intersection ○ Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder) ○ Eastbound approach of New Alignment Frontage Road will be STOP controlled • Halls Bottom Road ○ Mill and overlay from the New Alignment Frontage Road at Halls Bottom Road intersection to the Halls Bottom Road at Singing Wood Lane intersection ○ Construct exclusive right-turn lane along southbound Halls Bottom Road	$9,728,000
	• Singing Wood Lane - From the Halls Bottom Road intersection to the Black Wolf Drive intersection ○ Reconstruct/Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder) ○ Northbound/Southbound approaches of Black Wolf Drive will be STOP controlled • Singing Wood Lane/New Alignment Frontage Road - From the Black Wolf Drive intersection to the Spring Creek Road intersection ○ Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder) ○ Eastbound approach of New Alignment Frontage Road will be STOP controlled at Spring Creek Road intersection	$17,448,000
	TOTAL	**$29,984,000**

Table ES 4: Summary of Mid-Term I-81 Frontage Road Priorities/Recommendations French Moore Jr. Boulevard Extension/Cook Street Extension (Exit 14 to Exit 17 "North")

Improvement	Description	Planning Level Costs PE/RW/CN
Mid-Term Recommendations (10 to 15 years)		
Exit 14 to Exit 17 "North" **French Moore Jr. Boulevard Extension**	French Moore Jr. Boulevard Extension ○ Construct new two-lane roadway from existing cul de sac to new intersection with Stone Mill Road ○ Traffic control for the French Moore Jr. Boulevard Extension at Stone Mill Road will be a single lane roundabout	$16,761,000
Cook Street Extension	Cook Street Extension ○ Construct new two-lane roadway from intersection with Stone Mill Road to tie-in point with existing Cook Street ○ Two-lane typical section with curb and gutter ○ 5-foot sidewalk to 10' Shared-Use Path along one side of the roadway	$9,718,000
	TOTAL	**$26,479,000**

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Table ES 5: Summary of Long-Term I-81 Frontage Road Priorities/Recommendations Exit 17 to Exit 19

Improvement	Description	Planning Level Costs PE/RW/CN
Long-Term Recommendations (15 to 20 years)		
Exit 17 to Exit 19	Cummings Street to Glenview Drive intersection ○ Mill and overlay from Cummings Street intersection to Glenview Drive intersection New Alignment Frontage Road – from the existing Country Club Drive at Glenview Drive intersection to the identified tie-in point with Wycoff Drive ○ Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder) ○ Northbound approach of Glenview Drive at Country Club Drive/New Alignment Frontage Road intersection will be STOP controlled ○ Westbound approach of Country Club Drive will be STOP controlled ○ This segment of roadway will include a bridge aligned adjacent to I-81 over the Creeper Trail to minimize potential environmental impacts	$14,370,000
	Wycoff Drive - From the New Alignment Frontage Road tie-in point to the intersection with Trigg Street ○ Reconstruct/improve the existing two-lane typical section to match the proposed Frontage Road typical (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder) ○ Southbound approach of Trigg Street will be STOP controlled at the Wycoff Drive intersection	$2,034,000
	New Alignment Frontage Road (Berry Creek Drive) at the Trigg Street intersection to the location of the New Frontage Road alignment tie-in point ○ Reconstruct/improve the existing two-lane typical section to match the proposed Frontage Road typical (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder) ○ Reconstruct two private driveway approaches at New Alignment Frontage Road ○ Northbound approach of Private Driveway shared access will become STOP controlled	$2,842,000
	New Alignment Frontage Road from vicinity of Berry Creek Drive to the JEB Stuart Highway (U.S. Route 58)/Lee Highway (U.S. Route 11) intersection ○ Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder) ○ Traffic control for the New Alignment Frontage Road at JEB Stuart Highway will be a combination two-lane/single-lane roundabout ○ Realign U.S. Route 11 to tie into proposed roundabout location Construct roundabout at the JEB Stuart Highway (U.S. Route 58)/Lee Highway (U.S. Route 11) intersection	$21,366,000
	TOTAL	**$40,612,000**

Table ES 6: Summary of Long-Term I-81 Frontage Road Priorities/Recommendations
Exit 14 to Exit 17 "South"

Improvement	Description	Planning Level Costs PE/RW/CN
Long-Term Recommendations (15 to 20 years)		
Exit 14 to Exit 17 "South"	• From the New Alignment Frontage Road at Old Jonesboro Road intersection to the Bonneycastle Drive at Glenwood Drive intersection ○ Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder) ○ Westbound approach of New Alignment Frontage Road at Old Jonesboro Road will be STOP controlled ○ Northbound approach of Glenwood Drive at New Alignment Frontage Road intersection will be STOP controlled	$12,770,000
	• From the New Alignment Frontage Road at Glenwood Drive intersection to the Bonneycastle Drive at Stone Mill Road intersection ○ Reconstruct/improve the existing two-lane typical section to match the proposed Frontage Road typical (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder) ○ Eastbound/Westbound approaches of New Alignment Frontage Road will be STOP controlled at Stone Mill Road intersection	$2,708,000
	• From the New Alignment Frontage Road at Stone Mill Road intersection to the New Alignment Frontage Road at the Future Commerce Drive/Gravel Lake Road intersection ○ Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder) • Eastbound approach of New Alignment Frontage Road at Future Commerce Drive/Gravel Lake Road intersection will be STOP controlled	$7,667,000
	TOTAL	**$23,145,000**

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Table ES 7: Summary of Long-Term I-81 Frontage Road Priorities/Recommendations Exit 19 to Exit 22

Improvement	Description	Planning Level Costs PE/RW/CN
Long-Term Recommendations (15 to 20 years)		
(Exit 19 to Exit 22)	• From the New Alignment Frontage Road/Lee Highway (U.S. Route 11) at JEB Stuart Highway (U.S. Route 58) intersection to vicinity of the Lee Highway (U.S. Route 11) at Johnston Memorial Hospital "East" intersection ○ Widen existing Lee Highway (U.S. Route 11) to a four-lane divided typical section • Lee Highway at Johnston Memorial Hospital "West" Intersection ○ Signalize the improved intersection ○ Install necessary exclusive turn-lanes at the improved intersection	$24,501,000
	• From vicinity of the Johnston Memorial Hospital "East" intersection to the Lee Highway (U.S. Route 11) at Enterprise Road intersection ○ Widen existing Lee Highway (U.S. Route 11) to a four-lane divided typical section • Lee Highway at Enterprise Road ○ Signalize the improved intersection Install necessary exclusive turn-lanes at the improved intersection.	$28,581,000
	TOTAL	**$53,082,000**

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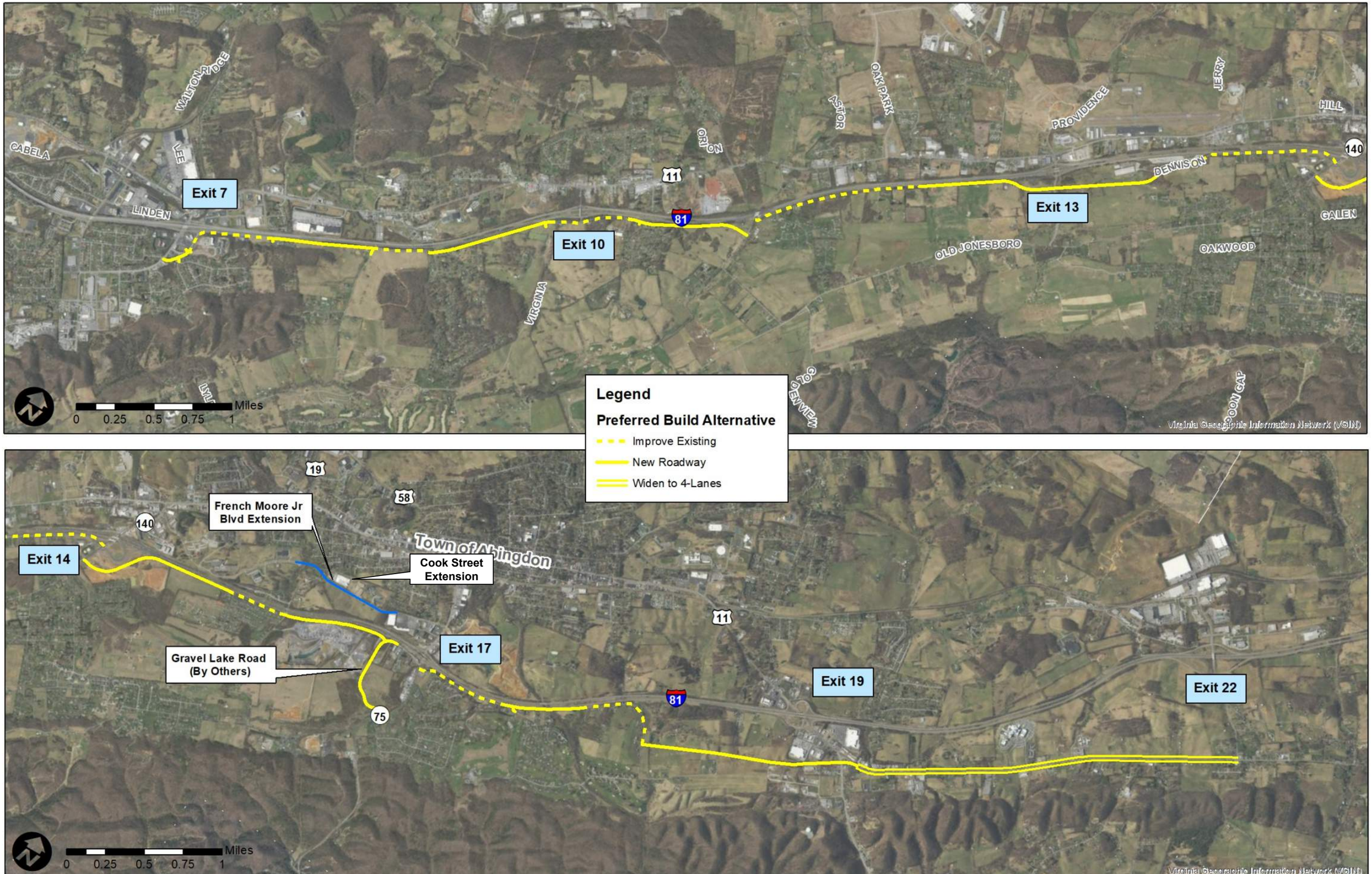

Kimley»Horn

Interstate 81 Frontage Road Corridor Study
Bristol, VA

Preferred Alignment Alternative

Figure ES-1

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2.0 Introduction

2.1 Background

The Virginia Department of Transportation (VDOT) in the Bristol District is continuing to review and evaluate ways to improve the safety and flow of traffic through the region, specifically between Exits 7 and 22 along Interstate 81 (I-81). Designated as a Corridor of Statewide Significance (CoSS), I-81 is the primary northeast to southwest highway that serves both local and regional traffic within the Bristol District. Additionally, approximately 40% of Virginia statewide interstate truck vehicle miles traveled (VMT) utilizes the I-81 corridor making it one of the Commonwealth's key freight corridors. Given the nature of the corridor and limited parallel route alternatives available between interchanges, a significant number of locally-based trips utilize I-81 for generally short distances between interchanges (e.g., between Exit 14 and Exit 17 or Exit 17 and Exit 19). The relatively heavy usage of the interstate for local traffic mobility has created a challenge to being able maintain the safe and efficient movement of people and goods at the regional level along this segment of the I-81 corridor.

In response to the operational issues along I-81, VDOT has been in the process of identifying, prioritizing, and implementing improvements along the entire length of the interstate in the Commonwealth of Virginia. This includes the widening of some of the existing four-lane segments to six-lanes. However, the section of I-81 within the Bristol District (i.e., between Exits 7 and 22) was not identified as a high priority segment for any of these widening improvements due relatively lower traffic volumes and cost limitations.

Therefore, staff within the VDOT Bristol have been considering alternatives to widening I-81 and instead focused on ways to improve and/or develop alternative route options for local traffic to avoid usage of I-81 for local trips altogether. Currently, the only other option for local traffic to travel through the Bristol District is U.S. Route 11 (Lee Highway), which operates mainly as a two-lane highway primarily north of I-81. U.S. Route 11 also serves as a parallel route to I-81 and periodically is relied upon to operate as a "relief" valve to I-81 when an incident occurs on the interstate. The District has also entertained various options to improve/widen sections of U.S. Route 11, but has had limited success due to available funding, cost to implement (i.e., overall project construction costs are impacted by significant right-of-way costs), and right-of-way (ROW) constraints (i.e., the portion that traverses through Historic Downtown Abington).

To address these challenges, a secondary contiguous frontage road could be built primarily to the south of I-81 between Exit 7 and Exit 22 based on existing segments of two-lane local roadways that are already present, but limited by their connectivity (i.e., gaps in the network). By constructing relatively short (i.e., approximately 1 mile in length) roadway connections to "close" these gaps, a new parallel route to I-81 could be provided to primarily serve local traffic and protect the function of the corridor in the absence of widening (i.e., U.S. Route 11 or I-81) at this time. This could also be accomplished in phases, providing needed network connectivity at relatively lower costs.

The frontage road would functionally help reduce local traffic demand on the interstate facility, offer the opportunity to create improved accessibility to/from otherwise unavailable land along the corridor, and most importantly result in a more resilient roadway network capable of supporting local traffic that diverts from U.S. Route 11 when an incident occurs on the I-81 corridor.

2.2 Purpose and Need

The purpose and need for the proposed I-81 frontage road network are three-fold:

- I-81 continues to experience increased demand associated with truck/freight for Virginia and the east coast combined with continued economic growth in the City of Bristol, the Town of Abingdon, and the Washington County area
- "Local traffic" continues to use the interstate for otherwise local mobility (i.e., adjacent interchange trips) rather than the surface street network, further increasing demand on the I-81 corridor
- During incidents along this segment of the I-81 corridor significant volumes of traffic are often diverted to alternate parallel routes (i.e., primarily U.S. Route 11) resulting in substantial operational impacts to the local street network for extended periods of time.

The *I-81 Frontage Road Corridor Study* will identify potential locations/alignments of a frontage road network and intersection improvements/upgrades. The study will ultimately be used as a planning tool by the VDOT Bristol District, the Bristol Metropolitan Planning Organization (MPO), Washington County, and the Town of Abingdon to manage growth and assess the transportation network impacts created by regional influences internally and externally to the study corridor. It will also be used as a guide to determine future planning activities and levels of funding needed to support proposed improvements that will enhance network resiliency. It is anticipated that this will include a list of SMART Scale, Commonwealth Transportation Board (CTB) approved I-81 Corridor Improvement Plan, and/or other alternative funding eligible projects.

2.3 Methodology

The process to develop the corridor study, recommendations, and implementation strategy consisted of the following efforts:

- **Project Team –** Kimley-Horn coordinated closely with Bristol MPO, Mount Rogers Planning District Commission (PDC), Washington County, the Town of Abingdon, VDOT staff, and other stakeholders throughout the study process. The project team worked together to guide and assist with the analysis of the study area.
- **Data Collection and Baseline Conditions –** This effort involved collecting and evaluating background information including existing traffic volumes, land use plans, traffic impact studies, geographic information system (GIS) data, future development plans, historical crash data, environmental/natural resources data, and other necessary information further establishing the baseline conditions. All analyses were conducted in accordance with the Highway Capacity Manual (2010/2016 Edition) and the VDOT Traffic Operations and Safety Analysis Manual (TOSAM).

- **Public Engagement –** providing and sharing project information with members of the public to obtain input and support for the project through informational meetings and an online survey.
- **Future Traffic Volume Projections –** Based on the data collection efforts, traffic volumes were modeled and projected to a future year to analyze No Build and Build conditions within the study area. The Bristol MPO Regional Travel Demand Model (TDM) was used to develop growth rates and future volumes for this analysis.
- **Recommended Alternative –** a preferred alternative as well as other identified transportation network improvement needs were identified and selected based on the results of the operational analysis and input provided by the project team, stakeholders, and public engagement process.
- **Implementation –** Implementation of the proposed transportation improvements begins with approval and support from, Washington County, the Town of Abingdon, and VDOT staff.

2.4 Related Studies

The following studies were considered and reviewed to understand the impacts of the proposed frontage road on the study area and surrounding traffic infrastructure, as well as to gather relevant data concerning the study corridor. Relevant data from the studies listed below were used as appropriate to support this analysis:

- Town of Abingdon Corridor and Connector Road Study (February 2012)
- Interstate 81 – Exit 17 Interchange Modification Report (February 2017)
- Interstate 81 – Exit 19 Interchange Modification Report (May 2017)
- Interstate 81 Corridor Improvement Plan (December 2018)

2.5 Framework Document

A framework document was created that outlines the approach and methodology assumptions used in developing this study. This document was prepared in conjunction with VDOT, FHWA, Bristol MPO, Mount Rogers PDC, Washington County, and the Town of Abingdon. Concurrence with the framework document and the associated methodologies occurred in November 2018. The approved I-81 Exit 7 to Exit 22 Frontage Road Corridor Study - Framework Document is provided in **Appendix A**.

2.6 Study Area

The study area consists of approximately 15.5 miles along I-81 within Washington County, VA, as illustrated in **Figure 1**. The study area corridor consists of a variety of roadway typical sections (e.g., two-lane, three-lane, and four-lane divided facilities) and a range of functional classifications (e.g., major collector, minor arterial, principal arterial, and Interstate). Additionally, U.S. Route 11 is designated as a Corridor of Statewide Significance (CoSS), as well as a Mobility Enhancement Segment (MES) per the VDOT Arterial Preservation Program (APP), further emphasizing the importance of this corridor at the local, regional, and state levels. The study area for the *I-81 Frontage Road Study* consists of the following roadways and intersections, organized into groups by nearby interchanges:

Exit 7

6. Old Airport Road at U.S. Route 11 (Lee Highway)
7. Old Airport Road at I-81 Southbound Off/On-Ramp
8. Old Airport Road at I-81 Northbound Off/On-Loop
9. Old Airport Road at Stagecoach Road

Exit 10

10. F-310 at U.S. Route 11 (Lee Highway)
11. F-310 at I-81 Southbound Off/On-Ramp
12. F-310 at I-81 Northbound Off/On-Loop
13. F-310 at Majestic Drive (F-021)

Exit 13

14. Spring Creek Road (State Route 611) at U.S. Route 11 (Lee Highway)
15. Spring Creek Road at I-81 Southbound Off/On-Ramp
16. Spring Creek Road at I-81 Northbound Off/On-Ramp
17. Spring Creek Road at Hubbard Lane
18. Spring Creek Road at Old Jonesboro Road (State Route 647)

Exit 14

19. Old Jonesboro Road (SR 647) at U.S. Route 11 (Lee Highway)
20. Old Jonesboro Road at VHCC Drive/French Moore Jr. Boulevard
21. Old Jonesboro Road at I-81 Southbound Off/On-Ramp
22. Old Jonesboro Road at I-81 Northbound Off/On-Loop
23. Old Jonesboro Road at Dennison Drive (F-024)

Exit 17

24. Cummings Street (SR 75) at U.S. Route 11 (Lee Highway)
25. Cummings Street at Cook Street/Realigned Green Spring Road
26. Cummings Street at I-81 Southbound Off/On-Ramp
27. Cummings Street at I-81 Northbound Off/On-Ramp
28. Cummings Street at Vances Mill Road (State Route 670)

Exit 19

29. Lee Highway (U.S. Route 11/58) at Hillman Highway (State Route 609)
30. Lee Highway at Empire Drive (F-030)
31. Lee Highway at I-81 Southbound Off/On-Ramp/On-Loop
32. Lee Highway at I-81 Northbound Off/On-Ramp/On-Loop
33. Lee Highway (U.S. Route 11) at U.S. Route 58

Exit 22

34. Enterprise Road (State Route 704) at Hillman Highway (State Route 609)
35. Enterprise Road at Newbanks Road
36. Old Trail Road (State Route 879) at Hillman Highway
37. Old Trail Road at Harrison Road (F-274)
38. Enterprise Road at I-81 Southbound Off/On-Ramp
39. Enterprise Road at I-81 Northbound Off/On-Ramp
40. Enterprise Road at Lee Highway (U.S. Route 11)

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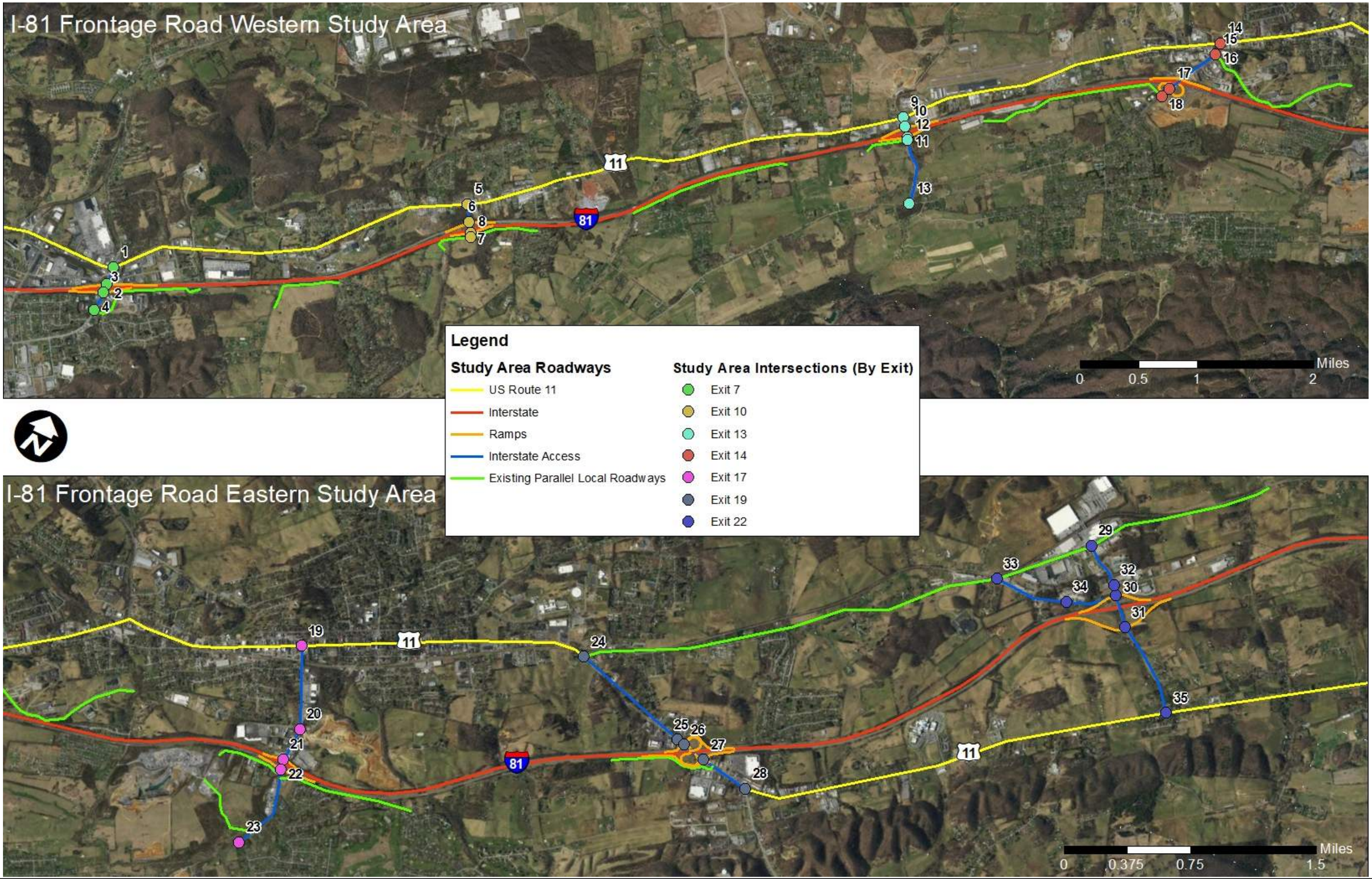

Kimley»Horn	Interstate 81 Frontage Road Corridor Study Bristol, VA	Study Area	Figure 1

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3.0 Existing Conditions

3.1 Demographics

Adjacent to the study area and within the Bristol MPO area is Washington County, the City of Bristol, and the Town of Abingdon. The U.S. Census Bureau 2018 population estimates indicate that Washington County has a population of approximately 54,400, while the City of Bristol and the Town of Abingdon had total populations of 16,500 and 8,000 respectively.

The Bristol MPO area which also includes counties and municipalities in Tennessee, had a 2015 total population estimate of approximately 107,700. Since 2010, the Bristol MPO area has seen a population growth of approximately 1.3% per year. Based on recent projections, this area is expecting to grow 8.3% by 2040 to reach a total population of approximately 115,000.

Employment trends within the study area and the surrounding region mentioned above indicate that the Bristol MPO will have a work force of approximately 79,300 employees by 2040; a growth of 46.1% from the 54,300-employee work force available in 2010.

3.2 Existing Land Use and Zoning

The area immediately adjacent to the study area within the Town of Abingdon and Washington County consist of residential, commercial, industrial and agricultural land uses. Parcels in this area are generally zoned for gateway office/commercial, agricultural, and low-density residential uses. For Washington County, parcels within the study area are zoned as General Agriculture (A2) and General Business District (B2). Existing land uses for both the Town of Abingdon and Washington County were considered as a part of preparing the I-81 Frontage Road study. **Figure 2** and **Figure 3** illustrate the existing land use plans near the study area, based on their respective Comprehensive Plans. From the Town of Abingdon plan, the land uses in the immediate vicinity of the proposed frontage road consist primarily of office/commercial, agricultural, medium-density residential, and low-density residential uses. For Washington County, land uses within the study area consist of commercial, agricultural, and residential uses as well.

3.3 Existing Roadway Network

The study area for this study consists of roadways of varying types, ranging from an interstate facility to local rural facilities. The following section provides a brief description of existing roadway characteristics of each various roadways within the study area. Additionally, **Figure 4** illustrates the functional classification of roadways within the study area, while **Figure 5** and **Figure 6** show the existing geometries/laneage.

Interstate 81 is a limited access highway classified by FHWA as an Interstate that connects Tennessee and Virginia within the study as well as portions of the northeast (i.e., Maryland, Pennsylvania and New York). VDOT has classified I-81 as a Corridor of Statewide Significance (CoSS). This segment of I-81 between Exit 7 and 22, has a posted speed limit of 70 mph. It is a divided facility that carries traffic along two 12-foot lanes in each direction. The segment of I-81 changes from a four-lane roadway to a six-lane roadway to the east of the Exit 7 (Old Airport Road) interchange and continues west to the Virginia/Tennessee state line.

The Annual Average Daily Traffic (AADT) of I-81 ranges from 39,000 to 51,000 vehicles per day (vpd) within the study area and based on VDOT's published volume data consists of approximately 19% to 22% heavy vehicles.

U.S. Route 11 is generally located to the north of I-81, where it runs parallel to the interstate. U.S. Route 11 then transitions south of I-81 east of Abingdon via the Exit 19 interchange. VDOT also classifies U.S. Route 11 as a CoSS. This study includes approximately 16.5 miles of U.S. Route 11 within Washington County. U.S. Route 11 is generally a two-lane undivided highway throughout most of the study area and is classified as a minor arterial. U.S. Route 11 has a posted speed limit of 55 mph throughout most of the study area with select segments ranging from 25 mph to 45 mph.

Interchanges/Cross Streets:

Seven interchanges consisting of various configurations of on- and off-ramps are included in the Frontage Road corridor study area. The Exit 7 interchange contains two signalized intersections at Old Airport Road. According to VDOT's published AADT workbook (2018), the ramps range from 4,700 to 6,600 vpd. The Exit 10 interchange consists of two unsignalized ramps that intersect with F-310. The ramps at this interchange carry approximately 1,600 to 2,700 vpd. The Exit 13 interchange also contains two unsignalized intersections at Spring Creek Road (State Route 611). Construction on the Exit 14 interchange was recently completed which included the removal of the northbound on-loop and off-loop ramps and reconfiguration as a northbound off-loop and on-ramp (to current design standards) in the southeast quadrant. Additional intersection, laneage, and signal improvements were completed as part of the Exit 14 improvements. The Exit 17 interchange has two signalized on/off-ramps at Cummings Street (State Route 75) that carry approximately 2,100 to 5,000 vpd. The Exit 19 interchange is a partial cloverleaf that intersects with U.S. Route 11. The Exit 22 interchange has two unsignalized ramps that intersect with Enterprise Road (State Route 704).

The cross streets within the study area intersect with the interchange ramps/loops. The segment of Old Airport Road is a four-lane roadway that carries approximately 17,000 vpd between the Exit 7 interchange and U.S. Route 11. F-310 is a roadway that spans approximately 350 feet from Majestic Drive to U.S. Route 11. Spring Creek Road is a two-lane undivided roadway that connects from Old Jonesboro Road to U.S. Route 11. Spring Creek Road carries approximately 2,500 vpd south of I-81; the northern side of Spring Creek Road has an AADT of approximately 6,600 vpd. Old Jonesboro Road (State Route 140) is the cross street that intersects with the Exit 14 interchange. The segment of Old Jonesboro Road from Dennison Drive to the NB Interstate ramps carry approximately 5,900 vpd. Cummings Street is a cross street that transitions from a two-lane undivided roadway to the south of I-81 to a four-lane roadway with a two-way left turn lane (TWLT) lane to the north of I-81. Cummings Street north of I-81 carries approximately 17,000 vpd. Enterprise Road is the cross street at the Exit 22 interchange that carries approximately 4,500 vpd. The proposed frontage road will intersect with the cross streets between Exit 7 and Exit 22.

Other Rural Roads:

The other rural roads within the study area generally run parallel to I-81 and will connect/share an alignment with a proposed frontage road in certain segments. Stagecoach Road is a local roadway that is located to the east of Old Airport Road. Flame Leaf Drive is a local roadway that runs parallel to I-81 for approximately 2,000 feet. Lowry Hills Road is a local residential roadway located to the west of Plantation Road. Majestic Drive is a local roadway that is located south of the Exit 10 interchange. Singing Wood Lane is a local roadway that carries approximately 410 vpd. Black Wolf Drive is a local roadway located southwest of the Exit 13 interchange. Within the study area, Dennison Drive is a 1.3-mile long roadway that connects to Old Jonesboro Road. Bonnycastle Drive is a 2,100-foot long segment between the Exit 14 and Exit 17 interchange. Country Club Drive is primarily a residential roadway located to the east of Cummings Street. Empire Drive is located north of I-81 to the east of U.S. Route 11. The interchange/cross streets described above tie into these existing rural roads that run parallel to I-81 within the study area.

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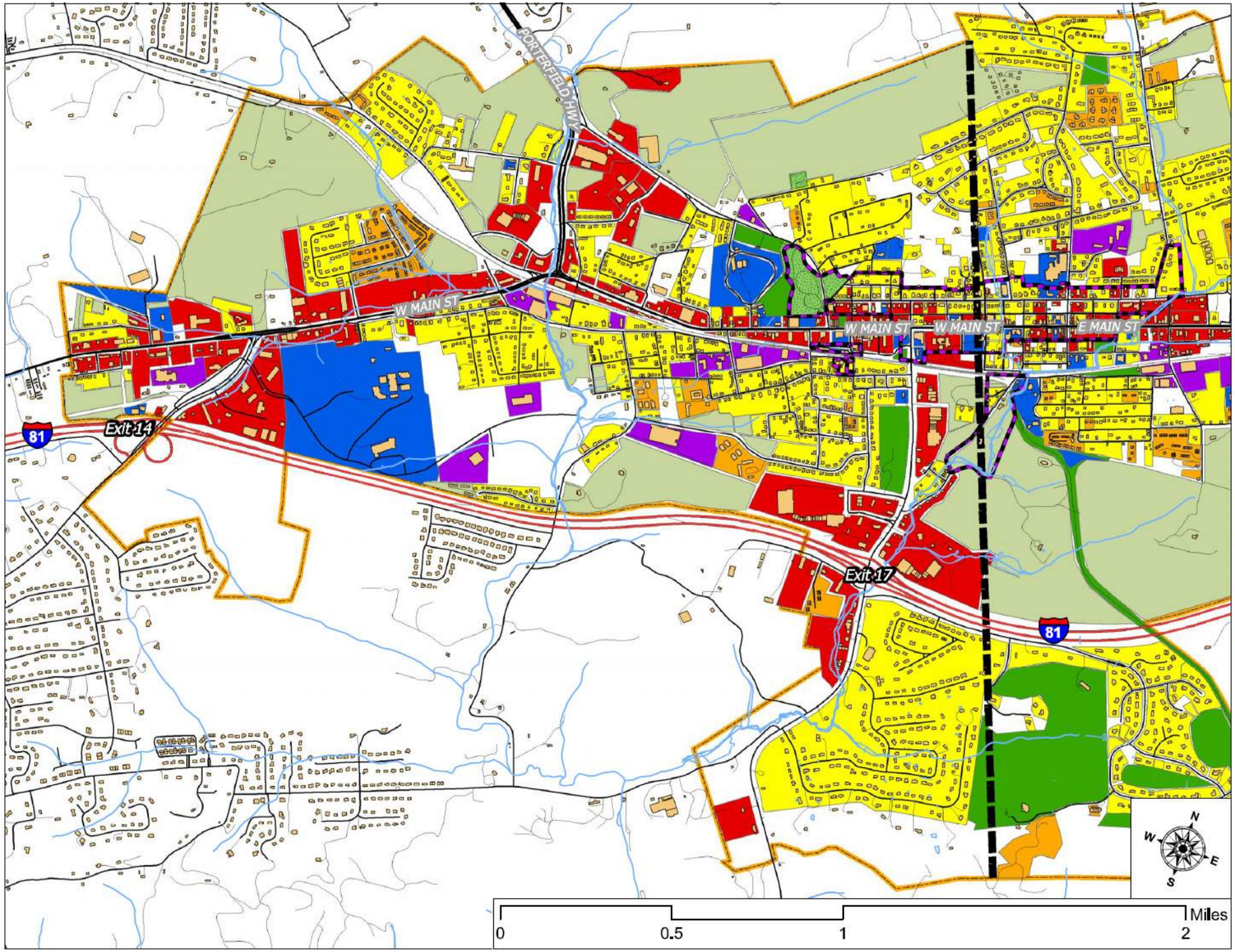


Town of Abingdon,
Washington County, Virginia
Comprehensive Plan Update
August 2013

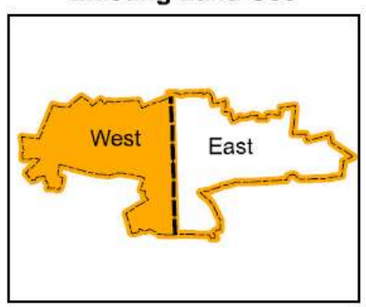
Legend

- Corporate Limits
- Historic District
- Match Line

Existing Land Use

- Agricultural/ Forest
- Low-Density Residential
- Medium-Density Residential
- High-Density Residential
- Office/ Commercial
- Business/ Tech./ Industrial
- Public/ Institutional
- Recreation
- Cemetery

Map 15- West
Existing Land Use



Kimley»Horn	Interstate 81 Frontage Road Corridor Study Bristol, VA	Town of Abingdon Existing Land Use Plan	Figure 2

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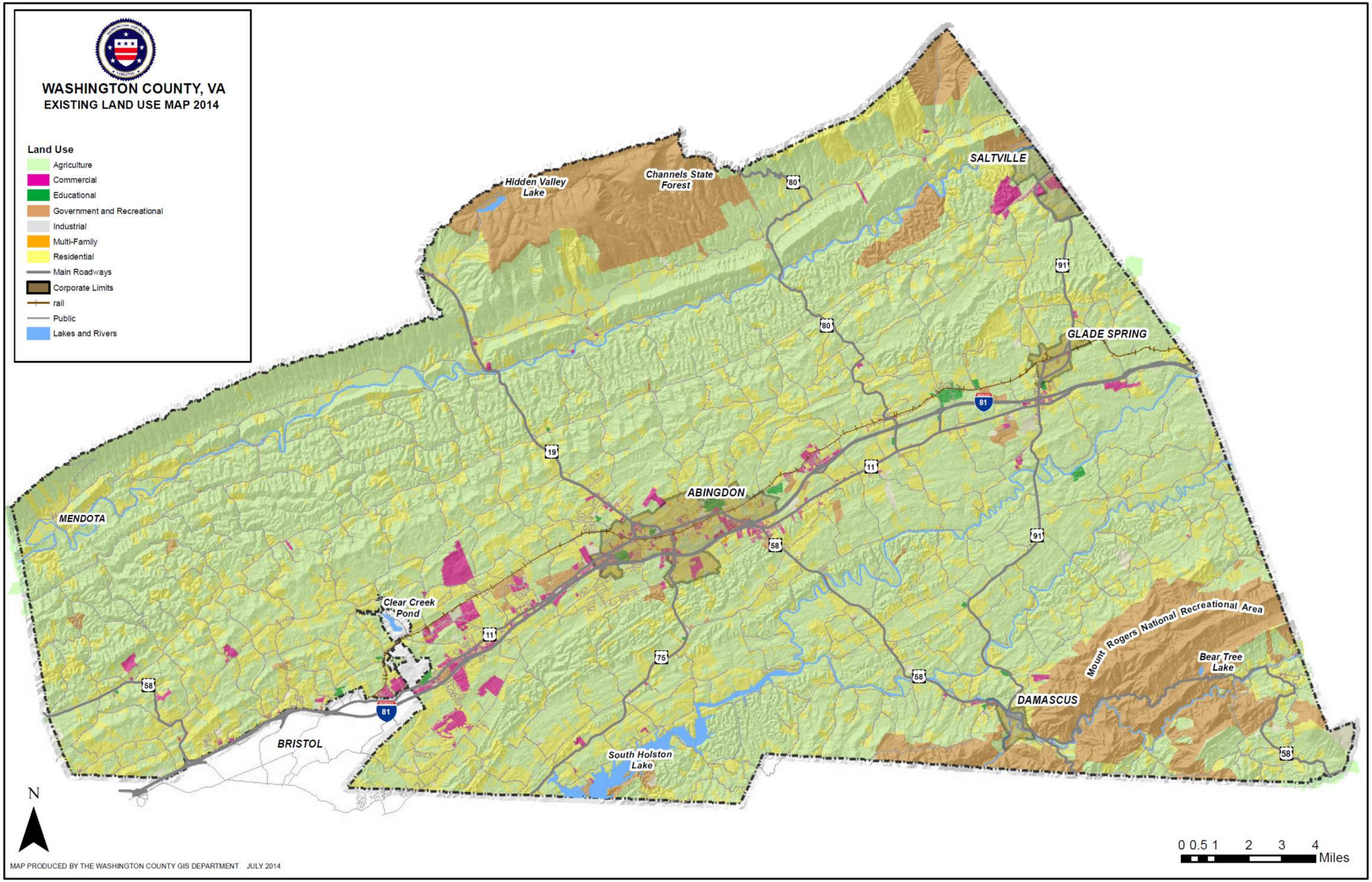

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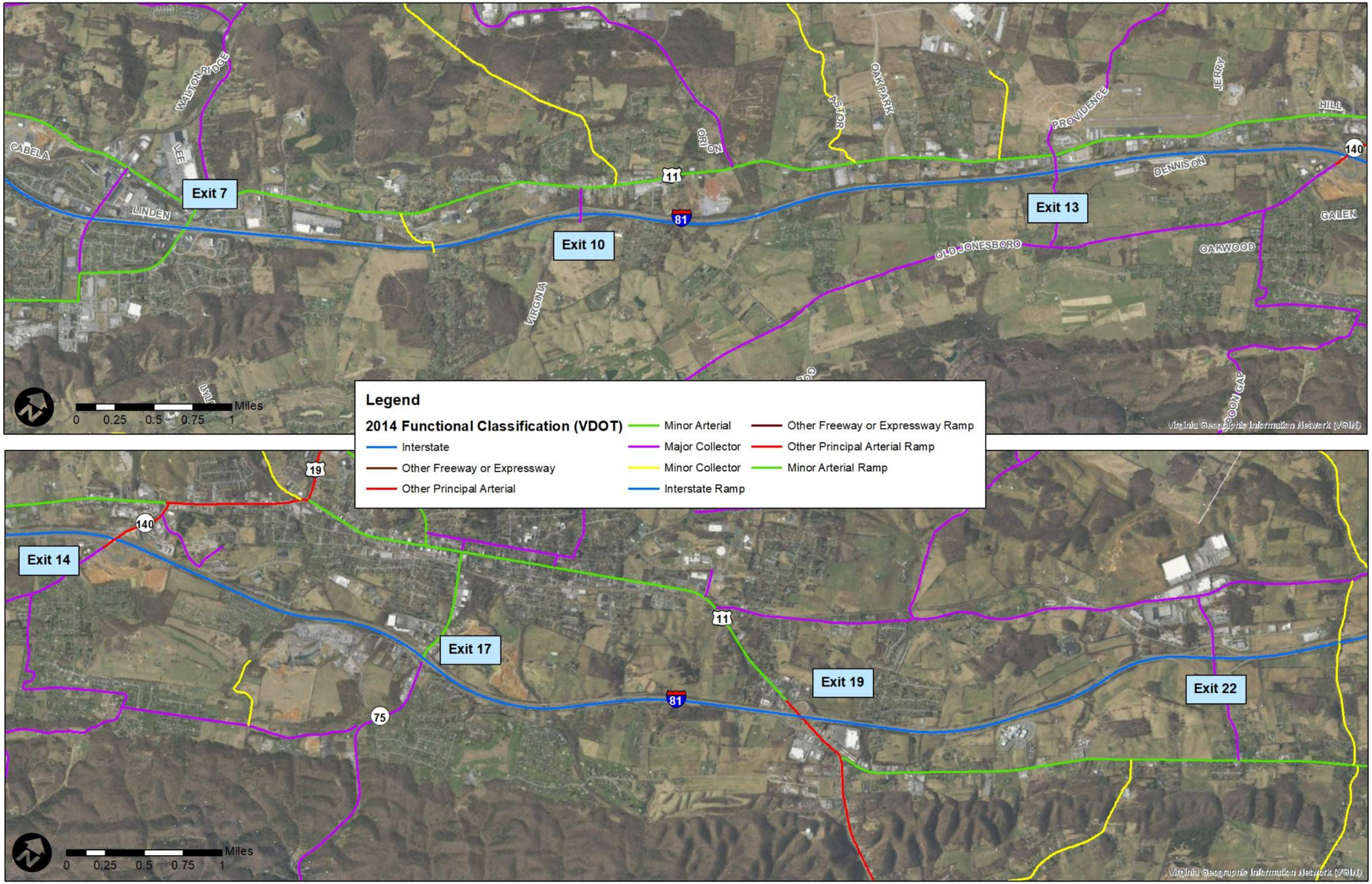

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Interstate 81 Frontage Road Corridor Study
Bristol, VA

Roadway Functional Class Map

Figure 4

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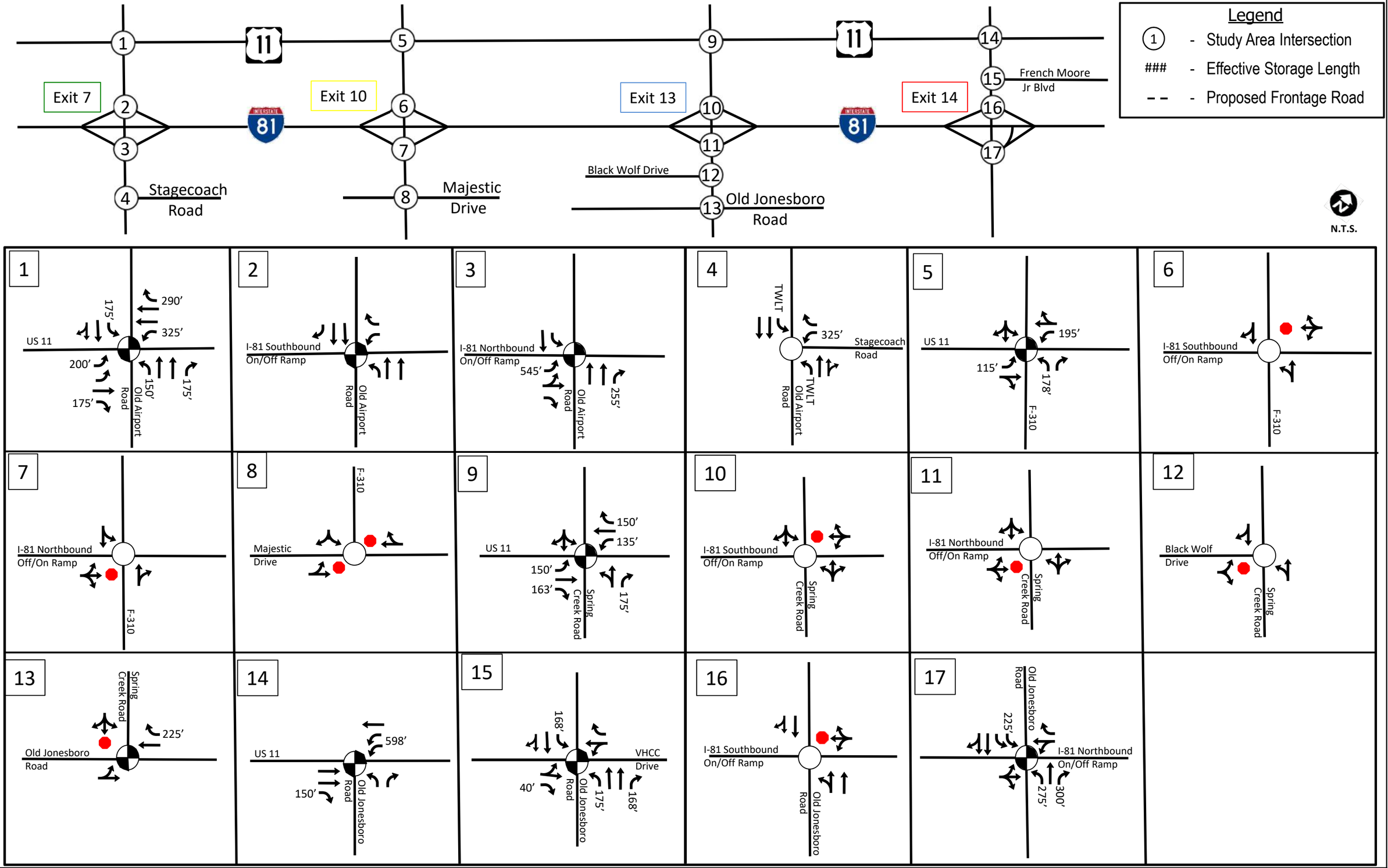

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Existing Roadway Conditions (1 of 2)

Figure 5

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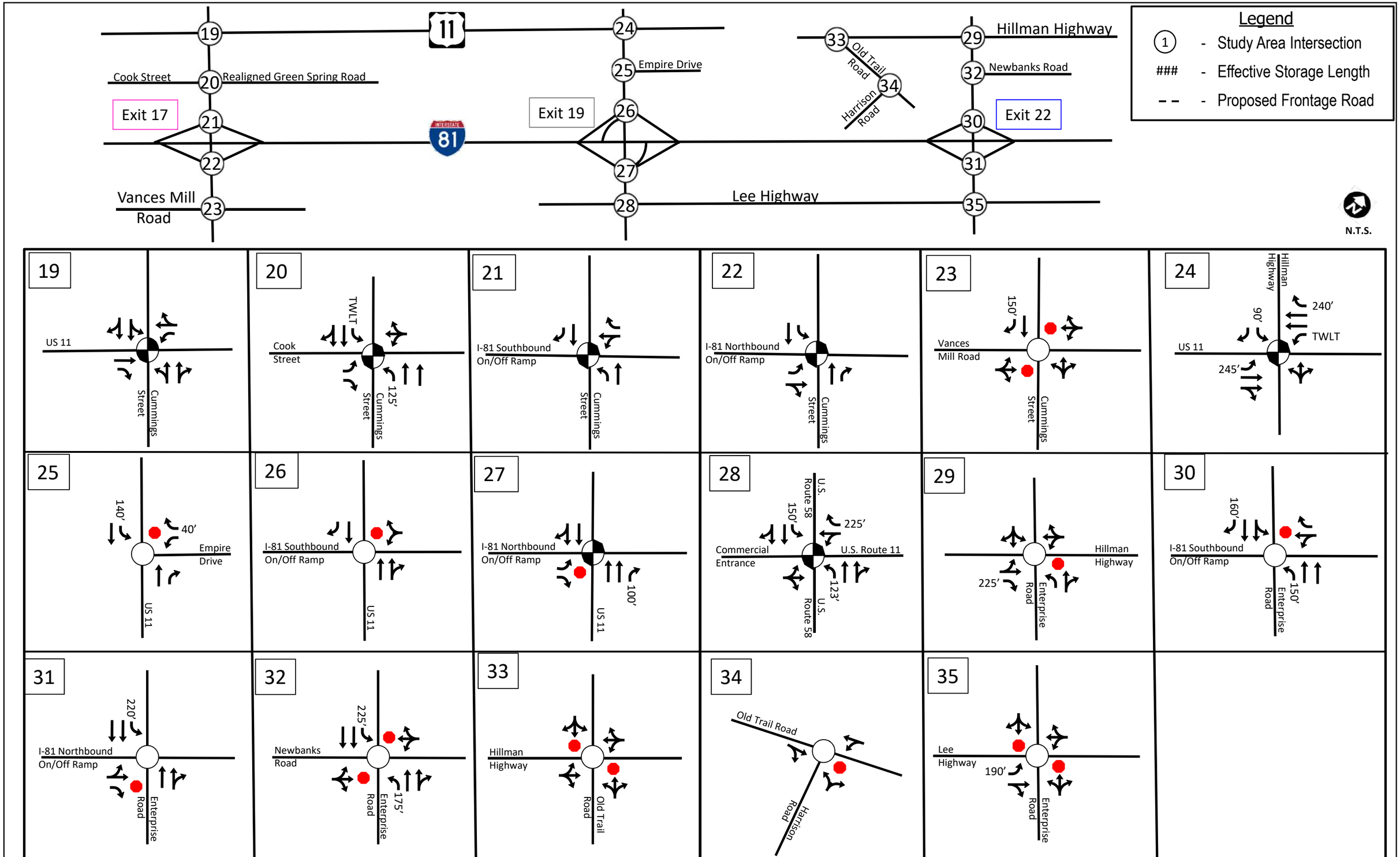

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Interstate 81 Frontage Road Corridor Study
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Existing Roadway Conditions (2 of 2)

Figure 6

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3.4 Alternative Travel Modes

There are minimal options within the study area and surrounding area for the use of alternative travel modes. Limited transit services are provided via the District Three Public Transit. This public transit program is available to all age groups and helps serve shopping routes, shuttle services and college commuter routes throughout the rural areas in the study area. Reservations to use the service are required. Bicycle and pedestrian facilities are also limited within the study area. There are some sidewalks provided along U.S. Route 11 within the study area. Most of U.S. Route 11 from Reedy Creek Road to Hillman Highway has sidewalks.

Additionally, the Virginia Creeper Trail is located within the study area in the vicinity of Exit 17. This trail is a converted railroad bed and stretches 34 miles from Abingdon, Virginia to Damascus, Virginia.

3.5 Environmental Data

A comprehensive review was conducted on data obtained from various standard environmental data sources related to wetlands and other surface waters, floodplains, threatened and endangered species, cultural and historic resources, and hazardous materials. Additional data regarding the environmental studies for this project can be found in **Chapter 6.0** of this report.

A field investigation was conducted January 16-17, 2019 for the Environmental Assessment that reviewed local existing conditions, verify the results of the database review, and collect data on those sites not identified in the database review but observed in the field.

3.6 Traffic Data Collection

Various data sources were used to compile the necessary inputs for the operational analyses. Traffic volumes (daily and peak hour), peak hour factors, heavy vehicle percentages, lane designations, turn-lane storage lengths, and traffic signal timings/phasings were all established from current data collection efforts.

Existing 2018 traffic counts were collected for the study area intersections and selected roadway segments. AM and PM turning movement counts (TMC) were collected at the study area intersections #1 through #35 from September 25-27, 2018. Uniform peak hours for the AM and PM time periods were determined from the available count data and established to be 7:30 am to 8:30 am and 4:30 pm to 5:30 pm. 72-hour ADT tube counts were collected from September 25-27, 2018 at the following locations:

- Old Dominion Road between U.S. Route 11 and Flame Leaf Drive
- Halls Bottom Road between U.S. Route 11 and Singing Wood Lane
- Singing Wood Lane between Hedgerow Hill and Dead End
- U.S. Route 11 between Russell Road and Academy Drive
- Stone Mill Road between Bonnycastle Drive and Lowry Drive
- Country Club Drive between Cummings Street and Oakmont Drive
- U.S. Route 11 between Tanner Street and Rugby Terrace
- U.S. Route 11 between Amanda Lane and Watauga Road
- Stonybrook Road between Hillman Highway and U.S. Route 11
- U.S. Route 11 between Green Meadows Lane and Ravenswood Drive
- U.S. Route 11 between Industrial Park Road and Halls Bottom Road
- U.S. Route 11 between Sky King Drive and Virginia Highlands Airport
- U.S. Route 11 between Charwood Drive and Reedy Creek Road

Daily, AM and PM peak hour volumes from the counts used for this analysis are shown in **Figure 7** and **Figure 8.** Detailed traffic count data is provided in **Appendix B**. Existing traffic signal timings were provided by the City of Bristol and VDOT for their applicable signalized intersections.

Windshield surveys were conducted to document existing traffic operations, existing roadway geometric conditions, and to compile an inventory of digital still photographs within the study area that captured elements of interest, such as signalized or unsignalized intersections, posted speed limits, roadway and intersection geometrics, geometric deficiencies, sight distance constraints, bike and pedestrian accessibility, potential safety concerns, utilities, and general operational deficiencies.

3.7 Existing Traffic Operations

The existing traffic operations for this study consists of the analysis of several freeway, arterial, and intersection components within the study area using the methods described in the TOSAM and consistent with the assumptions provided in the approved Framework Document.

Operational analyses for the study area roadways/intersections were analyzed using Highway Capacity Software (HCS), Synchro Professional (Version 10.2, Build 0, Revision 45) and SimTraffic, which is the microsimulation companion tool of Synchro. Interstate 81 and U.S. Route 11 segments within the study area were evaluated using the corresponding modules (i.e., Freeway, Multi-Lane, Two-Lane) of HCS 2010 (Version 6.5). Synchro was used to analyze the intersection operations and SimTraffic to report intersection queue lengths. Details on the existing traffic operation analysis methodologies, calibration, and result are presented in **Section 7.3**.

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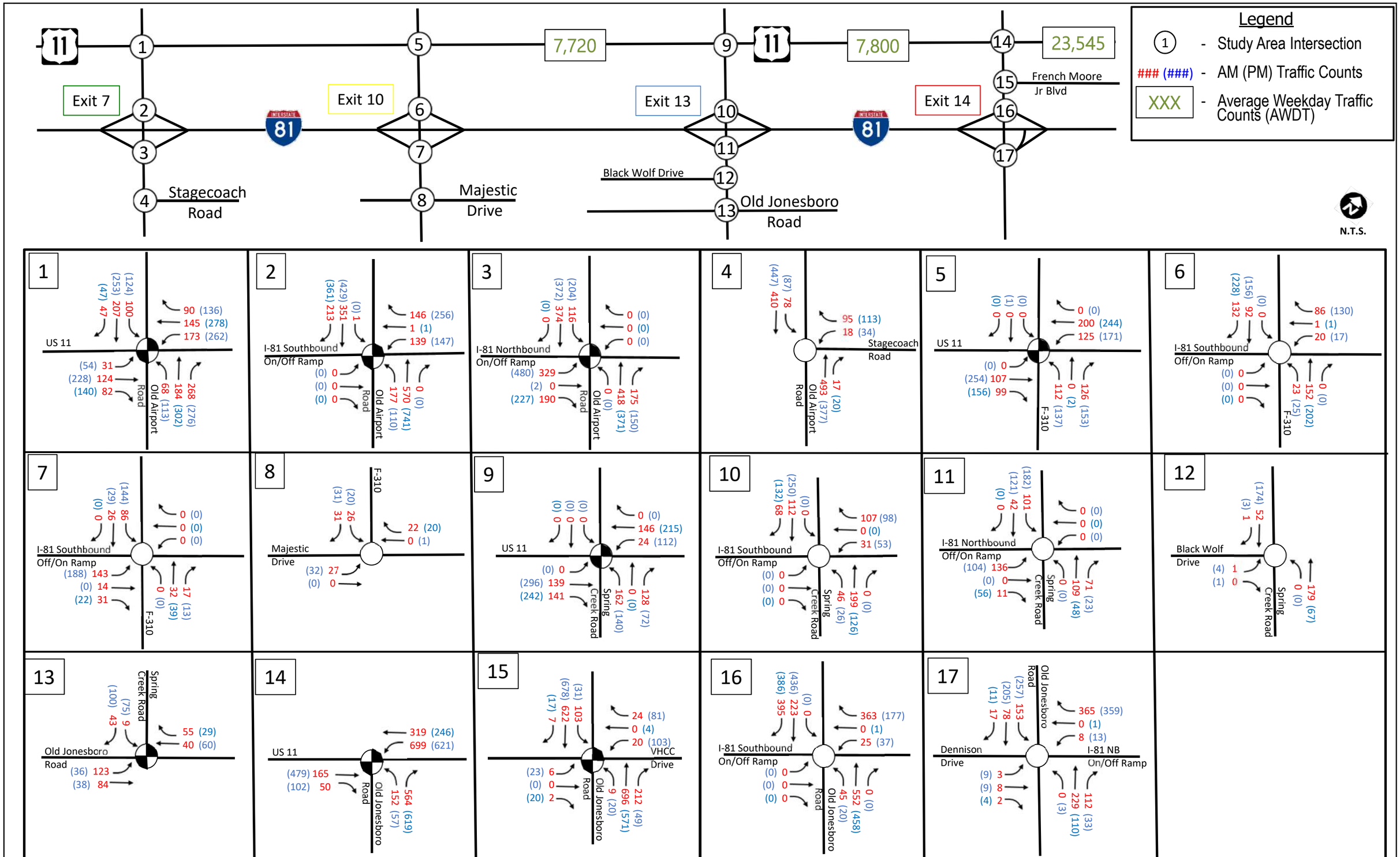

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2018 Existing Peak Hour Volumes (1 of 2)

Figure 7

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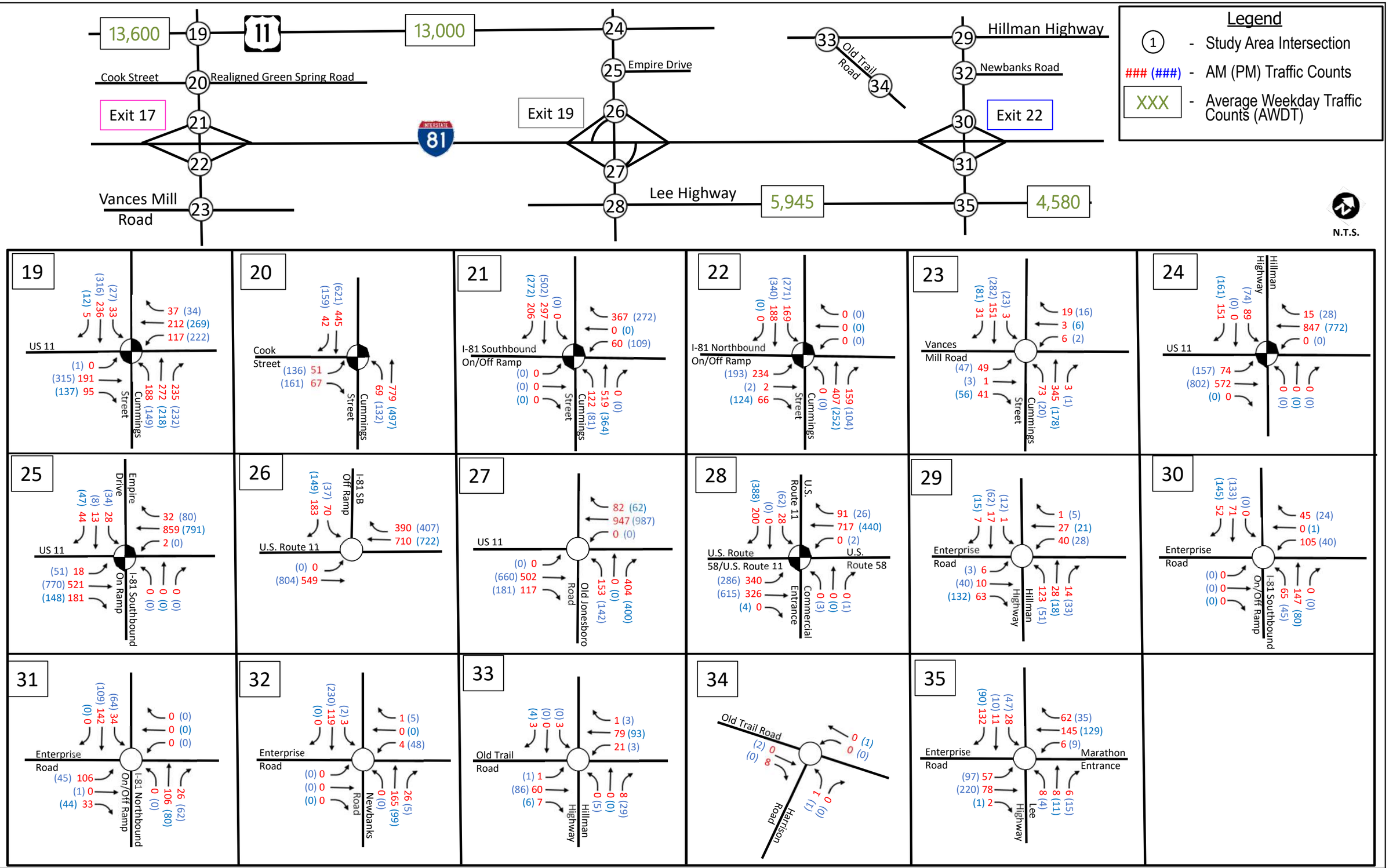

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Adjusted 2018 Peak Hour Volumes (2 of 2)

Figure 8

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3.8 Historic Crash Data

A qualitative safety analysis was conducted by reviewing the historic crash patterns on I-81, study intersections, and along other roadways within the study area. The latest five (5) years of crash data, collected between January 1, 2013, and December 31, 2017, was compiled and summarized within the study area. Historic crash densities were also determined along the study area and are presented in **Figure 9**. This illustrates the areas where higher frequencies of crashes were noted to occur. Based on the review of these crash densities, areas where with relatively higher frequencies of crashes can be identified through visual assessment. Specifically, the sections of I-81 between Exit 7 to Exit 10 and Exit 14 to Exit 19 were noted to experience a high density of crashes along the interstate. The area with the highest density of crashes along the interstate occur in the vicinity of Exit 19. For the non-interstate facilities, the segments with the highest density of crashes were noted to occur in the vicinity of Exit 7 (i.e., Old Airport Road) and Exit 17 (i.e., Cummings Street).

Detailed schematics illustrating the location, type, and severity of crashes during this period are provided in **Appendix C**.

3.8.1 Overall Crashes

During the five-year period, a total of 2,474 reported crashes occurred on the roadways contained within the study area. The majority of crashes that occurred in the study area were property damage only (PDO) crashes, making up 68 percent of the total crashes. Thirty two percent of the crashes resulted in an injury and five fatalities were noted to occur within the study area during this five-year period. Three of the five fatalities occurred on a non-interstate roadway within the study area. The two remaining fatalities occurred on northbound I-81, between milepost 13.7-14.3 and on the northbound Exit 10 off-ramp.

The majority of crashes occurred on a non-interstate roadway, making up 45% of the total crashes. 35% of the crashes occurred on I-81 or an interchange within the study area and 21% of the crashes occurred at the study intersections. The majority of the crashes were rear end collisions, making up 36% of the overall crashes. Generally, weather, time of day, and lighting conditions did not have a significant impact on the safety of this corridor.

3.8.2 Interstate Crashes

A total of 805 crashes occurred on the interstate mainline and 52 crashes occurred on the interstate ramps during the five-year period. The predominant crash type along I-81 within the study area were “fixed object-off road”, consisting of approximately 44 percent of the crashes on interstate. Rear end collisions were the second most prevalent crash type with 19 percent of the crashes on the interstate. Fixed object-off road collisions occur most frequently when drivers are distracted or lose control of their vehicle on roadways with high speeds. 33% of the crashes on the interstate mainline and interstate ramps resulted in an injury with 67% of the crashes being property damage only.

3.8.3 Intersection Crashes

532 total crashes occurred at the study intersections within the corridor. 74% of the collisions were property damage only and did not result in any injuries. The most common crash type at the study intersections were “rear end” collisions, making up 50% of the crashes at intersections within the study area. Rear end collisions occur most commonly at intersections where drivers are stopping and going frequently. Angle collisions were the second most common crash type with 30% of the crashes occurring at the study intersections. Angle collisions are common at intersections due to the conflicting points of traffic.

3.8.4 Crashes on other Roadway Segments

1106 total crashes occurred on roadways within the study area that are not on I-81 or at one of the study intersections. 67% of the crashes on these roadway segments resulted in property damage only. The majority of crashes were rear end collisions, consisting of 43% of the crashes on these roadways. The second most common collision type on these roadway segments were angle collisions. These roadway segments include intersections and roadways that were not captured as one of the study intersections. The rear end collisions likely occur at signalized

3.8.5 Impacts of Crashes on Freeway/Parallel Route Operations

It was noted during the development of this study that I-81 is subject to significant safety and reliability issues. Specifically, when incidents occur on I-81, many vehicles are forced to utilize U.S. Route 11 as a detour route. This significantly impacts the ability of local traffic to navigate the area and result in periods of high delay on both interstate and local travel. To this end, VDOT has begun investing in implementing targeted improvements along portions of Interstate 81 within the Commonwealth to help reduce these periods of significant delays.

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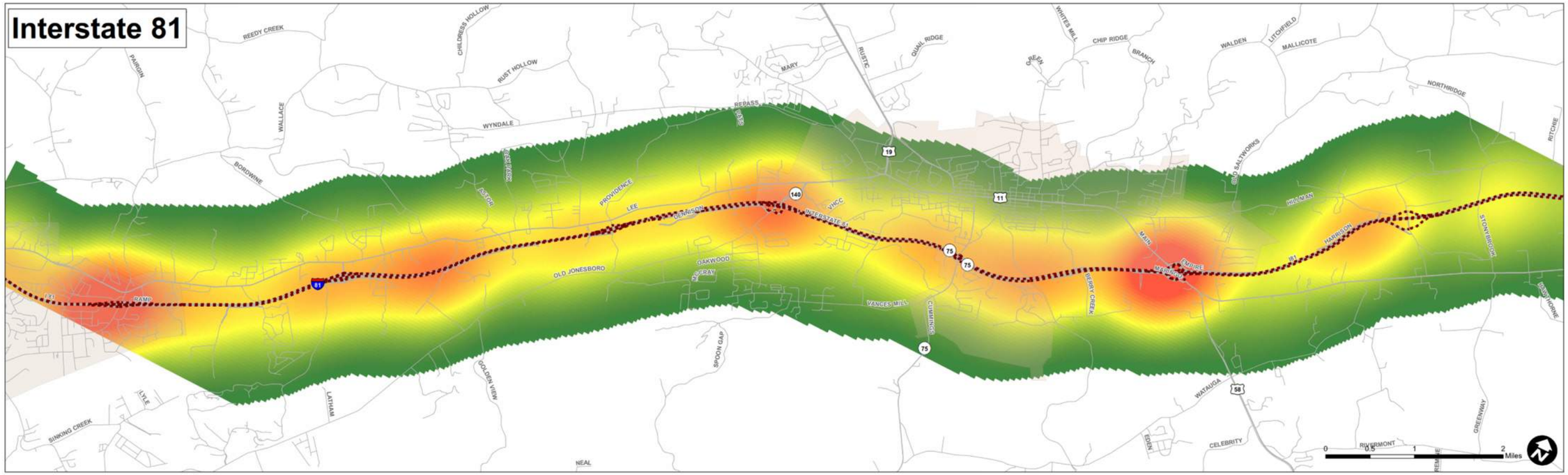
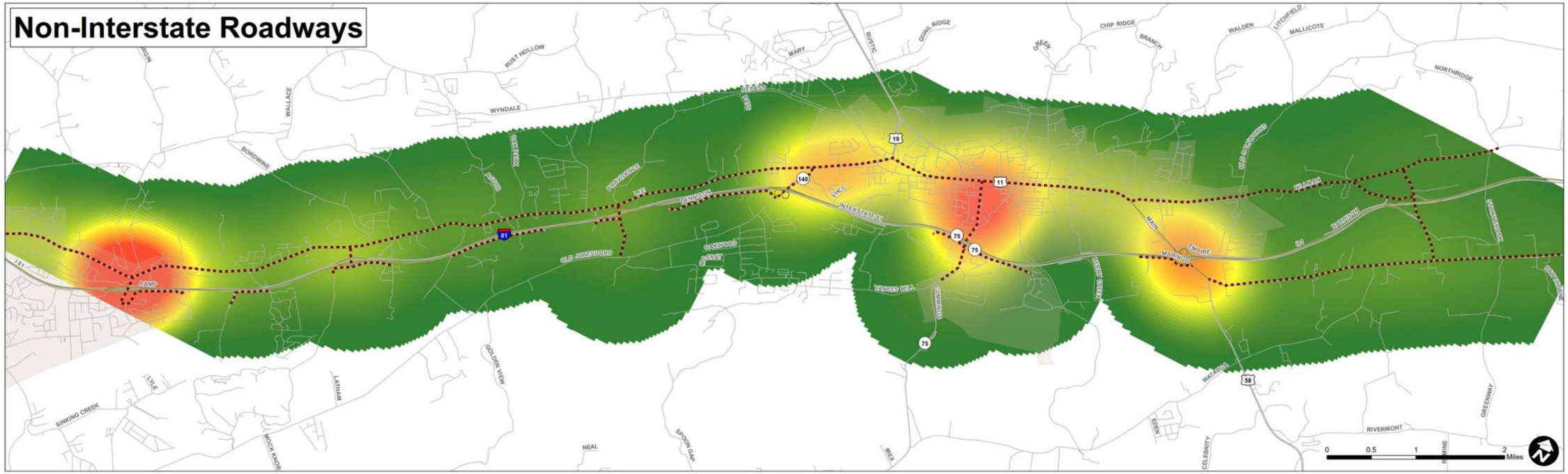


Crash Densities: Low → High

Legend

Study Roads



Kimley»Horn	Interstate 81 Frontage Road Corridor Study Bristol, VA	Study Area Crash Density Map (2013-2018)	Figure 9

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4.0 Alternatives Considered

In order to address the operational and reliability demands of I-81, multiple alternatives were developed that considered ways to improve the existing roadway network and/or develop new roadway alignments. The goal of these alternatives was to address the needs identified as part of this study and includes:

- Ability to safely and efficiently accommodate regional and local traffic volumes
- Support reliability and incident management along I-81 and adjacent facilities
- Support the needs of the community
- Implementable and fundable solutions

To this end, various types of alternatives were considered throughout the study area that included construction of new roadways, improvements to existing facilities, and/or a combination of the two. New alignments that were identified would serve as connections to existing roadway facilities that "fill the gaps" in a contiguous parallel frontage road system between Exit 7 and Exit 22. These eight (8) gaps, as highlighted in **Figure 10**, represent the only remaining segments where new roadway facilities could be constructed and ultimately provide the necessary connections for a complete frontage road system. In addition to new roadway construction, portions of the existing roadways located along this frontage road corridor would be upgraded to meet VDOT standards, where possible.

Frontage road alternatives were considered based on their ability to serve as viable routes between adjacent interchanges (i.e., between Exit 7 and Exit 10). Potential alignments were considered based on implementation cost, network connectivity, minimizing impacts to property owners, and limitations of the natural environment. Other alternatives considered as part of this study included capacity improvements to either existing U.S. Route 11 or I-81, which were consistent with other recent plans considered in the region. Ultimately, five (5) alternatives were developed and considered as part of this study:

- Alternative #1 – No Build
- Alternative #2 – Frontage Road Alignments (Northern Connections)
- Alternative #3 – Frontage Road Alignments (Southern Connections)
- Alternative #4 – Widen Existing U.S. Route 11
- Alternative #5 – Widen Interstate 81

4.1 No Build Conditions (Alternative #1)

Alternative #1, or the No-Build option, represents the current roadway conditions with just planned or programmed improvements within the study area. The No-Build option does not satisfy the purpose and need of this study. It is included in the analysis as a point of comparison to the other alternatives considered if no improvements were made to the existing roadway network.

4.2 Build Conditions – Frontage Road Alignments (Alternatives #2 and #3)

The ultimate vision for a frontage road system within the study area would be to provide a contiguous, two-lane roadway (i.e., 12-foot wide lanes, with 4-foot paved shoulders) that provides alternative connections to local facilities between Exit 7 to Exit 22. Additionally, to help minimize the impacts of new roadway construction, the ability to utilize or tie into existing roadways were heavily weighed when considering the location of a frontage road system. Proposed design criteria for the existing and proposed roadway segments within the study area are provided in **Appendix D**.

To achieve this vision, segments were considered individually as they provide independent connections to adjacent interchanges. The main differences in the potential frontage road alignments considered under Alternative #2 and Alternative #3 is whether to locate the road on the north or south side of I-81, based on network connectivity (i.e., ability to tie into, or utilize, existing roadway alignments). During the development of the frontage road alignments, some segments were had multiple configurations that could utilize existing facilities located on either side of I-81. For the purposes of organizing the frontage road connection, segments located on the north side were defined as Alternative #2, and segments located on the south side were defined as Alternative #3. It should also be noted that some segments only had one realistic location option in this regard and therefore share a common proposed alignment configuration under both Alternative #2 and Alternative #3.

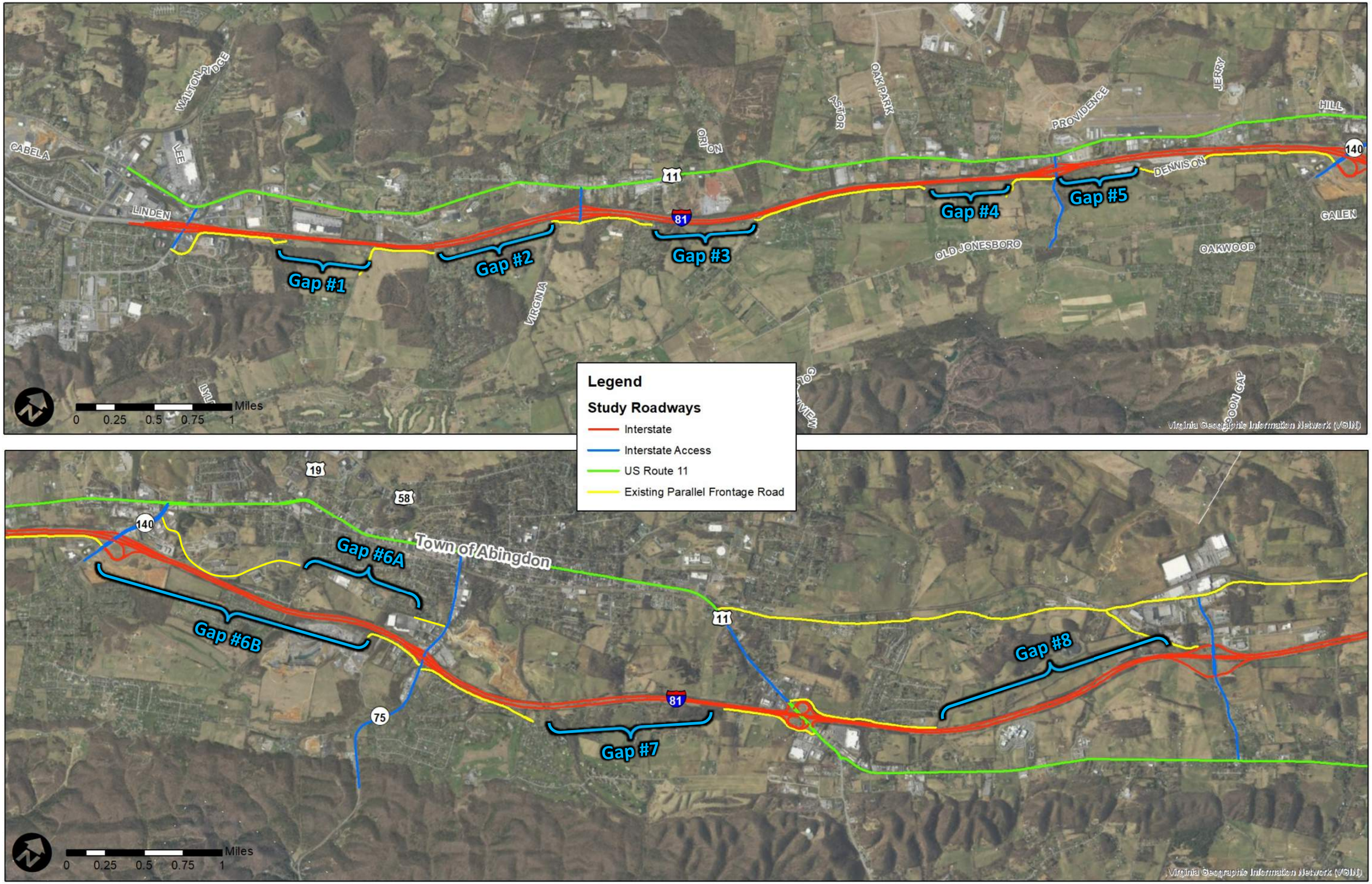
Frontage road alignments for Alternatives #2 and #3 are shown in **Figure 11** and are described in more detail in the following sections.

4.2.1 Between Exit 7 and Exit 10

4.2.1.1 ALTERNATIVES #2 AND #3

Based on the existing roadway network and other environmental constraints, it was determined that the only viable location for this segment of frontage road would be located on the south side of I-81 between Exits 7 and 10. This section was noted to have multiple portions of roadway that a potential frontage road could utilize as part of its alignment. The first section of a proposed frontage road system would incorporate existing Stagecoach Road from Old Airport Road to where it ends approximately 4,000 feet to the east. A new section of roadway would be constructed that extends approximately 3,600 feet to where it would tie into existing Flame Leaf Drive. The proposed frontage road would share an alignment with a portion of existing Flame Leaf Drive for approximately 1,900 feet, where it would then extend approximately 4,000 feet north of the Lowry Hills neighborhood and connect to Majestic Drive to the east.

In total, this segment of frontage road would require approximately 7,500 feet (1.4 miles) of new roadway alignment to provide a complete secondary roadway system that connects Exit 7 and Exit 10. This would also serve as a second point of access to/from the Lowry Hills neighborhood, as they currently can only enter/exit their neighborhood via Old Dominion Road to the north from U.S. Route 11.



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Existing Frontage Road Gaps

Figure 10

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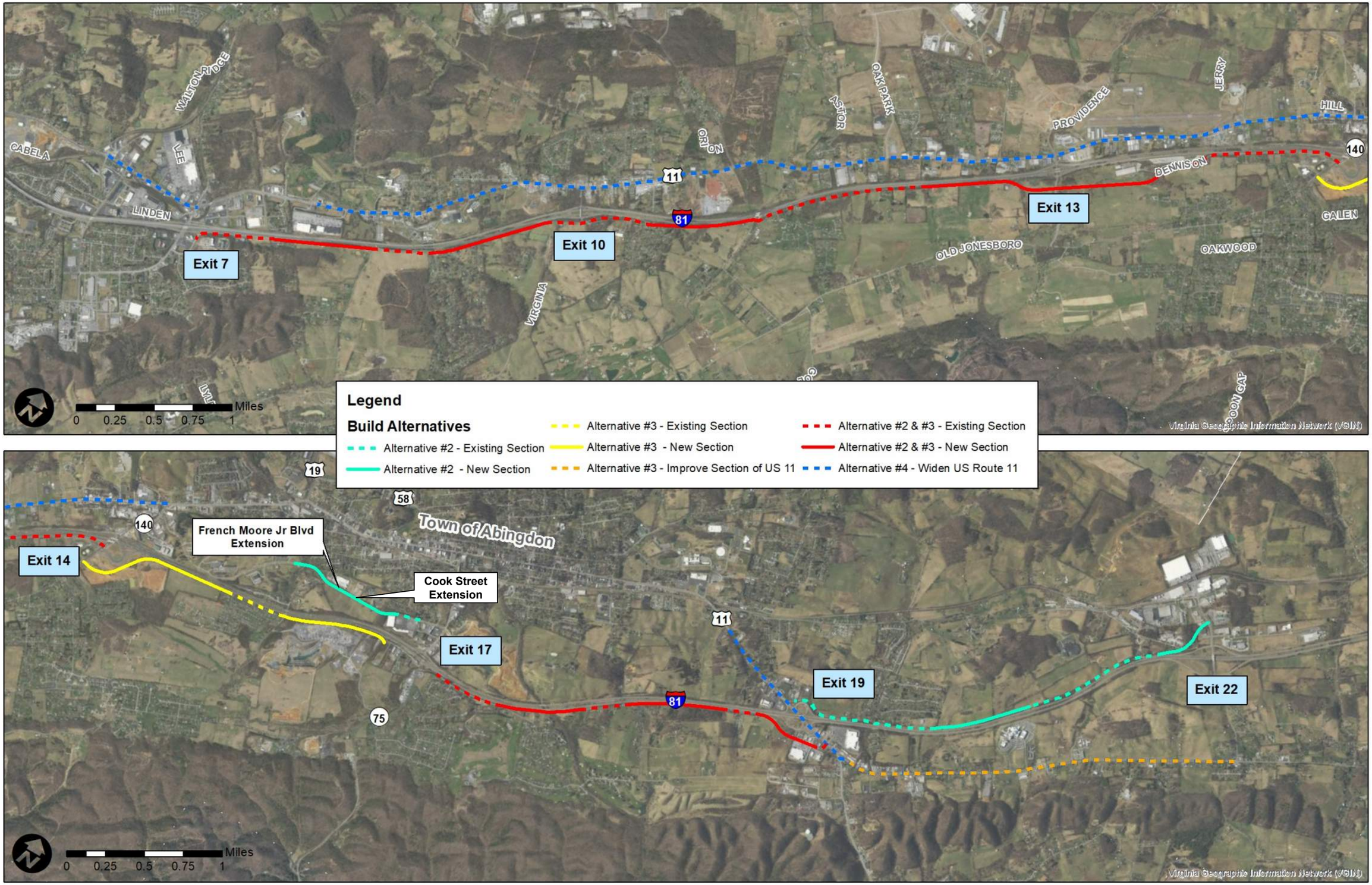

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Build Alternatives

Figure 11

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4.2.2 Between Exit 10 and Exit 13

4.2.2.1 ALTERNATIVES #2 AND #3

Based on the existing roadway network connectivity and other environmental constraints, it was determined that the only viable location for this segment of frontage road would be located on the south side of I-81 between Exits 10 and 13. This section was also noted to have multiple portions of roadway that a potential frontage road could utilize as part of its alignment. The first section of a proposed frontage road system would incorporate existing Majestic Drive and extend approximately 3,400 feet to the east where it would intersect with Halls Bottom Road, approximately 600 feet south of Singing Wood Lane. Due to elevation constraints in this area, the frontage road could not tie directly into the existing intersection with Singing Wood Lane, resulting in the proposed offset intersections. The next section picks up from Singing Wood lane, where a new section of roadway would be needed that extends to the east approximately 3,000 feet, and from there it would tie into existing Black Wolf Drive.

In total, this segment of frontage road would require approximately 6,400 feet (1.2 miles) of new roadway alignment to provide a complete secondary roadway system that connects Exit 10 and Exit 13.

4.2.3 Between Exit 13 and 14

4.2.3.1 ALTERNATIVES #2 AND #3

Based on the existing roadway network connectivity and other environmental constraints, it was determined that the only viable location for this segment of frontage road would be located on the south side of I-81 between Exits 13 and 14. This segment was also noted to only require one section of new roadway to be able to connect Exit 13 (i.e., Spring Creek Road) to Exit 14 (i.e., Old Jonesboro Road). This segment of frontage road would extend approximately 3,400 feet to the east from Spring Creek Road and tie into existing Dennison Drive. No additional improvements would be needed on Dennison Drive as the frontage road corridor would connect to Exit 14.

4.2.4 Between Exit 14 and Exit 17

A potential frontage road system between Exit 14 and Exit 17 was determined to have two potentially viable locations:

4.2.4.1 *ALTERNATIVE #2*

Under this alternative, the frontage road system would continue from Old Jonesboro Road at Exit 14 but would originate on the north side of I-81 and utilize existing VHCC Drive/French Moore Jr. Boulevard by the Virginia Highlands Community College campus. The frontage road system would transition where French Moore Jr. Boulevard ends and extend approximately 900 feet to tie it into Stone Mill Road to the east. Based on previous analyses and investigations, it was determined that this 900-foot section of roadway would also require a significant bridge structure to complete this extension. The next section of new frontage road would continue to east and extend approximately 3,000 feet where it would tie into existing Cook Street. This alternative and alignment is consistent with plans that the Town of Abingdon have previously developed for this area (*Town of Abingdon Corridor and Connector Road Study* [February 2012]). Collectively, Alternative #2 between Exit 14 and Exit 17 is also known as the "French Moore Jr Boulevard Extension".

In total, this segment of frontage road would require approximately 3,900 feet (0.7 miles) of new roadway alignment to provide a complete secondary roadway system that connects Exit 10 and Exit 13.

4.2.4.2 *ALTERNATIVE #3*

Under this alternative, the frontage road system would continue from Old Jonesboro Road at Exit 14 but would originate on the south side of I-81. A new section of roadway would be constructed and extend approximately 5,000 feet to the east, where it would tie into Bonnycastle Drive. From here, the frontage road system would extend approximately 3,000 feet to the east from Stone Mill Road, north of the quarry, and tie into the new section of Commerce Drive/Gravel Lake Road being constructed as part of the upcoming I-81 Exit 17 improvements.

In total, this segment of frontage road would require approximately 8,000 feet (1.5 miles) of new roadway alignment to provide a complete secondary roadway system that connects Exit 14 and Exit 17.

4.2.5 Between Exit 17 and Exit 19

4.2.5.1 ALTERNATIVES #2 AND #3

Based on the existing roadway network connectivity and other environmental constraints, it was determined that the only viable location for this segment of frontage road would be located on the south side of I-81 between Exits 17 and 19. This section was also noted to have multiple portions of roadway that a potential frontage road could utilize as part of its alignment. The first section of a proposed frontage road system would incorporate existing Country Club Drive, where it will be realigned to the south to accommodate the changes being implemented as part of the upcoming I-81 Exit 17 improvements. A new section of roadway would be constructed that extends where Country Clube Drive ends approximately 2,800 feet, over the Creeper Trail, to where it would tie into existing Wycoff Drive. To minimize any impacts to the Creeper Trail, the frontage road alignment would be located as close as possible to I-81 and would share a portion of the interstate bridge structure that traverses over the Creeper Trail. This bridge would need to be widened to accommodate the frontage road but would eliminate the need for a separate bridge crossing at this environmentally sensitive feature.

The proposed frontage road would continue on Wycoff Drive and transition into Berry Creek Drive in the east. A new alignment would extend approximately 4,500 feet to the east from where Berry Creek Drive ends, south of the Lowe's shopping center, and would intersect with U.S. Route 58/U.S. Route 11. Ultimately, the frontage road here would tie into a realigned intersection at U.S. Route 58 and U.S. Route 11 and would become the fourth leg at that intersection.

In total, this segment of frontage road would require approximately 7,300 feet (1.4 miles) of new roadway alignment to provide a complete secondary roadway system that connects Exit 17 and Exit 19.

4.2.6 Between Exit 19 and Exit 22

A potential frontage road system between Exit 19 and Exit 22 was determined to have two potentially viable locations:

4.2.6.1 *ALTERNATIVE #2*

Under this alternative, the frontage road system would continue from U.S. Route 58/U.S. Route 11, traverse through the Exit 19 interchange, and would originate to the north of I-81 at relocated Empire Drive (as part of the upcoming I-81 Exit 19 improvements). The first section of a proposed frontage road system under this alternative would incorporate existing Empire Drive until it ends to the east. From here, a new alignment would be constructed that extends approximately 3,900 feet to Harrison Road. The frontage road would utilize Harrison Road for approximately 4,000 feet, where then a new section of roadway would be constructed that extends approximately 2,200 feet and intersects with Enterprise Road. This new intersection, and the termini of the frontage system within the study are would be located approximately 890 feet to the north of the Exit 22 southbound on-/off-ramps.

In total, this segment of frontage road would require approximately 6,100 feet (1.2 miles) of new roadway alignment to provide a complete secondary roadway system that connects Exit 19 and Exit 22.

4.2.6.2 *ALTERNATIVE #3*

Under this alternative, consideration was given instead to widen existing U.S. Route 11, which picks up where previous section (i.e., Exit 17 to Exit 19) of the frontage road ended, and is located on the south side of I-81. This would require that U.S. Route 11 be widen from two- to four-lanes for a distance of approximately 2.6 miles. This improvement would also be consistent with plans previously developed by Washington County and coincides with their vision for this area (i.e., economic and medial districts in support of the Johnston Memorial Hospital).

4.3 Build Conditions – Widen Existing U.S. Route 11 (Alternative #4)

Under this alternative, consideration was given to widen U.S. Route 11 from a two-lanes to four lanes between Alexis Drive to the west and Enterprise Road to the east, where possible. This concept has been previously considered for many of the localities within the study area, as they have either pursued or received funding to improve portions of U.S. Route 11. Specifically, the City of Bristol has obtained funding to widen the portion of U.S. Route 11 between Exit 5 to the west and Alexis Drive to the east. Town of Abingdon and Washington County have also pursued funding opportunities in attempt to widen or improve sections of U.S. Route 11, with little success. These improvements were generally sought in support of Virginia's Transportation Plan (VTrans) for the I-81 corridor (Crescent Corridor). In this planning document, a need was identified along U.S. Route 11 as described below:

- *Need M – Ability for U.S. Route 11 to serve as a parallel highway facility limited by speed and capacity (VTrans Crescent Corridor)*

While widening U.S. Route 11 would help address this identified need, the feasibility of accomplishing these improvements have been noted to be challenging and costly. A 1.5-mile portion of U.S. Route 11 traverses through downtown Abingdon (i.e., between Russell Road and Boone Street) is severely constrained and would be nearly impossible to widen to four-lanes. Additionally, localities within the Bristol District have recently submitted applications for funding via the SMART Scale program for U.S. Route 11 widening and have not been successful, due to the higher project costs of the widening, limited District funds, and low scoring applications.

For the purposes of this study, the potential widening of U.S. Route 11 was considered as a potential alternative, as it would functionally address similar needs as the proposed frontage road. Section of U.S. Route 11 considered as part of this analysis are illustrated in **Figure 11**.

4.4 Build Conditions – Widen Interstate 81 (Alternative #5)

Interstate 81 is generally a four-lane facility within the study area. Under this alternative, approximately 15.3-miles of I-81 would be widened to a six-lane facility throughout the study area (i.e., between Exit 7 and Exit 22). It should be noted that, VDOT has recently made it a priority to address the many safety and operational issues along I-81 within the Commonwealth. As part of this effort, studies have been conducted that looked at how to improve the flow of traffic along I-81 and prioritize improvements to help mitigate periods of severe congestion. The *Interstate 81 Corridor Improvement Plan* (December 2018) was recently completed that helped identify the locations with the greatest needs and provide potential solutions.

While many segments along I-81 will ultimately be upgraded to a six-lane interstate facility, the portion located within Bristol District was identified to be "lower priority" and will not see significant interstate enhancements during the initial phase of implementation. Other improvements to parallel routes and interchange ramps will be made to help during incidents and to manage detour traffic.

For the purposes of this study, the potential widening of I-81 within the study area was initially considered as a potential alternative, as it would functionally address similar needs as the proposed frontage road.

4.5 Selection of Preferred Alternative

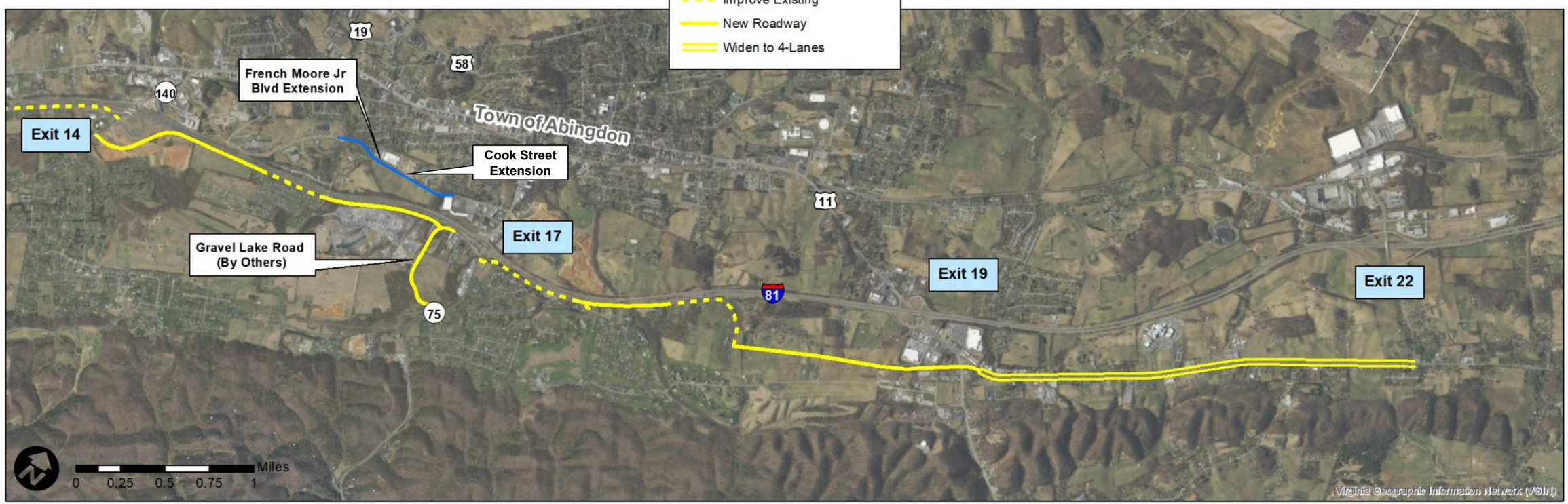
Based on the findings of this analysis in the following Chapters a preferred alternative was ultimately identified. The identified preferred alternative for this study represents a "hybrid" of the alternatives #2 and #3 alignment, with some modifications to the alignment locations, as illustrated in **Figure 12**. Detailed layout sheets for the preferred alternative are provided in **Appendix D.**

The preferred alternative represents a culmination of the input provided by the project team and results of the public engagement process. This reflects the most cost-effective alternative that is meets the intent of this study's purpose and need.

Legend

Preferred Build Alternative

- Improve Existing
- New Roadway
- Widen to 4-Lanes



Kimley»Horn	Interstate 81 Frontage Road Corridor Study Bristol, VA	Preferred Build Alternative	Figure 12

THIS DOCUMENT, TOGETHER WITH THE CONCEPTS AND DESIGNS PRESENTED HEREIN, AS AN INSTRUMENT OF SERVICE, IS INTENDED ONLY FOR THE SPECIFIC PURPOSE AND CLIENT FOR WHICH IT WAS PREPARED. REUSE OF AND IMPROPER RELIANCE ON THIS DOCUMENT WITHOUT WRITTEN AUTHORIZATION AND ADAPTION BY KIMLEY-HORN AND ASSOCIATES, INC. SHALL BE WITHOUT LIABILITY TO KIMLEY-HORN AND ASSOCIATES, INC.

5.0 Public Engagement

As part of the I-81 Frontage Road Corridor Study, multiple opportunities were provided to engage the public and solicit input during the planning process. This chapter describes those efforts and generally summarizes the public's response to the alternatives considered as part of this study.

5.1 Public Meetings

During the development of this study, two separate public information meeting were held to engage the public and include them in the planning process. All meetings were held in accordance with VDOT's policy for public meetings. Public meeting notices and adverts used throughout this study are provided in **Appendix E**.

5.1.1 Public Information Meeting #1

The first public meeting was held on February 7, 2019 from 4:00 pm to 7:00 pm at the Southwest Virginia Higher Education Center. The purpose of this meeting was to introduce and inform the public on the intent of the project. Additionally, the project teams want to solicit input from the public on their experiences traveling through the study area and general receptiveness towards a new frontage road system. At the meeting, display boards and fact sheets were provided that help describe the existing conditions of the study area including:

- Study Area
- Existing Operational Conditions (i.e., Intersection Level of Service)
- Safety/Crash Maps
- Environmental Resources and Constraints

Additionally, a questionnaire was provided to the public to solicit input on their experiences traveling through the study area and which roads/routes they take. The purpose of this questionnaire was to get members of the public thinking and engaged during the meeting on how they utilize the existing roadway system. This was then used to understand the public's perception of the conditions throughout the study area and how traffic could be improved. The questionnaire provided at this meeting is also included in **Appendix E**. Members of the public generally supported the idea of a frontage road system and saw the potential benefits to local traffic flows, based on the responses received at the meeting and on the questionnaire.

Figure 13: Public Information Meeting #1

The study team took the information gathered from this public informational meeting to help identify potential alignment alternatives for a frontage road system and how these connections could serve the public.

5.1.2 Public Information Meeting #2

The second public meeting was held on May 14, 2019 from 5:00 pm to 7:00 pm at the Southwest Virginia Higher Education Center. The purpose of this meeting was to present preliminary alignment alternatives and concepts for a frontage road system to the public. Meeting notices were provided in standard print and online media options. Additionally, letters were distributed to the property owners located in the vicinity of the proposed alignments to encourage attendance to the meeting.

Large display boards were provided illustrating the various alignment alternatives and project team representatives were on hand to answer questions. Members of the public were challenged to review the proposed alignments and provide feedback that could be used to further refine the concepts. Specifically, the project team wanted to gauge the public's interest on locating a frontage road north or south of I-81 where multiple options were preferred.

A comment sheet was also provided that asked members of the public to rate and provide comments on the alignment alternatives shown at the meeting. The comment sheet provided at this meeting is also included in **Appendix E**. Common feedback received from the public is described in more detail in the following sections.

Figure 14: Public Information Meeting #2

5.2 Public Survey Results

5.2.1 Online Survey

In addition to the two pubic informational meetings, VDOT was interested in broadening the scope of outreach to the public. To this end, the questionnaires provided at the two public meetings were combined into an online survey and distributed to the public via print (i.e., direct letter, local newspaper) and online/social media (i.e., direct email, Facebook). The purpose of the questionnaire was to reach a larger audience, gauge the public's current perception of the roadway network within the study area, share their visions of potential improvements options, and have them provide their opinions the alternative concepts shared from the second public informational meeting.

The survey was posted on www.surveymonkey.com for three (3) months between June and August 2019. The online survey questions are also included in **Appendix E.** In total, over 250 completed surveys were submitted by the close of the survey on August 31, 2019.

5.2.2 Public Comment Responses and Feedback

This section describes the overall results from the various surveys, questionnaires, and public comments sheets received during the public engagement process through either in-person or the online survey, as the same questions were asked.

The questionnaire included the following introductory questions to get members of the public thinking about their existing roadways system and how they perceive its operations:

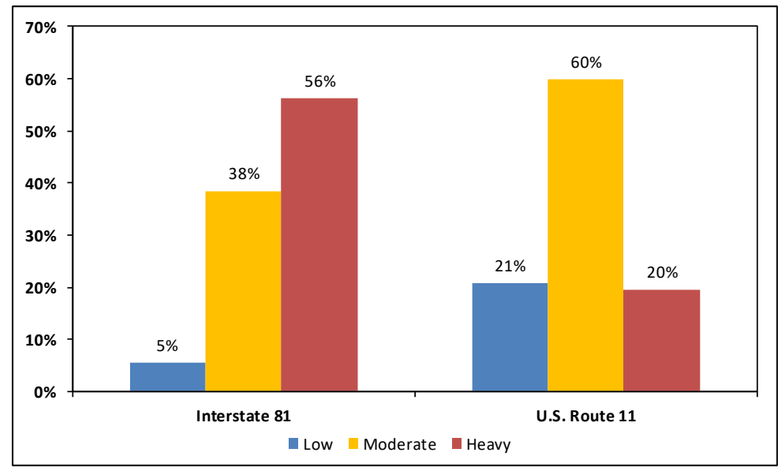
1. **When traveling through the described study area, do you primarily us the Interstate or other local** roads (U.S. Route 11)?
    a. 82% - Interstate 81 / 18% - Other Local Roads
    b. The majority of response showed that I-81 serves as the primary route for users within the study area, rather than using U.S. Route 11 or other local roads.
2. **What specific problems/concerns do you have about Interstate 81 and/or U.S. Route 11?**
    a. Reponses to this question are displayed in **Table 1**.
    b. The majority of responses identified congestion, heavy vehicle traffic, and safety as the greatest issue along the roadways within the study area. This

Table 1: Survey Question #2 Responses

Problems/Concerns	Response
Congestion	24%
Road Condition/Pavement Maintenance	10%
Heavy Vehicle Traffic	24%
Future Growth/Economic Development	10%
Safety/Crashes	19%
Speed Limits/Travel Speeds	7%
Environment Conservation	3%
Other (please specify)	3%

3. **What is your general perception of traffic congestion along Interstate 81 or U.S. Route 11 during an average day?**
    a. Reponses to this question are displayed in **Figure 15**
    b. 56% of the public perceive I-81 as operating with heavy congestion
    c. 20% of the public perceive U.S. Route 11 as operating with heavy congestion

Figure 15: Survey Question #3 Responses



4. **Please select the Interstate 81 interchange Exits/roadways that you feel consistently experience the heaviest and longest periods of traffic congestion or bottlenecking?**
    a. Reponses to this question are displayed in **Table 2**.
    b. 60% of the responses identified Exit 17 (i.e., Cummings Street) as the interchange the consistently experiences the highest amount of traffic/congestion

Table 2: Survey Question #4 Responses

Interchanges	Responses
Exit 7 – Old Airport Road	19%
Exit 10 – F310	1%
Exit 13 – Spring Creek Road	0%
Exit 14 – Old Jonesboro Road	3%
Exit 17 – Cummings Street	60%
Exit 19 – Lee Highway	17%
Exit 22 – Enterprise Road	0%

5. **What other transportation improvements along Interstate 81, U.S. Route 11, or a new frontage road would you like to see VDOT research or consider?**
    a. Common response included:
        i. Ability to reroute/bypass around the Town of Abingdon
        ii. Increase capacity on I-81
        iii. Improve traffic signal coordination and operation
        iv. Roadway maintenance
        v. Improve interstate access (i.e., increase acceleration/deceleration lanes)

The remaining questions on the survey focus on obtaining the public's opinions and comments for the various frontage road alignment/connections between the study area interchanges. The questionnaire asked the public to rate the frontage road alignments to determine if they:

- support the shown alignment location
- support the idea of a connection in an area, but had concerns with the location of an alignment
- do not support the alignment or connection

The following sections describe the responses on the proposed frontage road alignments between the study area interchanges.

5.2.2.1 BETWEEN EXIT 7 AND EXIT 10

A graphic illustrating a potential frontage road connection between Exit 7 and Exit 10 was included as part of this survey question, with the public's responses to what was shown summarized in **Table 3**. The majority (i.e., 68%) of respondents supported the connection, or the idea of a connection, at this location.

Table 3: Public's Responses on a Frontage Road Connection between Exit 7 and Exit 10

Opinion on Frontage Road Alternative	Responses
I do not support this option/alignment	14%
I support the general idea, but have issues with what is being shown	11%
I greatly support what is being shown	57%
No Opinion	18%

Other notable themes or issues submitted as part of this question include:

- Concerns with impacts to the neighborhood/residences in the vicinity of the proposed frontage road
- Priority should be to improve U.S. Route 11 and/or I-81
- Unsure of project/frontage road need
- This segment of frontage road is generally a lower priority/need, compared to the other segments along the study area

5.2.2.2 BETWEEN EXIT 10 AND EXIT 13

A graphic illustrating a potential frontage road connection between Exit 10 and Exit 13 was included as part of this survey question, with the public's responses to what was shown summarized in **Table 4**. The majority (i.e., 68%) of respondents supported the connection, or the idea of a connection, at this location.

Table 4: Public's Responses on a Frontage Road Connection between Exit 10 and Exit 13

Opinion on Frontage Road Alternative	Responses
I do not support this option/alignment	13%
I support the general idea, but have issues with what is being shown	11%
I greatly support what is being shown	57%
No Opinion	19%

Other notable themes or issues submitted as part of this question include:

- Concerns with impacts to the neighborhood/residences in the vicinity of the proposed frontage road
- Priority should be to improve U.S. Route 11 and/or I-81
- Unsure of project/frontage road need
- This segment of frontage road is generally a lower priority/need, compared to the other segments along the study area

5.2.2.3 BETWEEN EXIT 13 AND EXIT 14

A graphic illustrating a potential frontage road connection between Exit 10 and Exit 13 was included as part of this survey question, with the public's responses to what was shown summarized in **Table 5**. The majority (i.e., 67%) of respondents supported the connection, or the idea of a connection, at this location.

Table 5: Public's Responses on a Frontage Road Connection between Exit 13 and Exit 14

Opinion on Frontage Road Alternative	Responses
I do not support this option/alignment	16%
I support the general idea, but have issues with what is being shown	13%
I greatly support what is being shown	54%
No Opinion	17%

Other notable themes or issues submitted as part of this question include:

- Priority should be to improve U.S. Route 11 and/or I-81
- Unsure of project/frontage road need
- This segment of frontage road is generally a lower priority/need, compared to the other segments along the study area

5.2.2.4 BETWEEN EXIT 14 AND EXIT 17

A graphic illustrating two (2) potential frontage road connections between Exit 14 and Exit 17 were included as part of this survey question, with the public's responses to what was shown summarized in **Table 6**. As mentioned previously, this segment of frontage road considered two potential alignments located on the north or south side of I-81. Feedback received from the public was even split between the two options, with 36% preferring a northern connection and 39% preferring a southern connection.

Table 6: Public's Responses on Frontage Road Connections between Exit 14 and Exit 17

Opinion on Frontage Road Alternative	Responses
Option 1 - French Moore Blvd Northern Connection	36%
Option 2 - Southern Connection	39%
Neither Option	10%
No Opinion	14%

Other notable themes or issues submitted as part of this question include:

- Concerns with increased traffic/congestion occurring in the vicinity of Exit 17
- Priority should be to improve U.S. Route 11 and/or I-81
- Preference for both connections to be pursued
- This segment of frontage road is generally a higher priority/needed connection, compared to the other segments along the study area

5.2.2.5 BETWEEN EXIT 17 AND EXIT 19

A graphic illustrating a potential frontage road connection between Exit 17 and Exit 19 was included as part of this survey question, with the public's responses to what was shown summarized in **Table 7**. The majority (i.e., 71%) of respondents supported the connection, or the idea of a connection, at this location.

Table 7: Public's Responses on a Frontage Road Connection between Exit 17 and Exit 19

Opinion on Frontage Road Alternative	Responses
I do not support this option/alignment	15%
I support the general idea, but have issues with what is being shown	19%
I greatly support what is being shown	52%
No Opinion	14%

Other notable themes or issues submitted as part of this question include:

- Concerns with increased traffic/congestion occurring in the vicinity of Exit 17
- Priority should be to improve U.S. Route 11 and/or I-81
- Concerns about impacts to the Creeper Trail
- Concerns with increased traffic/congestion occurring in the vicinity of Exit 19 (i.e., U.S. Route 11/U.S. Route 58)

5.2.2.6 BETWEEN EXIT 19 AND EXIT 22

A graphic illustrating two (2) potential frontage road connections between Exit 19 and Exit 22 were included as part of this survey question, with the public's responses to what was shown summarized in **Table 8**. As mentioned previously, this segment of frontage road considered two potential options located on the north or south side of I-81. Feedback received from the public showed a preference to the southern option, which focuses on improving/widening an existing portion of U.S. Route 11, rather than a new roadway alignment.

Table 8: Public's Responses on Frontage Road Connections between Exit 19 and Exit 22

Opinion on Frontage Road Alternative	Responses
Option 3 - Northern Connection	29%
Option 4 - Widen US 11	47%
Neither Option	12%
No Opinion	12%

Other notable themes or issues submitted as part of this question include:

- Improve U.S. Route 11 and/or I-81
- Impacts to adjacent property owners along U.S. Route 11
- This segment of frontage road is generally a lower priority/need, compared to the other segments along the study area

5.3 Public Engagement Summary

Throughout the development of this study, the public had multiple opportunities to interact directly with the project team, review study materials, and provide feedback to help shape the direction of the preferred alternative. Overall, the following takeaways were developed through the public involvement process:

- Majority support for a frontage road system to primarily serve local traffic within the study area.
- Agree with the idea that a frontage road system could pull local traffic off of I-81
- Interest in maintaining the "French Moore Jr. Boulevard Extension" connection, in addition to a contiguous southern frontage road network between Exits 14 and 17
- Preference to widen U.S. Route 11 between Exits 19 and 22, rather than construct a new roadway on the north of I-81.
- Concerns with some impacts to local property owners and/or local neighborhoods.
- Concerns with impacts to the natural environment (i.e., Creeper Trail).

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6.0 Environmental Assessment

6.1 Environmental Assessment

A preliminary environmental review was conducted for the project study area to determine if environmentally sensitive sites may be present or potentially impacted by the construction of the proposed frontage road. This document assesses the potential for impacts to the human or natural environment. Based on the comprehensive review of various standard environmental data sources, the proposed project may pose potential impacts to natural and historic resources. The environmental study area for the proposed project generally consists of approximately 15.5 miles along the north and south of I-81 from Bristol to Abingdon, VA.

The following areas were preliminarily reviewed to identify potential impacts:

- Cultural and Historic Resource Impacts
- Section 4(f) and Section 6(f) Properties
- Natural Resources
  - Floodplain
  - Wetlands and Surface Waters
  - Wildlife and Habitat
  - Hazardous Materials Impacts

6.2 Cultural and Historical Resources

The Virginia Department of Historic Resources' (VDHR) Cultural Resources Information System (V-CRIS) was used to identify potentially eligible architectural or archaeological sites located within or near the study area. Under Federal law, a historic property is any district, site, building, structure, or object that is listed in or eligible for listing in the National Register of Historic Places (NRHP). To be eligible for listing, sites must meet at least one of the National Register Criteria for Evaluation, which involves examining the age, integrity, and significance of the site. Historic sites that are eligible for listing or listed on the NRHP and archeological sites that are eligible for listing or listed on the NRHP and recommended for preservation in place are also protected under Section 4(f). Section 4(f) is further discussed in **Section 6.3**.

Fifty-six (56) architectural resources were identified within and immediately adjacent to the project corridor and associated intersections. Additionally, thirty-six (36) archaeological resources were identified within and immediately adjacent to the project corridor and associated intersections. **Table 9** below presents a summary of the architectural and archaeological resources and their eligibility status as identified in the V-CRIS database. The site locations are shown in **Figure 16**.

Table 9: Summary of Resources Identified within the Project Corridor or Immediate Vicinity

VDHR #	Resource Name	Address or Site Characteristic	Eligibility or Status
Architectural Resources			
095-5361	Virginia & Tennessee Railway, RR Segment (Historic); Norfolk & Western Railway, RR Segment (Current)	Wallace Pike (Current); Clear Creek Road (Alternate)	DHR Staff: Eligible
102-5013	Bridge #1820 Colonel Robert Preston Memorial Bridge	Route 11	DHR Staff: Not Eligible
095-5343	Farm, 14224 Lee Highway (Function); Henry Donald Preston Farm, 14224 Lee Highway (Current)	14224 Lee Highway (Current); 14224 Route 11 (Alternate)	DHR Staff: Not Eligible
095-5342	Volkswagon Dealership, Lee Highway	Lee Highway (Current); Route 11 (Alternate)	DHR Staff: Not Eligible
095-5341	Commercial Building, Lee Highway	Lee Highway (Current); Route 11 (Alternate)	DHR Staff: Not Eligible
095-5328	Farm, 15128 Lee Highway	15128 Lee Highway (Current); 15128 Route 11 (Alternate)	DHR Staff: Not Eligible
095-5323	Evergreen Motor Court, Lee Highway	Lee Highway (Current); Route 11 (Alternate)	DHR Staff: Not Eligible
095-5319	House, 15454 Lee Highway	15454 Lee Highway (Current); 15454 Route 11 (Alternate)	DHR Staff: Not Eligible
095-5315	Barn at Fleenor's Trailer Park, Lee Highway	Lee Highway (Current); Route 11 (Alternate)	DHR Staff: Not Eligible
095-5314	House, 15486 Lee Highway	15486 Lee Highway (Current); 15486 Route 11 (Alternate)	DHR Staff: Not Eligible
095-5313	House, 15500 Lee Highway	15500 Lee Highway (Current); 15500 Route 11 (Alternate)	DHR Staff: Not Eligible
095-5424	Quesenberry Farm (Current); Farm, 20214 Halls Bottom Road (Route 808)	20214 Halls Bottom Road Route 808	DHR Staff: Not Eligible
095-5360	Johnston House	Route 808	
095-5256	Moonlight Theatre (Alternate Spelling); Moonlite Drive-in Theatre (Historic/Current)	Route 11 (Alternate); 17555 Lee Highway (Current)	VLR Listing
095-5260	Johnson House	18079 Lee Highway (Current); 18081 Lee Highway (Alternate)	DHR Staff: Not Eligible
095-5261	Ratliff House	18105 Lee Highway	DHR Staff: Not Eligible
095-5262	Hortenstine House	18115 Lee Highway	DHR Staff: Not Eligible
095-5379	Culvert 6142, Spring Creek Road (Route 611)	Route 611 (Alternate); Spring Creek Road (Current)	DHR Staff: Not Eligible
095-5380	Clyce Cemetery, Spring Creek Road (Route 611)	Route 611 (Alternate); Spring Creek Road (Current) *Burial site of Isaac Baker (1726-1793)-early pioneer in Washington County.	DHR Staff: Not Eligible

Table 9: Summary of Resources Identified within the Project Corridor or Immediate Vicinity

VDHR #	Resource Name	Address or Site Characteristic	Eligibility or Status
095-5381	Private Culvert, Spring Creek Road (Route 611)	Route 611 (Current); Spring Creek Road (Current)	DHR Staff: Not Eligible
095-0187	Richards House	Route 7 (Current); FO24 Service Road (Current)	
095-5265	House, 19204 Lee Highway	19204 Lee Highway	DHR Staff: Not Eligible
095-5266	House, 19226 Lee Highway	19226 Lee Highway	DHR Staff: Not Eligible
095-5439	House, 19430 Lee Highway (Route 11)	19430 Lee Highway Route 11	DHR Staff: Not Eligible
140-0046	Bridge #1004 (Current); General John H. Morgan Memorial Bridge (Current); John H. Morgan Memorial Bridge (Current)	Route 11 (Current)	DHR Staff: Not Eligible
140-0045	Acklin (Historic/Current)	Main Street East Route 11 (Current)	DHR Staff: Potentially Eligible
140-5007	Log House (Descriptive); House, Old 11 Court (Function/Location)	Old 11 Court	
095-0311	House, 24443 Lee Highway (Function/Location); Campbell-McIntire House (Historic/Current)	24443 Lee Highway Route 11 (Current)	
095-0126	House, Route 704 (Function/Location)	Route 704 (Current)	
095-0127	Tobacco Barn, Route 704 (Function/Location)	Route 704 (Current)	
095-0131	Tobacco Barn, Route 704 (Function/Location)	Route 704 (Current)	
095-0129	Storage Building, Route 704 (Function/Location)	Route 704 (Current)	
095-0130	Tobacco Barn, Route 704 (Function/Location)	Route 704 (Current)	
095-0128	Granary, Route 704 (Function/Location)	Route 704 (Current)	
095-0123	House, Route 879 (Function/Location)	Route 879 (Current)	
095-0124	House, Route 879 (Function/Location)	Route 879 (Current)	
095-0125	House, Route 879 (Function/Location)	Route 879 (Current)	
Archaeological Resources			
44WG0053	Whitten Site Terrestrial, open air Native American Camp, base	Late Archaic Period, Late Woodland, Early Archaic Period, Middle Archaic Period (1201 B.C.E. – 8500 B.C.E.; 1000-1606)	
44WG0210	Terrestrial, open air Native American	Early Archaic Period, Late Archaic Period, Middle Archaic Period, Early Woodland, Late Woodland, Middle Woodland (8500-1201 B.C.E.; 1200 B.C.E.-1606 C.E.)	
44WG0615	Terrestrial, open air Native American camp	Middle Archaic Period	

Table 9: Summary of Resources Identified within the Project Corridor or Immediate Vicinity

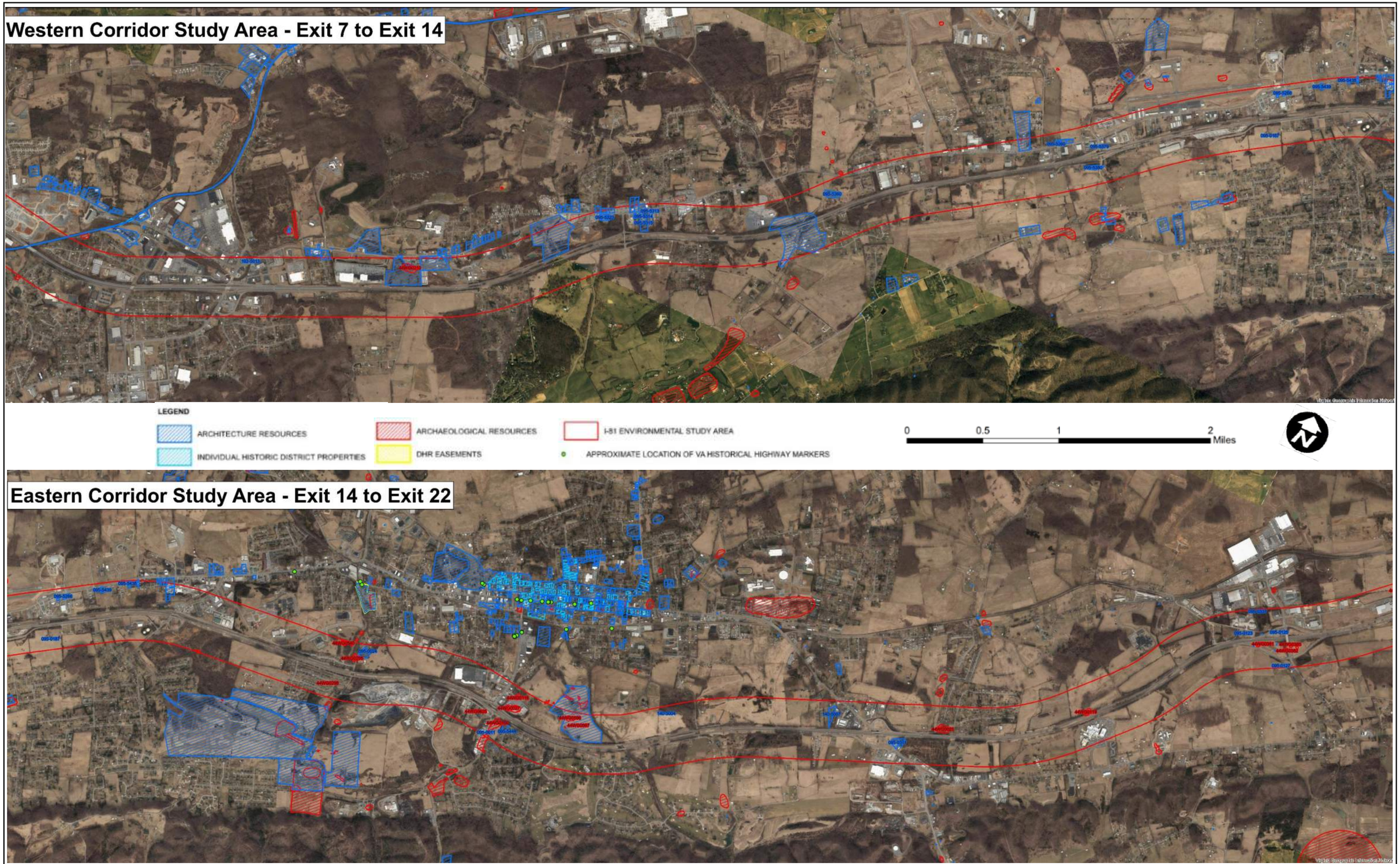
VDHR #	Resource Name	Address or Site Characteristic	Eligibility or Status
44WG0296	Terrestrial, open air Native American	Early Archaic Period, Late Archaic Period, Middle Archaic Period, Early Woodland, Late Woodland, Middle Woodland, Paleo-Indian (15000 B.C.E – 1606 C.E.)	
44WG0295	Clapp's Mill; Stone Mill Terrestrial, open air, Mill Euro-American	Colony to Nation, Early National Period, Antebellum Period, Civil War, Early National Period, Reconstruction and Growth, The New Dominion, World War I to World War II (1775-1799, 1800-1899, 1900-1949, 1950-1974)	DHR Staff: Potentially Eligible
44WG0540	Dwelling, single Native American	15000 B.C.E.-1606 C.E., 1875-1899, 1900-1999	
44WG0465	Native American camp, temporary Domestic Camp- temporary hunting/gathering camp	15000 B.C.E.-1606 C.E.	DHR Staff: Not Eligible
44WG0589	Terrestrial, open air Scatter of historic era materials; apparently residential in origin, but possibly associated with nearby mill	1800-1899, 1900-1949	DHR Staff: Not Eligible
44WG0590	Terrestrial, open air Pre-historic Native American site along Wolf Creek	15000 B.C.E. – 1606 C.E.	DHR Staff: Not Eligible
44WG0297	Terrestrial, open air Native American	Early Woodland, Late Woodland, Middle Woodland (1200 B.C.E.-1606 C.E.)	
44WG0624	Terrestrial, open air Native American camp	Early Woodland, Late Woodland, Middle Woodland	DHR Staff: Potentially Eligible
44WG0625	Terrestrial, open air Native American Artifact scatter	Pre-Contact, French Broad-Holston	
44WG0166	Terrestrial, open air Native American camp	Early Woodland, Late Woodland, Middle Woodland, French Broad-Holston (1200 B.C.E.-1606 C.E.)	DHR Staff: Potentially Eligible
44WG0027	Arrington Site Terrestrial, open air Native American/Hamlet	Late Archaic Period, Middle Woodland (3000-1201 B.C.E., 300-900 C.E.)	
44WG0116	Terrestrial, open air Native American camp Upstream campsite	Middle Archaic Period, Middle Woodland (6500-3001 B.C.E., 300-999 C.E.)	

Table 9: Summary of Resources Identified within the Project Corridor or Immediate Vicinity

VDHR #	Resource Name	Address or Site Characteristic	Eligibility or Status
44WG0622	Terrestrial, open air Euro-American, Native American artifact scatter "1800s Trash Dump"- late-nineteenth/early twentieth century household debris and non-diagnostic lithic debitage	Antebellum Period, Civil War, Reconstruction and Growth, World War I to World War II (1840-1945)	
44WG0623	Terrestrial air, open air Euro-American, Native American artifact scatter Site consists of three positive shovel tests - non-diagnostic lithic debitage and a brick fragment	Pre-Contact, Reconstruction and Growth, World War I to World War II (1900-1945)	
44WG0430	Fields-Penn House site Terrestrial, open air Euro-American single Dwelling	French Broad-Holston, Reconstruction and Growth, The New Dominion, World War I to World War II (1900-1949)	
44WG0166	Terrestrial, open air Native American camp	French Broad-Holston, Early Woodland, Late Woodland, Middle Woodland (1200 B.C.E.-1606 C.E.)	DHR Staff: Potentially Eligible
44WG0115	Terrestrial, open air Native American camp	French Broad-Holston, Middle Woodland, Late Archaic Period (3000-1201 B.C.E., 300-999 C.E.)	
44WG0626	Terrestrial, open air Native American camp	French Broad-Holston	DHR Staff: Potentially Eligible
44WG0012	Sullins/Abingdon Site Grave/burial – funerary Terrestrial, open air	French Broad-Holston, Late Woodland, Palisaded settlement (1000-1606)	DHR Staff: Potentially Eligible
44WG0622	Terrestrial, open air Artifact scatter	French Broad-Holston, Euro-American, Native American (1830-1945)	
44WG0623	Terrestrial, open air Artifact scatter	French Broad-Holston, Euro-American, Native American (1900-1945)	
44WG0596	Terrestrial, open air Artifact scatter, Lithic scatter	French Broad-Holston, Euro-American, Native American	
44WG0597	Terrestrial, open air Native American, lithic scatter	French Broad-Holston, Native American	
44WG0595	Terrestrial, open air Native American, lithic scatter	French Broad-Holston, Native American	

Table 9: Summary of Resources Identified within the Project Corridor or Immediate Vicinity

VDHR #	Resource Name	Address or Site Characteristic	Eligibility or Status
44WG0267	Terrestrial, open air Lithic quarry Native American	Early Archaic Period, Early Woodland, Late Archaic Period, Late Woodland, Middle Archaic Period, Middle Woodland, Paleo-Indian (15000 B.C.E.-1606 C.E.)	
44WG0021	Terrestrial, open air Native American camp, base, single dwelling	Middle Woodland, Antebellum Period, Early National Period, Early Archaic Period, Late Archaic Period, Middle Archaic Period (8500-1201 B.C.E., 300-999 C.E., 1825-1849)	
44WG0119	Terrestrial, open air Native American camp Small upstream camp	Early Woodland, Late Woodland, Middle Woodland (1200 B.C.E.-1606 C.E.)	
44WG0387	Terrestrial, open air Camp Lithic concentration		
44WG0381	Terrestrial, open air Native American camp Lithic scatter (hunting station	Early Archaic Period, Early Woodland, Late Archaic Period, Late Woodland, Middle Archaic Period, Middle Woodland, Paleo-Indian (15000 B.C.E.-1606 C.E.)	
44WG0382	Terrestrial, open air Native American camp Trash scatter	Post Cold War, Reconstruction and Growth, The New Dominion, World War I to World War II, Early Archaic Period, Early Woodland, Late Archaic Period, Late Woodland, Middle Archaic Period, Middle Woodland, Paleo-Indian (15000 B.C.E.-1606 C.E, 1900-1999)	
44WG0385	Terrestrial, open air Native American camp Lithic concentration	Early Archaic Period, Early Woodland, Late Archaic Period, Late Woodland, Middle Archaic Period, Middle Woodland, Paleo-Indian (15000 B.C.E.-1606 C.E.)	
44WG0386	Terrestrial, open air Native American Lithic scatter	Early Archaic Period, Early Woodland, Late Archaic Period, Late Woodland, Middle Archaic Period, Middle Woodland, Paleo-Indian (15000 B.C.E.-1606 C.E.)	
44WG0380	Terrestrial, open air Native American camp Lithic scatter Funerary/Cemetery	Antebellum Period, Civil War, Early National Period, Reconstruction and Growth, World War I to World War II, Late Archaic Period (3000-1201 B.C.E.; 1800-1899; 1900-1924)	



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Interstate 81 Frontage Road Corridor Study
Bristol, VA

Historical Resources

Figure 16

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A Phase I Cultural Resource Survey may be required within the determined Area of Potential Effect (APE) to identify, evaluate, and determine the eligibility of historic resources. Further assessment of the project's effects to historic properties and coordination with VDHR will then be necessary for concurrence on an effect determination. If adverse effects are identified, then additional consultation including evaluation of avoidance, minimization and mitigation of impacts would be required.

In addition to the resources identified in DHR's V-CRIS, Historical Highway Markers are also located along US Route 11 (Lee Highway) and Interstate 81. **Table 10** below presents a summary of the Historical Highway Markers as identified in the Department of Historic Resources database. The approximate location of Virginia Historical Highway Markers are depicted in **Figure 16**.

Table 10: Summary of Historic Highway Markers Identified within the Project Corridor or Immediate Vicinity

Marker Number	Marker Name	Marker Location
K-123	Walnut Grove Plantation	3415 Lee Highway
K-42	Bristol, Virginia	Sugar Hollow road, inside Sugar Hollow Park
K-47	King's Mountain Men	Route 11, at western entrance of Abingdon
K-60	Revolutionary War Muster Ground	Colonial Road SW, east of intersection with Reedy Creek Road
K-50	Boyhood Home of General Joseph E. Johnston	0.02 miles west of Intersection of Route 11 and Route 75, Abingdon
K-49	Abingdon, Virginia	Route 11 near intersection with Cummings Street, Abingdon
K-61	John Campbell	Intersection of Cummings Street and Mont Calm Street, in Abingdon
K-58	Governor David Campbell	Corner of Cummings Street and entrance of Mont Calm, Abingdon

6.3 Section 4(f) & 6(f)

6.3.1 Section 4(f)

Section 4(f) of the Department of Transportation Act of 1966 stipulates that federal agencies cannot approve the use of land from publicly owned parks, recreation areas, wildlife and waterfowl refuges, or historic sites unless there is no prudent and feasible alternative to using that land, and the program or project includes all possible planning to minimize harm to the Section 4(f) resource. A "use" of a Section 4(f) property includes any acquisition of right-of-way or a permanent easement, temporary occupancy, or constructive use. The following sources were reviewed to identify park and recreational facilities within the study area:

- Washington County GIS data
- City of Bristol GIS data
- Town of Abingdon GIS data
- Virginia Department of Game and Inland Fisheries (DGIF) GIS data
- Virginia Department of Conservation and Recreation (DCR) GIS data
- Virginia Outdoors Foundation (VOF) GIS data
- United States Department of Agriculture (USDA) Forest Service GIS data
- National Park Service (NPS) GIS data

The following facilities were identified within, immediately adjacent to, or adjacent to the study area.

Joseph Van Pelt Elementary School (200 Spring Hill Terrace) was identified within the study area. The school's sports complex, including tennis courts and a basketball court, is located to the east of the school buildings along the north side of School Road in Bristol, VA. Also associated with this complex are the Bonham Soccer Fields, located at the intersection of Bonham Road and Old Airport Road. The soccer fields are not located with the study area but are located immediately to the south of the proposed corridor. In some cases, recreational facilities associated with schools are open to the public outside of school hours and may be considered a Section 4(f) resource.

Suncrest Park (200 Spring Hill Terrace) was identified within the study area. The park is a ten (10) acre open space area that includes four (4) illuminated tennis courts and a paved court. The park is also located adjacent to a four (4) acre school play area.

The Virginia Creeper Trail, trailhead located on Pecan Street, is a 34.3-mile rail-to-recreation trail that extends south from Pecan Street, intersects the study area, and terminates in the town of Whitetop, VA near the North Carolina state line. The trail runs along a rail right-of-way that dates to the industrial expansion across the U.S. in the 1880s. In 1987, the Virginia Creeper Trail was dedicated as a National Recreation Trail. The trail is maintained by public-private partnerships between the US Forest Service, the towns of Abingdon and Damascus, and the Virginia Creeper Trail Club. The Virginia Creeper Trail likely meets the definition of a Section 4(f) property, and additional coordination on proposed impacts to the trail may be required.

Sugar Hollow Park & Campground (23261 Sugar Hollow Park) is located immediately adjacent to the study area, north of Route 11 (Lee Highway). The Park is approximately 400-acres and includes multiple softball fields and soccer fields, picnic sites and shelters, campsites, a pool, and the Waldo Miles Pavilion. In addition, this park is owned and operated by the City of Bristol and is open to the public. Therefore, this facility meets the definition of a Section 4(f) property. Since the park is located outside of the Study Area, it is not anticipated that the proposed project would have an adverse effect on the resource.

Veterans Memorial Park (425 Lt. Billy Webb Avenue) was identified immediately adjacent to the study area, north of I-81 and west of Cummings Street (Exit 17) in Abingdon, VA. The Park has picnic tables and shelters, playground equipment, and a grassed park displaying flags representing the branches of military service, the World War II Monument, the Korean War Monument, the Vietnam War Monument, the Lt. Billy Webb Memorial Tribute, and the Bronze Ribbon Memorial. This is owned and operated by the Town of Abingdon and is open to the public. Therefore, this facility meets the definition of a Section 4(f) property.

However, due to its location as outside of the Study Area, it is not anticipated that the proposed project would have an adverse effect on the resource.

John S. Battle High School (21264 Battle Hill Drive) was identified adjacent and to the north of the study area. The school's sports complex, including two baseball fields, a football field, and tennis courts, is located to the west and southwest of the school buildings across Battle Hill Drive. In some cases, recreational facilities associated with schools are open to the public outside of school hours and may be considered a Section 4(f) resource. However, due to the location of the school and sports complex as outside of the study area, it is not anticipated that the proposed project would have an adverse effect on the resource.

T**he Historic Abingdon Muster Grounds and Wolf Creek Trail** are located north of the study area at the intersection of Muster Place and Colonial Road SW. The Abingdon Muster Grounds are a 9-acre historical park located within the town limits of Abingdon. The Muster Grounds is the northern trailhead of the 330-mile long Overmountain Victory National Historic Trail. The Overmountain Victory trail starts south of Colonial Road and extends south of the Town of Abingdon. The trail stretches 330 miles through four states. The campaign can be followed by the Commemorative Motor Route which uses existing state highways marked with distinctive trail logo, as well as 87 miles of walkable pathways. The trail is recognized as a national historic trail. A portion of the study area intersects the Town of Abingdon Trail. However, due to the location and extent of proposed activities within this area, it is not anticipated that the project will have an adverse effect on the resource.

No other local, state, or national parks, recreational areas or wildlife and waterfowl refuges that are protected under Section 4(f) were identified within the study area. The location of all potential Section 4(f) items are represented within **Figure 17**.

Potential historic resources identified within the project's study area are described in **Section 6.2**. Depending upon the impacts to historic resources and the effect determination, additional coordination regarding Section 4(f) as it pertains to historic resources may be required.

6.3.2 Section 6(f)

The Land and Water Conservation Fund Act (LWCFA) of 1965 (16 USC 4601-4 *et seq*.) established a funding source to assist state and federal agencies in the acquisition and development of public outdoor recreational areas and facilities. Section 6(f) of the LWFCA requires that all properties "acquired or developed, either partially or wholly, with LWCF funds" must be maintained as such in perpetuity.

The Detailed Listing of Grants grouped by County prepared by the National Park Service (NPS) Land and Water Conservation Fund program are listed in **Table 11**. Based on GIS mapping, these sites are not located within the study area. Therefore, no conversion of Section 6(f) properties is anticipated.

Table 11: Summary of Land and Water Conservation Fund Projects in Bristol, VA and Abingdon, VA

County	Grant ID	Grant Title	Grant Sponsor	Fiscal Year	Amount
Washington	65	Washington County/ Avens Bridge Parks	Washington County	1971	$77,297.62
Washington	224	Glade Springs/ Washington County Park	Washington County	1980	$330,146.50
Washington	197	Damascus Town Park	Town of Damascus	1979	$212,670.08
Washington	243	Abingdon to Damascus Trail	Town of Abingdon and Damascus	1981	$60,000.00
Bristol	330	War Memorial Park	City of Bristol	1994	$179,604.21

6.4 Natural Resources

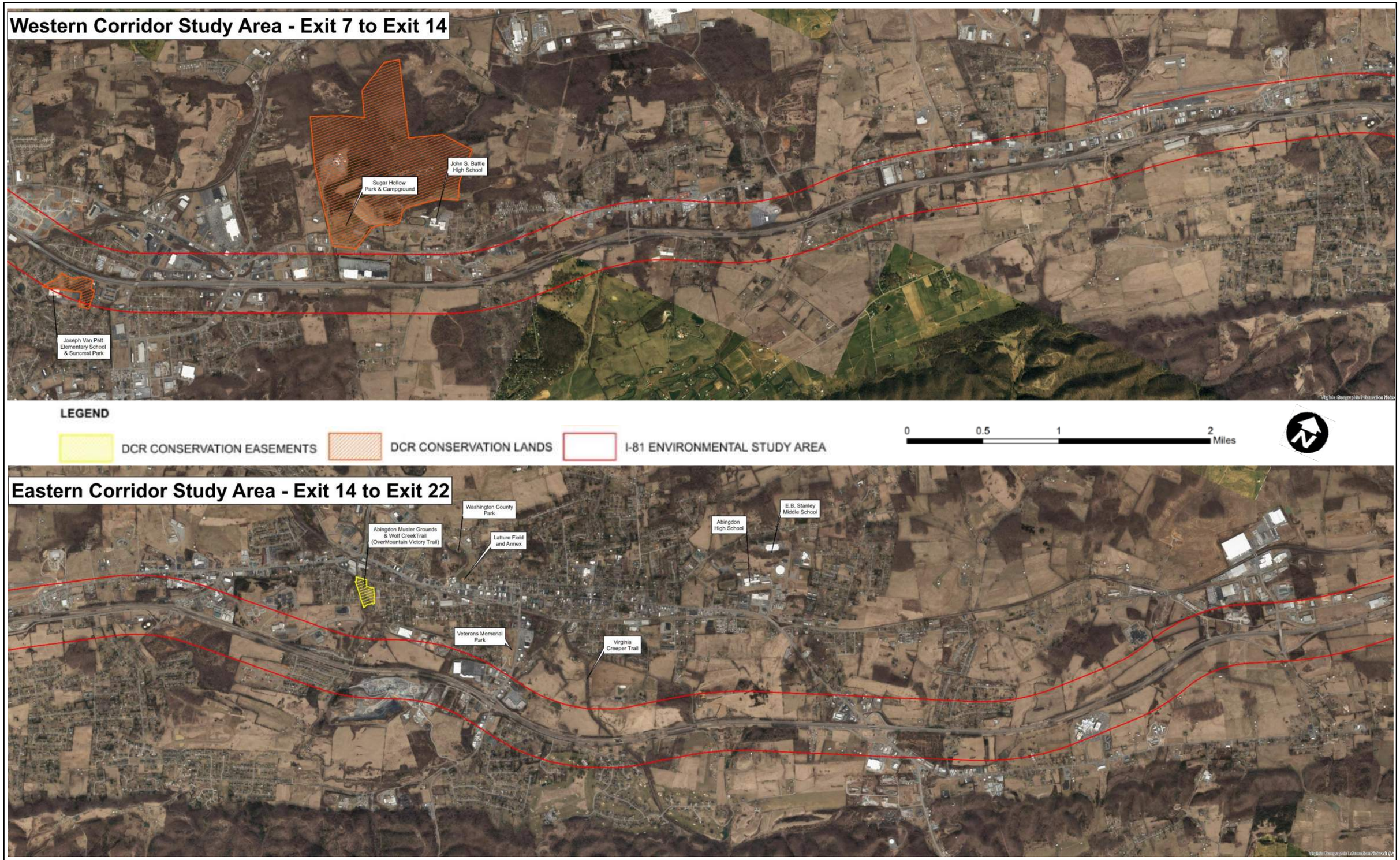
Natural resources data were also reviewed to identify potential environmental constraints within the study area. Information about water resources – floodplain, streams, and wetlands – as well as wildlife and habitat areas in and near the study area are described below. Additional information about these resources can be found in the appendices of this report.

6.4.1 Floodplain

The Federal Emergency Management Agency (FEMA) defines the 100-year floodplain as the area that will be inundated by the flood event having a one percent chance of being equaled or exceeded in any given year. The study area is shown on FEMA Flood Insurance Rate Maps (FIRM) for the City of Bristol, the Town of Abingdon, and Washington County. The Panel/Map Numbers containing the study area are as follows:

- 5100220005D (dated 2/4/2004) – Exit 7 – a portion of the study area is located within Zone AE, associated with Beaver Creek. Zone AE is designated as a special flood hazard area subject to inundation by the 1% annual chance flood (100-year flood).
- 51191C0265C (dated 9/29/2010) – Exit 10 – this portion of the study area is located within unshaded Zone X, which are areas determined to be outside the 0.2% annual chance floodplain.
- 51191C0280C (dated 9/29/2010) – Exit 17 – a portion of the study area is located within Zone AE and Zone A, associated with Town Creek. Zone AE and Zone A are designated as special flood hazard areas subject to inundation by the 1% annual chance flood (100-year flood).
- 51191C0285C (dated 9/29/2010) – Exit 19/Exit 22 – this portion of the study area is located within unshaded Zone X, which are areas determined to be outside the 0.2% annual chance floodplain.

A copy of the FEMA FIRM maps can be found in **Appendix F**.



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Potential Section 4(f) Features

Figure 17

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6.4.2 Wetlands and Surface Waters

Topographic and National Wetland Inventory (NWI) mapping, aerial photography, and the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) soil survey data were reviewed to identify potential wetland and stream areas. The United States Geological Survey (USGS) Abingdon, Virginia 7.5 Minute Quadrangle and the Wyndale, Virginia 7.5 Minute Quadrangle maps show the study area as ranging in elevation between approximately 2,000 to 2,100 feet above the National Geodetic Vertical Datum of 1929. The USGS 1:24,000 scale topographic maps for Abingdon and Bristol, as well as the National Hydrology Dataset from the USGS were reviewed to identify surface waters within and near the study area. The referenced mapping is provided in **Appendix F**.

Kimley-Horn conducted a limited site visit on January 16 and January 17, 2019 to review the study area for wetlands or WOUS from public thoroughfare. Based on the limited review, it appears that the wetlands and WOUS observed are consistent with those features identified in the NWI and USGS topographic mapping. Likely stream and wetland areas are represented within **Figure 18** and described below.

- Beaver Creek and associated tributaries riverine, unknown perennial, unconsolidated bottom, and permanently flooded (R5UBH) were identified within portions of the study area between Exit 7 and Exit 10. Beaver Creek enters the study area in the north along the southern side of Linden Drive and crosses beneath I-81 at the intersection of I-81 and Old Airport Road. Tributaries of Beaver Creek run parallel to Old Airport Road and continue south, past the intersection of Old Airport Road and Stagecoach Road, extending outside of the study area. The main stem of Beaver Creek crosses beneath Old Airport Road to the north, and crosses beneath Route 11, extending outside of the study area. Another tributary of Beaver Creek re-enters the study area south of Route 11, crossing beneath I-81 and runs south, parallel to Flame Leaf Road. An additional tributary of Beaver Creek crosses beneath Old Dominion Road and runs parallel to I-81 until it terminates after crossing beneath Route 310.
- A palustrine, unconsolidated bottom, permanently flooded, and excavated (PUBHx) wetland system was identified southeast of the intersection at Exit 7. However, this system no longer exists.
- A PUBHx wetland system and palustrine, unconsolidated bottom, permanently flooded, and diked/impounded (PUBHh) wetland system were identified south of I-81 and west of Flame Leaf Road. The NWI maps shows tributaries of Beaver Creek feeding into the two wetland systems, however during the field review, no tributaries were observed connecting to the ponds.
- A R5UBH tributary of Beaver Creek feeds into a PUBHh wetland system located west of Virginia Trail and Majestic Drive.
- A R5UBH tributary of Sinking Creek enters the study area from the south and west of Halls Bottom Road. Another R5UBH branch of Sinking Creek runs north along Halls Bottom Road and crosses beneath I-81 and extends outside of the study area to the north.
- A R5UBH tributary of Spring Creek enters the study area from the south and runs north along Spring Creek Road crossing beneath I-81 and then crossing under Spring Creek Road (Route 611) to the west. A visual observation of Spring Creek showed evidence of adjacent wetlands south I-81 and to the east of Spring Creek Road. The wetlands appear to be disturbed from cattle grazing.
- A PUBHh wetland system was identified south of Dennison Road with a R5UBH tributary of Spring Creek feeding into the pond. Segments of the tributary extend north crossing beneath I-81, as well as extend east within the study area and parallel to Dennison Road.
- A segment of Wolf Creek (R5UBH) crosses beneath Stonemill Road at Gravel Lake Road, the entrance to the existing rock quarry. The tributary extends east parallel to Gravel Lake Road and terminates south of I-81.
- Several PUBHh wetland systems are located north of I-81 and east of Cummings Street that are fed by tributaries of Town Creek (R5UBH).
- The study area is intersected by the Creeper Trail between Exit 17 and Exit 19.
- A tributary of Fifteenmile Creek (R5UBH) intersects the study area from the south at Berry Creek Drive and Trigg Street, crossing beneath I-81.
- Another tributary of Fifteenmile Creek (R5UBH) intersects the study area from the south at Empire Drive and Canterbury Lane.

A field delineation of wetlands and WOUS in accordance with the USACE *Wetland Delineation Manual* (1987) and applicable Regional Supplement has not been conducted. Additional wetlands and Waters of the U.S. may be present within the study area.

If encroachment within the wetland and WOUS features identified is proposed, additional coordination with the USACE to determine the jurisdiction status of these features should be conducted. Following a formal delineation of the wetland and WOUS systems within the project corridor, efforts to avoid and minimize impacts to these features to the maximum extent practicable should be incorporated into the design.

Tidal and non-tidal wetlands and Waters of the US (WOUS) are subject to the jurisdiction of the US Army Corps of Engineers (USACE) and the Virginia Department of Environmental Quality (VDEQ). Subaqueous lands, tidal wetlands, and waters with a drainage area greater than five square miles are subject to the jurisdiction of Virginia Marine Resources Commission (VMRC). Permit types and the level of coordination will be determined based on the amount of impact to these jurisdictional areas. Permit issuance is subject to the level of effort during the design to first avoid, and then minimize impacts to jurisdictional areas.

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Potential Surface Waters

Figure 18

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6.4.4 Wildlife and Habitat

Section 7 of the Endangered Species Act (ESA) requires federal agencies to ensure that an undertaking is not likely to jeopardize the continued existence of species that are listed as endangered or threatened. The Virginia Department of Game and Inland Fisheries (VDGIF) Virginia Fish and Wildlife Information Service (VaFWIS), VDGIF's Wildlife Environmental Review Map Service (WERMS), VDGIF's Northern Long-eared Bat (NLEB) Winter Habitat and Roost Trees Application, VDGIF's Little Brown Bat (MYLU) and Tri-colored Bat (PESU) Winter Habitat and Roosts Application, the Department of Conservation and Recreation's (DCR) Natural Heritage Data Explorer, the U.S. Fish and Wildlife Service's (USFWS) Information, Planning, and Conservation system (IPaC), and the Center for Conservation Biology's (CCB) Eagle Nest Locator were reviewed to identify known federal or state listed endangered and threatened species and critical habitats within the project corridor. A summary of the species identified on the referenced databases reviewed and a preliminary evaluation of potential habitat within the study area is provided as **Table 12**, supplemental information is provided in **Appendix F**. The WERMS database results are shown in **Figure 19**.

The preliminary evaluation of potential habitat was based on available desktop and site-specific field studies and determinations were not conducted.

The study area was submitted to VDCR through the Virginia Natural Heritage Data Explorer (NHDE) to identify natural heritage resources within the vicinity of the project site. Natural heritage resources are defined by VDCR as "the habitat of rare, threatened, or endangered plant and animal species, unique or exemplary natural communities, and significant geologic formations." DCR also typically provides comments regarding anticipated negative impacts and recommendations to avoid, minimize or mitigate impacts. VDCR has reviewed the study area for potential impacts to natural heritage resources and offered comments by 1:24,000 quadrangles. The following listed items were identified in the correspondence received from VDCR, dated February 8, 2019.

- Global Conservation Status Rank/ State Conservation Status Rank/ Federal Legal Status/ State Legal Status
- Global Conservation Status Rank: G1 (Critically imperiled); G2 (Imperiled); G3 (Vulnerable); G4 (Apparently secure); G5 (Secure)
- State Conservation Status Rank: S1 (Critically imperiled); S2 (Imperiled); S3 (Vulnerable); S4 (Apparently secure); S5 (Secure)
- Federal Legal Status: LE (Listed endangered); LT (Listed threatened); PE (Proposed endangered); PT (Proposed threatened); C (Candidate); SOC (Species of concern); NL (Not listed)
- State Legal Status: LE (Listed endangered); LT (Listed threatened); PE (Proposed endangered); PT (Proposed threatened); C (Candidate); NL (Not listed)
- Glade Spring Quad, Hayters Gap Quad, Damascus Quad, and Abingdon Quad
- South Fork-Middle Fork Holston River Stream Conservation Unit (SCU) – this site is located downstream from the study area. This SCU has a biodiversity ranking of B3 (high significance). SCU's identify stream reaches that contain aquatic natural heritage resources, including 2 miles upstream and 1 mile downstream of documented occurrences, and all tributaries within this reach. The natural heritage resources associated with this site are:
  - *Alasmidonta marginata,* Elktoe - G4/S1S2/NL/NL
  - *Apalone spinifera,* Spiny Softshell - G5/S2/NL/NL
  - *Erimonax monachus*, Turquoise Shiner - G2/S1/LT/LT
  - *Etheostoma acuticeps,* Sharphead Darter - G3/S1/NL/LE
  - *Pleuronaia barnesiana,* Tennessee Pigtoe - G2G3/S2/SOC/NL
  - *Pleuronaia dolabelloides,* Slabside Pearlymussel - G2/S2/LE/LT
  - *Moxostoma carinatum,* River Redhorse - G4/S2S3/NL/NL
  - *Phenacobius crassilabrum,* Fatlips Minnow - G3G4/S2/NL/NL
  - *Pleurobema oviforme,* Tennessee Clubshell - G2G3/S2S3/SOC/NL
  - *Ptychobranchus subtentum,* Fluted Kidneyshell - G2/S2/LE/NL
  - *Cryptobranchus alleganiensis,* Hellbender - G3G4/S2/NL/NL
  - *Etheostoma Swannanoa,* Swannanoa Darter - G4/S2/NL/NL
  - *Etheostoma chlorobranchium,* Greenfin Darter - G4/S1/NL/LT
  - *Percina evides,* Gilt Darter - G4/S2/NL/NL
  - *Uranidea baileyi,* Black Sculpin - G4Q/S2/NL/NL
- Abingdon Quad
  - Berry Creek – Fifteen Mile Creek Stream Conservation Unit (SCU) – this site is located downstream of the study area. This SCU has a biodiversity ranking of B3 (high significance). The natural heritage resources associated with this site are:
    - *Pleuronaia barnesiana,* Tennessee Pigtoe - G2G3/S2/SOC/NL
    - *Pleurobema oviforme,* Tennessee Clubshell - G2G3/S2S3/SOC/NL
- Wyndale Quad
  - Spring Creek Stream Conservation Unit (SCU) – this site is located downstream of the study area. This SCU has a biodiversity ranking of B3 (high significance). The natural heritage resources associated with this site are:
    - *Gomphus consanguis*, Cherokee Clubtail - G3/S2/NL/NL
- Bristol Quad and Wallace Quad
  - South Fork Holston River-Beaver Creek – documented habitat for the following natural heritage resources:
    - *Pleuronaia barnesiana,* Tennessee Pigtoe - G2G3/S2/SOC/NL
- Karst – All Quads
  - The VDCR karst staff screened this study area against the Virginia Speleoogical Survey (VSS) database and the Virginia Department of Mines, Minerals, and Energy (DMME) sinkhole coverage for documented sensitive karst features and caves.

- Cedarville and Dutton Karst Conservation Sites – these sites are located within the Damascus and Abingdon quadrangles. Three known caves and numerous sinkholes are reported within the study area and two additional caves fall immediately outside of the study area. VDCR has no records of biological assessments of the known caves ever being performed and at least one of the caves has a stream in it. The following caves are known to exist within the study area: Blue Bell Cave, Barkers Cave, and Barkers Water Cave. The Abingdon Cave and Thunder Hill Cave are located immediately outside of the study area. VDCR has provided a map depicting the location of the listed caves (**Appendix F**).

VDCR Recommendations

VDCR provided the following recommendations:

- Coordinate with the USFWS and VDGIF on listed species;
- Develop and adhere to a strict erosion and sediment control plan;
- Avoidance of all karst features;
- Field location of cave entrances, biological assessments of the caves for bats and invertebrates;
- Assessment of hydrology within the study area; and,
- Coordinate with VDCR's Karst Protection Coordinator.

Table 12: Summary of Identified Threatened and Endangered Species

Species & Listing	Agency Identified By	Notes	Preliminary Habitat Conclusions
Mammals			
Carolina Northern Flying Squirrel (*Glaucomys sabrinus colaratus*) **FE**	USFWS	The Carolina Northern Flying Squirrel is found in areas that contain northern hardwood tree species and adjacent to higher-elevation Red spruce-Fraser fir forests.	Habitat potentially present
Gray Bat (*Myotis grisescens*) FESE	USFWS VaFWIS	Gray Bats typically live in caves year-round. During the winter, they hibernate in deep, vertical caves. In the summer, they roost in caves which are scattered along rivers. These caves are in limestone karst areas of the southeastern United States. They do not use houses or barns.	Maternity roost and winter hibernacula likely not present. Summer habitat potentially present.
Indiana Bat (*Myotis sodalis*) FESE	USFWS	There is final critical habitat for this species. The project corridor is located outside of the critical habitat. Indiana Bats hibernates primarily in caves or mines. Maternity sites generally are behind loose bark of trees or in tree cavities.	Maternity roost and winter hibernacula likely not present. Summer habitat potentially present.

Table 12: Summary of Identified Threatened and Endangered Species

Species & Listing	Agency Identified By	Notes	Preliminary Habitat Conclusions
Northern Long-eared Bat (*Myotis sodalis*) FESE	USFWS	Northern long-eared bats spend winter hibernating in caves and mines, called hibernacula. During the summer, northern long-eared bats roost singly or in colonies underneath bark, in cavities or in crevices of both live trees and snags (dead trees). Maternity roost sites and winter hibernacula were not identified on DGIF's NLEB Winter Habitat and Roost Trees Application.	Maternity roost and winter hibernacula likely not present. Summer habitat potentially present.
Virginia Big-eared Bat (*Corynorhimus townsendii virginianus*) FESE	USFWS	Virginia Big-eared Bats inhabit caves in limestone karst regions dominated by mature hardwood forests. There is final critical habitat for this species. The study area is located outside the critical habitat.	Maternity roost, winter hibernacula, and summer habitat likely not present
Little Brown Bat (*Myotis lucifugus*) SE	VaFWIS	Little Brown Bats typically utilizes human dwellings (barns, sheds, attics, buildings, ect.) as well as trees and caves for maternity roosts. DGIF's Winter habitat and Roost Trees Application did not identify winter habitat within 0.25 mile of the study area or known maternity roost trees within 150 feet of the study area. However, the study area lies within the 5.5-mile outer hibernaculum buffer according to the MYLU PESU Habitat Mapper.	Maternity roost and winter hibernacula likely not present
Tri-colored Bat (*Perimyotis subflavus*) SE	VaFWIS	Tri-colored Bats typically utilize human dwellings (barns, sheds, attics, buildings, ect.) as well as trees for maternity roosts. VDGIF is not aware of any tri-colored bat roosts in Virginia.	Maternity roost and winter hibernacula likely not present
Species & Listing	Agency Identified By	Notes	Preliminary Habitat Conclusions
Fish			
Spotfin Chub (*Erimonax monachus*) FTST	USFWS VaFWIS	Spotfin Chub inhabit medium to fairly large rivers. This species was listed on VaFWIS as having confirmed sightings within a 2-mile radius of the study area. There is final critical habitat for this species. The study area is located outside the critical habitat.	Habitat potentially present
Sharphead Darter (*Etheostooma auticeps*) SE	VaFWIS	Sharphead Darter inhabit runs and riffles of warm to slightly cool streams of moderate and large size. This species was listed on VaFWIS as having one confirmed occurrence within the South Fork Holston River of Washington County.	Habitat potentially present
Sickle Darter (*Percina williamsi*) ST	VaFWIS	Sickle Darter inhabits deeper riffles and pools with currents of the mountain-torrent type of moderate or large-sized streams which normally have fairly clear waters and clean bottoms of gravel and boulders. This species was listed on VaFWIS as having four confirmed occurrences, with one confirmed occurrence in the Middle Fork Holston River of Washington County.	Habitat potentially present
Mussels			

Table 12: Summary of Identified Threatened and Endangered Species

Species & Listing	Agency Identified By	Notes	Preliminary Habitat Conclusions
Black Sandshell (*Ligumia recta*) ST	VaFWIS	Black Sandshell inhabit medium to large rivers with a strong current, and is closely associated with shoals of sand and gravel substrate. This species was listed on VaFWIS as having three confirmed occurrences, with one confirmed occurrence in the Middle Fork Holston River of Washington County.	Habitat potentially present
Clams			
Fluted Kidneyshell (*Ptychobranchus subtentum*) FE	USFWS VaFWIS	The Fluted Kidneyshell inhabits small to medium rivers in areas with swift current or riffles. It is often embedded in sand, gravel, and cobble substrates.	Habitat potentially present
Slabside Pearlymussel (Pleuronaia dolabelloides) FESE	USFWS VaFWIS	Slabside Pearlymussels inhabit high gradient riffles systems in creeks and large rivers.There is final critical habitat for this species. The study area is located outside of the critical habitat designated for this species.	Habitat potentially present
Littlewing Pearlymussel (*Pegias fabula*) FESE	USFWS	The Littlewing Pearlymussel inhabits small creeks and small to medium sized rivers. It prefers riffle pools with sand or gravel substrates.	Habitat potentially present
Shiny Pigtoe (*Fusconaia cor*) FE	USFWS	The Shiny Pigtoe is commonly found in shoals and riffle pools within small to medium sized rivers with clear water and a moderate to fast current. VaFWIS has listed confirmed sightings of this species within a 2-mile radius of the study area.	Habitat potentially present
Tan Riffleshell (*Epioblasma florentina walkeri)* FE	USFWS	USFWS has not designated critical habitat or typical habitat requirements for this species. VDGIF recommends a TOYR of April 15 – June 15 for the glochidia release, and August 15 – September 30 for the spawning season.	Habitat potentially present
Spruce-fir Moss Spider (*Microhexura montivaga)* FE	USFWS	There is final critical habitat for this species. The project corridor is located outside of the critical habitat designated for this species.	Habitat potentially present
Other			
Bald Eagle (*Haliaeetus leucocephalus*) FS	CCB	The CCB's Eagle Nest Locater did not depict bald eagle nests within 660-feet of the study area.	No nests identified

Note: FE=Federal Endangered; FT=Federal Threatened; SE=State Endangered; ST=State Threatened; FS=Federal Species of Concern

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LEGEND

WERMS SPP OBS

- Bat, gray
- Bat, northern long-eared
- I-81 ENVIRONMENTAL STUDY AREA
- Bat, little brown
- Bat, tri-colored

0 0.5 1 2 Miles

Kimley»Horn	Interstate 81 Frontage Road Corridor Study Bristol, VA	WERMS Database Results	Figure 19

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6.5 Hazardous Materials

The Virginia Department of Environmental Quality's (VDEQ) GIS datasets and Virginia Environmental Geographic Information Systems (VEGIS) were reviewed (accessed 02/01/2019) for known petroleum releases, tank facilities, and Voluntary Remediation Program (VRP) sites within the study area. In addition to a review of readily available GIS data, a site visit was conducted on January 16 and 17, 2019 to review the study area and adjacent properties from public thoroughfares.

The study area is developed with a mix of commercial, residential, and industrial land uses. Commercial land uses consist of retail, restaurants, gas stations, and hotels. Industrial uses consist of storage facilities, hardware and glass production. Based on a review of the VDEQ GIS data, petroleum release sites and registered tank facilities were identified within the study area. No VRP sites were identified within the study area. Specifically, thirty-six (36) petroleum releases and forty-four (44) registered tank facilities were identified within the study area or immediately adjacent to the study area. **Table 13** provides a summary of petroleum releases and **Table 14** provides a summary of the registered tank facilities within the study area. All features listed within **Table 13** and **Table 14** are represented within **Figure 20**.

A detailed review to assess and identify the potential for the selected contractor to encounter contamination during construction within the project corridor should be conducted. In addition, if right-of-way acquisition will be required for the proposed project, a Phase I Environmental Site Assessment (ESA), conducted in accordance with American Society of Testing and Materials (ASTM) Standard 1527-13, may be required.

Table 13: Summary of Petroleum Releases

Facility Name	Facility Address	PC Number	Case Status	Release Status	Release Reported Date	Date Case Closed
Super Oil Station #18	2329 Lee Highway	19901454	Closed	Confirmed	4/26/1990	8/2/1994
Appalachian Exxon Station #5-0450	2291 Lee Highway	19921513	Closed	Confirmed	3/2/1992	4/18/1996
Maxi Mart #3	2291 Lee Highway	19943340	Closed	Suspected	4/7/1994	7/5/1994
Walling Distributing Warehouse	306 Walling Road	20001001	Closed	Confirmed	5/26/1999	3/7/2000
Chick-Fil-A #2084	3332 Lee Highway	20071054	Open	Confirmed	6/5/2007	NA
Exit 4 Shell Station	1136 Old Airport Road	19891752	Closed	Confirmed	6/14/1989	6/28/1989
Double Kwik #9	1136 Old Airport Road	20061025	Closed	Confirmed	11/17/2005	7/26/2006
Exit 7 Chevron	1135 Old Airport Road	11960164	Closed	Suspected	8/24/1995	9/1/1995
Exit 10 Conoco	15324 Lee Highway	20001115	Closed	Confirmed	6/15/2000	6/23/2000

Table 13: Summary of Petroleum Releases

Facility Name	Facility Address	PC Number	Case Status	Release Status	Release Reported Date	Date Case Closed
Cherokee Food Store 23	1020 Old Airport Road	20031009	Closed	Confirmed	8/21/2002	6/11/2008
Citgo Food Mart	1020 Old Airport Road	20081005	Closed	Suspected	7/28/2007	5/1/2008
Cherokee Food Store #14	1020 Old Airport Road	19990338	Closed	Confirmed	11/19/1998	4/26/2001
Citgo Food Mart	1020 Old Airport Road	20061004	Closed	Suspected	8/18/2005	7/25/2006
Quick Stop Market 36	15324 Lee Highway	20171026	Open	Suspected	3/22/2017	NA
Appco #63	16074 Lee Highway	20001095	Closed	Suspected	5/3/2000	7/17/2000
Virginia Highlands Airport	18521 Lee Highway	19910753	Closed	Confirmed	12/3/1990	2/11/1991
Virginia Highlands Airport	18521 Lee Highway	19950109	Closed	Confirmed	8/10/1994	11/8/1994
Wright Equipment Store	19209 Lee Highway	19921000	Closed	Confirmed	11/22/1991	7/29/1994
Dutt and Wagner of Virginia Incorporated	1142 W Main Street	20081054	Closed	Suspected	4/11/2008	7/29/2008
Roadrunner Market 186	191 Old Jonesboro Road	20171030	Open	Confirmed	3/31/2017	NA
Exit 14 Texaco Convenience Store	Jonesboro Road	19980357	Closed	Suspected	3/25/1998	11/21/2000
Food Mart of Abingdon	182 Jonesboro Road	20021011	Closed	Confirmed	8/7/2001	2/21/2002
Food Mart of Abingdon	182 Jonesborough Road	20021076	Closed	Confirmed	4/10/2002	9/6/2002
Former Super Check/Jimni Station	I-81 Exit 14	20011008	Closed	Confirmed	8/9/1999	4/2/2001
Super Check/ Jimni Station	I-81 Exit 14	19980351	Closed	Confirmed	2/25/1998	9/20/2001
Super Check/ Jimni Station	I-81 Exit 14	19900908	Closed	Confirmed	1/19/1990	12/16/1991
Rocket Food Mart #8	598 Cummings Street	20011015	Closed	Confirmed	8/22/2000	3/5/2003
Exit 17 Chevron	611 Cummings Street	20021074	Closed	Confirmed	3/27/2002	5/13/2002
Abingdon Travel Plaza	611 Cummings Street	20141020	Closed	Confirmed	2/18/2014	2/28/2014
Exit 17 Valero	713 Cummings Street	20081011	Open	Confirmed	9/5/2007	NA
Cherokee Convenience Store #15	713 Cummings Street	19990323	Closed	Confirmed	9/29/1998	1/30/2002

Table 13: Summary of Petroleum Releases

Facility Name	Facility Address	PC Number	Case Status	Release Status	Release Reported Date	Date Case Closed
Blevins Exxon Station	939 E Main Street	19920418	Closed	Confirmed	8/29/1991	1/25/1993
Sentry Food Mart 25	930 E Main Street	20001014	Closed	Confirmed	8/25/1999	12/11/2000
Roadrunner Store #134	24468 Lee Highway	20101002	Closed	Confirmed	9/15/2009	5/16/2013
Roadrunner Store #134	24468 Lee Highway	19980313	Closed	Confirmed	9/8/1997	8/19/1998
Roadrunner Store #134	24468 Lee Highway	19950119	Closed	Suspected	10/5/1994	6/8/1995

Table 14: Summary of Registered Tank Facilities

Facility Name	Facility Address	Facility ID	Facility Type	Facility Active	Active UST	Inactive UST	Active AST	Inactive AST
Atlas Honda	2377 Lee Highway	1003986	Auto Dealer	No	0	3	0	0
Super Oil #8	2329 Lee Highway	1021274	Gas Station	No	0	4	0	0
Planters & Designers	2353 Lee Highway	1003985	Commercial	No	0	2	0	0
Chatters 2 Short Stop	2291 Lee Highway	1010758	Gas Station	Yes	3	5	0	0
Walling Distributing Company	306 Walling Road	1006544	Commercial	No	0	2	0	0
Dairymen Inc.	283 Bonham Road	1006705	Trucking/ Transport	No	0	4	0	0
Sprint Nextel Bristol Call Center	134 Commerce Court	1036613	Utility	Yes	0	0	1	0
Fire Station #3	105 Suncrest Drive	1037496	Local	No	0	1	0	0
Crossings	300 Bonham Road	1022381	Commercial	Yes	3	0	0	0
Bristol Fueling Facility	868 Bonham Road	1011549	State	No	0	1	0	0
Clear Creek Mart	24 Clear Creek Road	1017464	Former Gas Station	Yes	2	0	0	0
Quick Stop Market 39	1135 Old Airport Road	1004270	Gas Station	Yes	3	6	0	0
Fas Mart 409	1136 Old Airport Road	1022167	Gas Station	Yes	4	0	0	1
Exit 7 Citgo	1020 Old Airport Road	1022339	Gas Station	No	0	6	0	0
Roadrunner Market 102	1001 Old Airport Road	1020885	Gas Station	Yes	3	0	0	0

Table 14: Summary of Registered Tank Facilities

Facility Name	Facility Address	Facility ID	Facility Type	Facility Active	Active UST	Inactive UST	Active AST	Inactive AST
Cummins Cumberland Inc	400 Stagecoach Road	1022145	Commercial	No	0	3	0	0
Bristol Virginia Utilities Board	15022 Lee Highway	1038403	Local	Yes	2	0	0	0
Quick Stop Market 36	15324 Lee Highway	1000868	Gas Station	Yes	3	2	0	0
Roadrunner Market 193	15572 Lee Highway	1018277	Gas Station	Yes	4	6	0	0
Appalachian Equipment	5520 Lee Highway	1015356	Industrial	No	0	2	0	0
Double Kwik 10	17306 Lee Highway	1025504	Gas Station	No	0	3	0	0
Dixie Pottery	17507 Lee Highway	1026494	Farm	No	0	2	0	0
World Wide Equipment	18285 Lee Highway	1003201	Commercial	Yes	0	0	1	1
Roadrunner Market #130	18224 Lee Highway	1021562	Gas Station	Yes	4	0	1	0
Virginia Highlands Airport	18521 Lee Highway	1018296	Airline/ Airport	Yes	0	5	2	0
Cherokee Construction Company	18564 Lee Highway	1016779	Contractor	No	0	3	0	0
Roberts Tire & Recapping, Inc.	19032 Lee Highway	1003570	Commercial	No	0	1	0	0
Wright Equipment Company	19209 Lee Highway	1006615	Commercial	No	0	7	0	0
Abingdon Ready Mix	19312 Lee Highway	1016764	Commercial	No	0	1	0	0
Roadrunner Market 186	191 Old Jonesboro Road	1018281	Gas Station	Yes	3	6	0	0
VA 0136	182 Jonesborough Road	1015285	Gas Station	Yes	3	8	1	0
Super Check	I-81 Exit 14	1000319	Gas Station	No	0	4	0	0
Bullys Market 1	1034 W Main Street	1002416	Gas Station	Yes	3	0	0	0
Rocket Food Mart 108	598 Cummings Street	1025479	Gas Station	No	0	5	0	0
Lakeway Food Mart	604 Cummings Street	1016778	Gas Station	Yes	3	6	0	0
Abingdon Travel Plaza	611 Cummings Street	1015332	Gas Station	No	0	7	0	0
Bullys One	713 Cummings Street	1022934	Gas Station	Yes	2	3	1	0
Mini Mart	Route 1 Box 546	1020662	Gas Station	No	0	2	0	0
W-L Construction	21339 Gravel Lick Road	1039751	Industrial	Yes	0	0	4	0

Table 14: Summary of Registered Tank Facilities

Facility Name	Facility Address	Facility ID	Facility Type	Facility Active	Active UST	Inactive UST	Active AST	Inactive AST
Abingdon Asphalt Plant								
Bullys 2	939 E Main Street	1009093	Gas Station	Yes	3	10	0	0
Sentry Food Mart 25	930 E Main Street	1011357	Gas Station	No	0	5	0	0
Bares Discount Tobacco and Wine	970 E Main Street	1038966	Gas Station	Yes	3	0	0	0
Roadrunner Market 134	24468 Lee Highway	1025499	Gas Station	Yes	3	5	0	0
MXI Environmental Inc.	26319 Old Trail Road	1040938	Industrial	Yes	0	0	3	2

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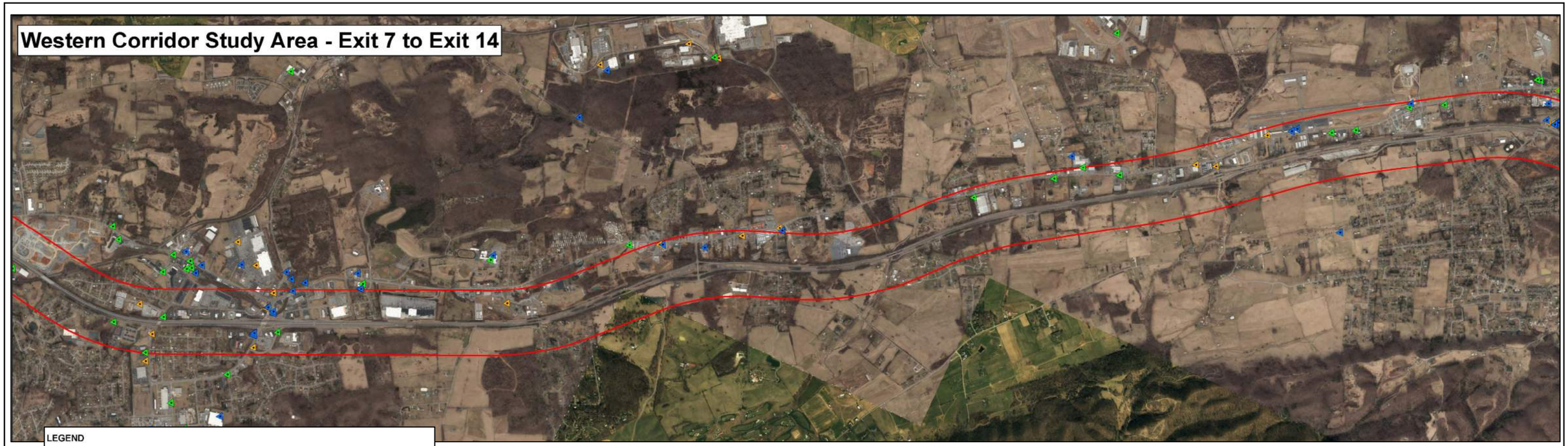


LEGEND

VDEQ Petroleum Releases

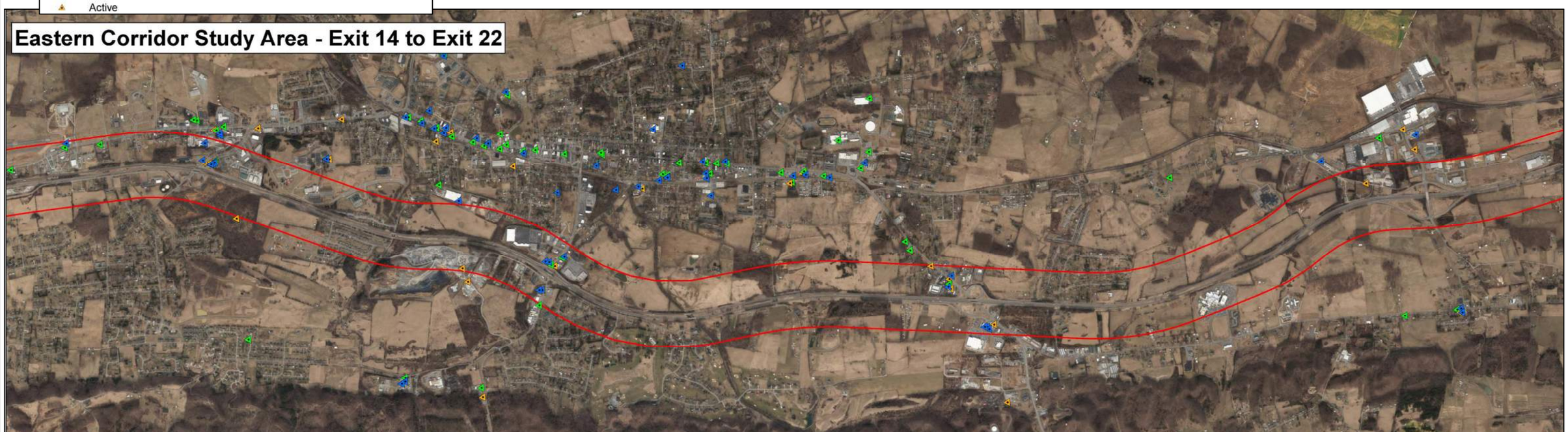
I-81 ENVIRONMENTAL STUDY AREA

VDEQ Registered Tank Facilities

Inactive

Active

0 0.5 1 2 Miles



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Interstate 81 Frontage Road Corridor Study

Bristol, VA

Summary of Petroleum Releases and Registered Tank Facilities

Figure 20

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7.0 Future Conditions Analysis

This chapter summarizes the future conditions analysis for the proposed alternatives considered in this study. Future traffic volumes were developed for the study horizon year of 2035. These volumes represent the projected growth that is expected to occur within and around the study area based on the various roadway alternatives analyzed as part of this study. This section details the methods and process for determining future traffic volumes for the study area corridor and intersections. Operational results from existing and future conditions are also discussed and presented within this chapter.

7.1 Future Traffic Volume Development

To establish 2035 horizon year traffic volumes within the study area, several growth and developmental factors were taken into consideration that could impact how traffic flows through the study area. Anticipated future traffic volumes were primarily developed based on historical trends, conversations with VDOT staff, and obtained from the Bristol MPO's 2040 Regional Travel Demand Model (TDM).

7.1.1 Bristol Regional TDM

The primary tool used in the development of future volumes was the Bristol MPO's Regional TDM. The Regional TDM was used to determine the approximately amount of traffic diversion onto new or improved facilities. This allows for the network implications of the proposed frontage road segments and/or other facility improvements to be considered as part of the future volume development process.

The Bristol MPO Regional TDM is a validated mathematical representation of the regional transportation system and its users' travel behavior. The model estimates the number of trips that will be made, the distribution patterns of the trips throughout the region, the likely mode used for the trips, and the actual roadways and transit lines used for auto and transit trips. Traffic volume projections from these simulations help assess transportation system performance and identify future road and transit needs. The TDM is based on a "four step modeling" as outlined below

- Step 1: Trip Generation (How many trips)
- Step 2: Trip Distribution (Where do trips go)
- Step 3: Mode Choice (How do we get there)
- Step 4: Trip Assignment (Which route to take)

The model includes the existing roadway network and committed (i.e., funded projects ready for construction) network changes, and has a base year of 2010 and a horizon year of 2040. The base network structure was updated within the study area limits to increase the model's granularity. This included coding in additional local roadway links that would serve as potential connecting points for the proposed frontage road alignments and modifying centroid connectors (i.e., links used to load the roadway network with social-economic and trip generating data). This resulted in a more refined network that could better capture the operational impacts of the proposed alternatives. The following scenarios were then setup for use in the TDM:

- Base year (2010)
- 2040 No Build
- 2040 Build
  - Alternative #2 – Frontage Road Alignments (Northern Connections)
  - Alternative #3 – Frontage Road Alignments (Southern Connections)
  - Alternative #4 – Widen Existing U.S. Route 11

7.1.2 Screen Line Analysis

With these runs established, a screen line analysis was conducted to compare how flows of traffic differ between scenarios and how much traffic diverted to new facilities. Screen lines provide a way to verify the overall flow of traffic across a set "barrier". For this analysis, screen lines were analyzed across U.S. Route 11, Interstate 81, and any potential frontage road alignment to determine the overall north/south flows of traffic between each interchange connection, as illustrated in **Figure 21**. The results of this screen line analysis based on uncalibrated TDM outputs for the aforementioned alternatives are summarized in **Table 15** through **Table 17**.

Alternative #2 (i.e., Northern Frontage Road Connections) shows that this proposed frontage road has the potential to divert 2.6% to 7.3% of the total north/south flows of daily traffic within the study area on to it. Likewise, Alternative #3 (i.e., Northern Frontage Road Connections) showed that this proposed frontage road has the potential to divert 1.8% and 6.7% of the total north/south flows of daily traffic within the study area on to it. The screen line analysis also shows that widening U.S. Route 11 could increase it volume of daily traffic by 0.2% to 9.5%, when compared to No Build volumes.

Figure 21: Regional TDM North/South Screen Lines Schematic

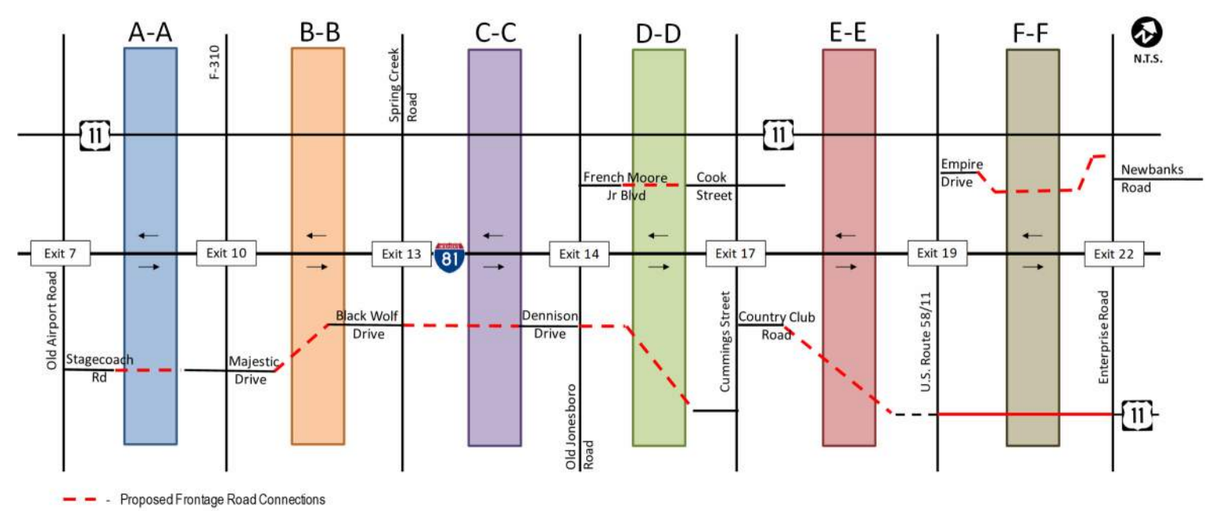

Table 15: Alternative #2 Screen Line Analysis

Alternative #2 - Northern Frontage Road Alignmnent Connections																						
		2010 (Base) ADTs						2040 (No Build) ADTs						2040 (ALT #2) ADTs						No Build/		% Diversion
Screen line	Location	US 11	I-81 NB	I-81 SB	Frontage Rd	Other	Total N-S	US 11	I-81 NB	I-81 SB	Frontage Rd	Other	Total N-S	US 11	I-81 NB	I-81 SB	Frontage Rd	Other	Total N-S	Build Diff	% Diff	on New
A-A	Between Exit 7 and Exit 10	8,466	22,618	22,964	-	-	**54,048**	9,818	26,037	26,042	-	-	**61,897**	8,071	26,015	25,833	4,746	-	**64,665**	2,768	4%	**7.3%**
B-B	Between Exit 10 and Exit 13	8,335	21,834	22,242	-	-	**52,411**	11,328	24,942	24,720	-	-	**60,990**	10,972	24,861	24,909	1,840	-	**62,582**	1,592	3%	**2.9%**
C-C	Between Exit 13 and Exit 14	8,749	21,184	22,438	-	-	**52,371**	11,722	23,809	25,427	-	-	**60,958**	11,599	23,533	25,400	1,619	-	**62,151**	1,193	2%	**2.6%**
D-D	Between Exit 14 and Exit 17	14,946	21,167	21,747	-	-	**57,860**	19,506	24,180	24,468	-	-	**68,154**	18,709	23,877	24,008	1,877	-	**68,471**	317	0%	**2.7%**
E-E	Between Exit 17 and Exit 19	6,191	20,744	21,257	-	-	**48,192**	6,631	25,177	25,084	-	-	**56,892**	6,379	24,650	24,952	2,112	-	**58,093**	1,201	2%	**3.6%**
F-F	Between Exit 19 and Exit 22	7,367	18,468	18,284	-	1,270	**45,389**	11,120	22,210	21,630	-	1,468	**56,428**	11,467	21,253	20,710	2,250	1,217	**56,897**	469	1%	**4.0%**

Table 16: Alternative #3 Screen Line Analysis

Alternative #3- Southern Frontage Road Alignmnent Connections																						
		2010 (Base) ADTs						2040 (No Build) ADTs						2040 (ALT #3) ADTs						No Build/		% Diversion
Screen line	Location	US 11	I-81 NB	I-81 SB	Frontage Rd	Other	Total N-S	US 11	I-81 NB	I-81 SB	Frontage Rd	Other	Total N-S	US 11	I-81 NB	I-81 SB	Frontage Rd	Other	Total N-S	Build Diff	% Diff	on New
A-A	Between Exit 7 and Exit 10	8,466	22,618	22,964	-	-	**54,048**	9,818	26,037	26,042	-	-	**61,897**	8,037	25,990	25,787	4,286	-	**64,100**	2,203	4%	**6.7%**
B-B	Between Exit 10 and Exit 13	8,335	21,834	22,242	-	-	**52,411**	11,328	24,942	24,720	-	-	**60,990**	11,011	24,810	24,859	1,917	-	**62,597**	1,607	3%	**3.1%**
C-C	Between Exit 13 and Exit 14	8,749	21,184	22,438	-	-	**52,371**	11,722	23,809	25,427	-	-	**60,958**	11,586	23,505	25,340	1,635	-	**62,066**	1,108	2%	**2.6%**
D-D	Between Exit 14 and Exit 17	14,946	21,167	21,747	-	-	**57,860**	19,506	24,180	24,468	-	-	**68,154**	18,946	23,725	24,099	1,351	-	**68,121**	33	0%	**2.0%**
E-E	Between Exit 17 and Exit 19	6,191	20,744	21,257	-	-	**48,192**	6,631	25,177	25,084	-	-	**56,892**	6,274	24,676	24,874	2,030	-	**57,854**	962	2%	**3.5%**
F-F	Between Exit 19 and Exit 22	7,367	18,468	18,284	-	1,270	**45,389**	11,120	22,210	21,630	-	1,468	**56,428**	12,150	22,097	21,538	-	1,457	**57,242**	814	1%	**1.8%**

Table 17: Alternative #4 Screen Line Analysis

Alternative #4- Widen U.S. Route 11																						
		2010 (Base)							2040 (No Build)							2040 (Widen US 11)						
Screen line	Location	US 11	I-81 NB	I-81 SB	Frontage Rd	Other	Total N-S	% on US 11	US 11	I-81 NB	I-81 SB	Frontage Rd	Other	Total N-S	% on US 11	US 11	I-81 NB	I-81 SB	Frontage Rd	Other	Total N-S	% on US 11	% Increase on US 11
A-A	Between Exit 7 and Exit 10	8,466	22,618	22,964	-	-	**54,048**	15.7%	9,818	26,037	26,042	-	-	**61,897**	15.9%	16,400	25,320	25,457	-	-	**67,177**	24.4%	**8.6%**
B-B	Between Exit 10 and Exit 13	8,335	21,834	22,242	-	-	**52,411**	15.9%	11,328	24,942	24,720	-	-	**60,990**	18.6%	18,654	23,806	24,048	-	-	**66,508**	28.0%	**9.5%**
C-C	Between Exit 13 and Exit 14	8,749	21,184	22,438	-	-	**52,371**	16.7%	11,722	23,809	25,427	-	-	**60,958**	19.2%	17,112	23,020	24,584	-	-	**64,716**	26.4%	**7.2%**
D-D	Between Exit 14 and Exit 17	14,946	21,167	21,747	-	-	**57,860**	25.8%	19,506	24,180	24,468	-	-	**68,154**	28.6%	21,125	24,263	24,813	-	-	**70,201**	30.1%	**1.5%**
E-E	Between Exit 17 and Exit 19	6,191	20,744	21,257	-	-	**48,192**	12.8%	6,631	25,177	25,084	-	-	**56,892**	11.7%	6,778	25,223	25,360	-	-	**57,361**	11.8%	**0.2%**
F-F	Between Exit 19 and Exit 22	7,367	18,468	18,284	-	1,270	**45,389**	16.2%	11,120	22,210	21,630	-	1,468	**56,428**	19.7%	12,548	21,304	20,779	-	1,180	**55,811**	22.5%	**2.8%**

7.1.3 Daily Traffic Volumes

To determine the calibrated future volume for the alternatives, additional adjustments were needed to the data to produce future ADTs. This was accomplished by applying the following steps to estimate 2035 ADTs used in the operational analysis:

1. Determine each screen line's 2035 No Build volumes based on 2018 count data and applied growth rates
   a. Interstate volumes – 2018 ADTs grown using approved VDOT Transportation and Mobility Planning Division (TMPD) interstate growth rates (i.e., 1.4-1.5% per year, based on location)
   b. Non-interstate roadways – adjusted based on each link's individual growth projections from TDM outputs (i.e., between 2010 base and 2040 horizon year)
2. Calculate 2035 Build screen line totals
   a. Interpolated between 2040 No Build and Build TDM outputs against the 2035 No Build volumes calculated in the previous step
3. Determine U.S. Route 11, I-81, and Frontage Road 2035 link volumes
   a. Proportional calculated each link's volumes compared to the corresponding screen line's total (i.e., 2040 TDM Build link volume divided 2040 TDM Build screen line total)
   b. Apply that proportion to the 2035 Build screen line total for each link to calculate 2035 Build ADTs

The resulting 2035 ADTs for Alternatives #1 through #4 are presented in **Figure 22** through **Figure 25**.

7.1.4 Future Peak Hour Volumes and Turning Movements

Peak hour turning movements for the study area intersections were also estimated based on outputs generated by the TDM. The Bristol TDM was updated to include the ability to report an individual intersection's turning movements. Turning movements were generated for the AM and PM peak hours from the 2010 Base Year, 2040 No Build, and the 2040 Preferred Alternative (See Section XX) model outputs. The individual steps for calculating an intersections future turning movements volumes are presented below:

1. Determine each intersection's 2035 No Build turning movement volumes based on 2018 count data and applied growth rates
   a. Interstate Ramps – 2018 TMC grown using approved VDOT Transportation and Mobility Planning Division (TMPD) interstate growth rates (i.e., 1.4-1.5% per year, based on location)
   a. Non-interstate roadways – Historical AADTs between 2014 and 2018 were reviewed to determine growth rates for many of the roadways within the study area. Based on this data, little to no growth has occurred. In order to account for some potential growth within the study area intersections, a conservative 0.5% per year growth rate was selected and applied to 2018 turning movements.
2. Use Bristol TDM to obtain intersection turning movements for 2010 Base Year, 2040 No Build, and the 2040 Preferred Alternative model outputs.
3. Adjust/Calibrate TDM outputs to be consistent with count data
   a. Calculate approach turning movement percentages for 2018 count data
   b. Applying approach turning movement percentages to 2010 Base and 2040 No Build approach volumes
4. Calculate 2040 Build diversion factors
   a. Compare and take the ratio of the 2040 Build turning movement volumes and 2040 adjusted No Build volume s
   b. Develop diversion factor to represent the proportion of volume that changes between No Build and Build due to network changes
5. Calculate 2035 Build peak hour turning movement
   a. Apply diversion factor to 2035 No Build peak hour volumes
   b. Adjust/balance volumes as appropriate based on network and link location

The resulting future peak hour volume determination worksheets for each study intersection are provided in **Appendix I**.

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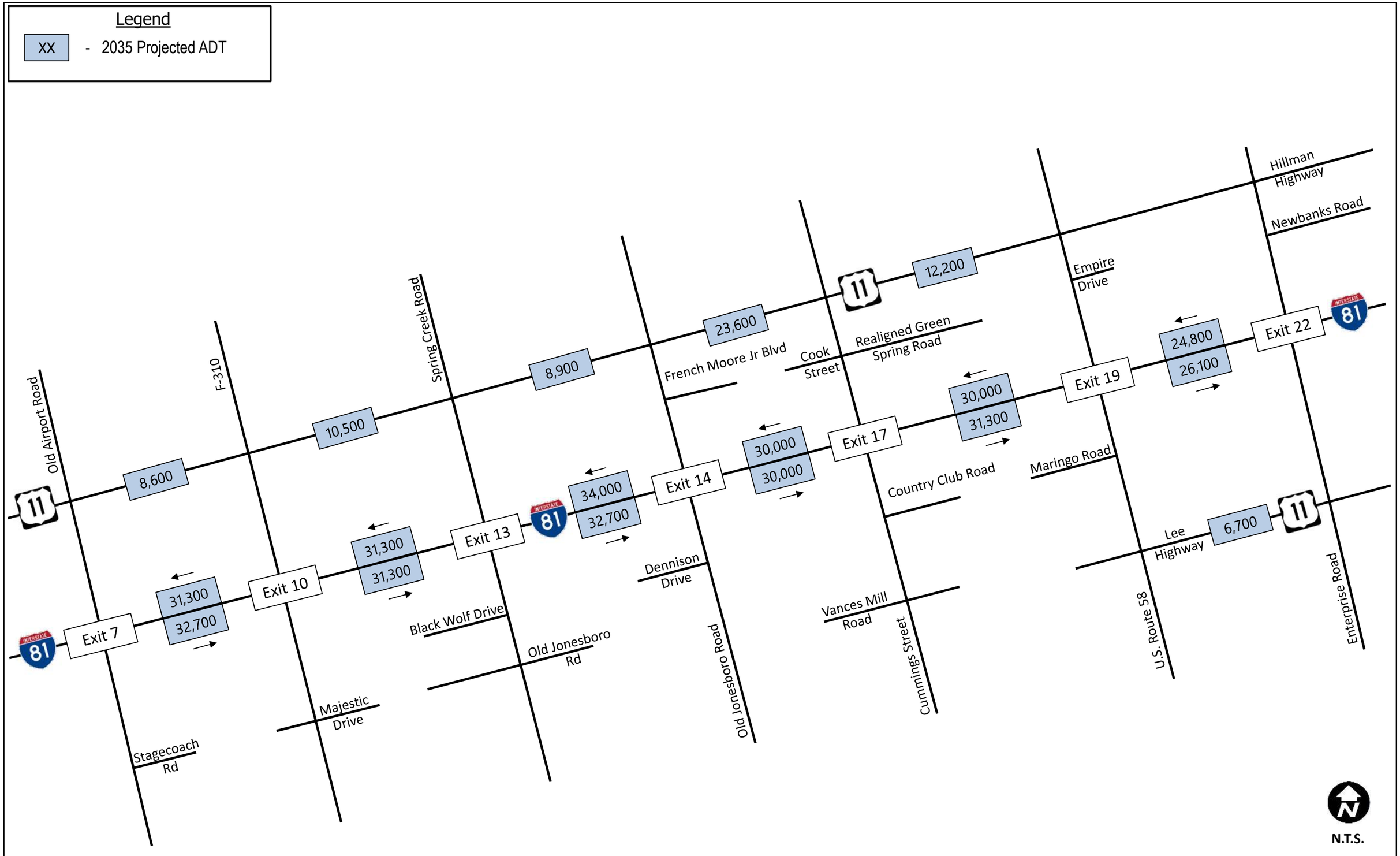

Kimley»Horn

Interstate 81 Frontage Road Corridor Study
Bristol, VA

Alternative #1 - 2035 No-Build ADTs

Figure 22

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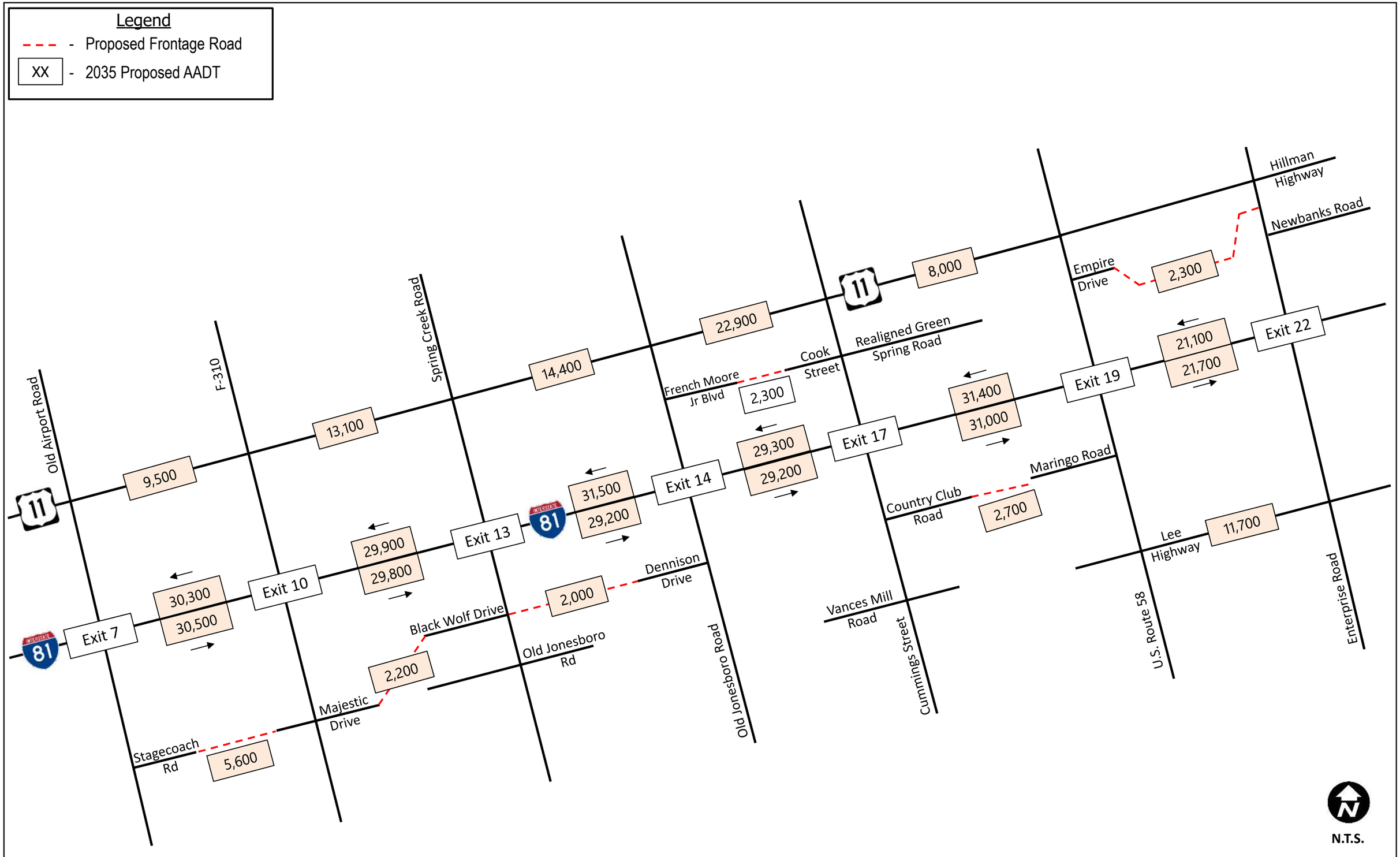

Kimley»Horn	Interstate 81 Frontage Road Corridor Study Bristol, VA	Alternative #2 - Northern Connections 2035 Projected ADTs	Figure 23

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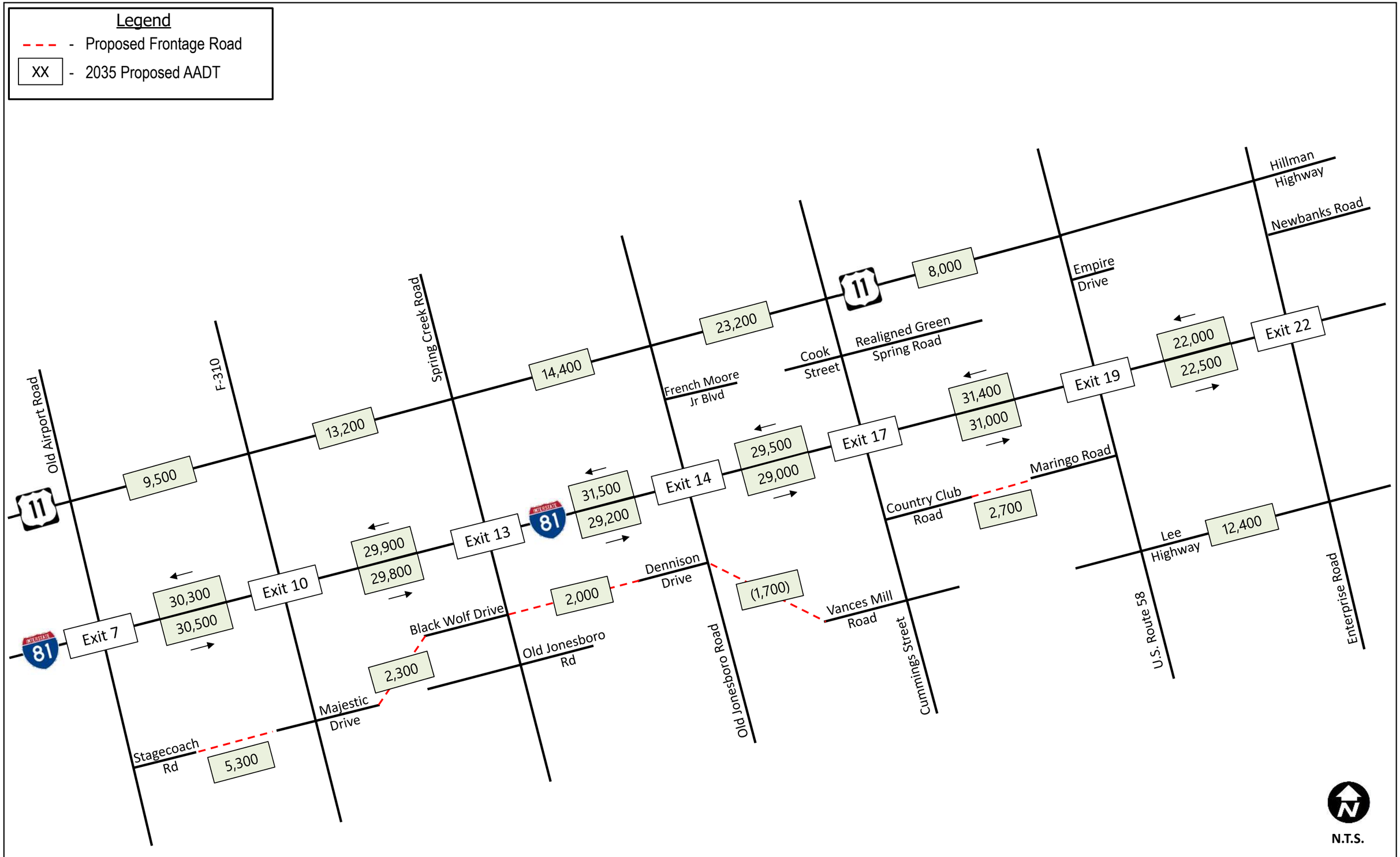

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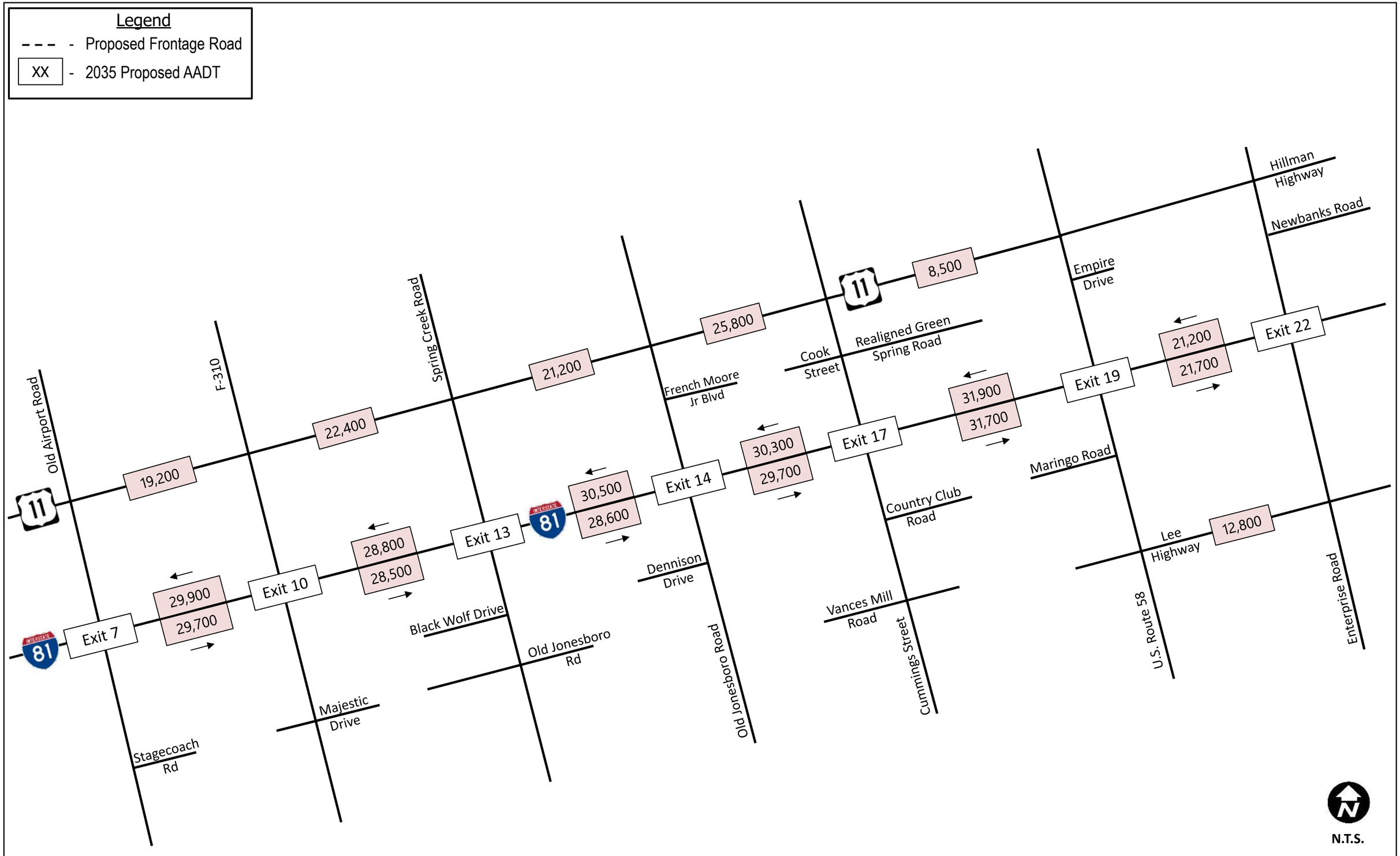

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Interstate 81 Frontage Road Corridor Study
Bristol, VA

Alternative #4 - Widen U.S. Route 11
2035 Projected ADTs

Figure 25

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7.2 Operational Analysis Methodologies

The traffic operations included the analysis of several freeways, arterials, and intersections within the study area. Along the freeway; mainline freeway segments were analyzed as part of the frontage road alternatives analysis to help in the identification of the preferred alternative. After the preferred alternative was selected, study area signalized and unsignalized intersections were evaluated in terms of their operational performance.

For the operational analysis, inputs and analysis methodologies were kept consistent with VDOT's TOSAM and this study's approved framework document. Both roadway segments and intersections were analyzed under Existing, No-Build, and Build scenarios using methods contained within the TOSAM. Four (4) main steps were generally completed for each of the AM and PM model simulations used in this study:

1. Network Development, Coding, and Model Inspection
2. Network Calibration
3. Inspection and Sample Size Determination
4. Analysis and Reporting

7.2.1 HCS Methodology

Roadway operational conditions were analyzed using the various modules contained within the Highway Capacity Software (HCS) 2010 (Version 6.5). HCS 2010 includes several modules that evaluates operational performance using the methodologies contained within the 2010 Highway Capacity Manual (HCM) based on the facility type (i.e., Freeways, Multilane, and TwoLane modules). Result presented from the HCS vary based on the module used for reporting, as summarized below:

- Two Lane Facility
  - Level of Service (LOS)
  - Volume to capacity ratio
- Multi-Lane Facility
  - Density (pc/mi/ln)
  - Level of Service (LOS)
- Freeway Facility
  - Density (pc/mi/ln)
  - Speed (MPH)

The results from this analysis was used in the identification and selection of the preferred alternative

7.2.2 Synchro/SimTraffic Methodology

Operational analyses for the study area intersections were analyzed using Synchro 10.1 Professional and SimTraffic 10.1. Existing intersection turning movement counts were used in conjunction with existing geometric data (i.e., number of lanes, turn-lane storage lengths, intersection traffic control, etc.) and traffic signal timing/phasing plans to analyze conditions at the study area intersections. The network was further modified for the future scenario analyses to reflect planned and programed improvements. The purpose of this analysis was to confirm the operations at the intersection level and identify any additional improvements were needed to support the preferred alternative.

Two measures of effectiveness (MOE) were analyzed in the intersection capacity analyses – average vehicle delay (in seconds per vehicle) and maximum queue lengths (in feet). Average vehicle delays were obtained using *2000 Highway Capacity Manual (HCM)* methodologies contained within *Synchro*, while maximum queue lengths were obtained from SimTraffic, which is the microsimulation companion tool of Synchro. Accompanying HCM vehicle delays are HCM level of service (LOS) designations. LOS ranges from A to F—"A" indicating a condition of little or no congestion and "F" indicating a condition with severe congestion, unstable traffic flow, and stop-and-go conditions. Generally, LOS A through D is considered "acceptable", while LOS E and F are considered unacceptable and are **bolded** in the results tables. **Table 18** summarizes LOS thresholds for unsignalized and signalized intersection operations.

Table 18: Intersection Level of Service (LOS) Thresholds

LOS	Intersection Delay per Vehicle(s)	Intersection Delay per Vehicle(s)
	Unsignalized	Signalized
A	0 - 10	0-10
B	>10 - 15	>10 - 20
C	>15 - 25	>20 - 35
D	>25 - 35	>35 – 55
E	>35 - 50	>55 - 80
F	>50	>80

Source: Highway Capacity Manual, Transportation Research Board, Washington, D.C., 2010

The existing synchro models were calibrated per the guidelines outline in VDOT's TOSAM. For this analysis, the following critical links/intersections (by ID) were selected and agreed upon for calibrating the existing Synchro/SimTrafffic models:

1. Old Airport Road at U.S. Route 11 (Lee Highway)
2. Old Airport Road at I-81 Southbound Off/On-Ramp
3. Old Airport Road at I-81 Northbound Off/On-Loop
4. Old Airport Road at Stagecoach Road

14. Old Jonesboro Road (SR 647) at U.S. Route 11 (Lee Highway)
16. Old Jonesboro Road at I-81 Southbound Off/On-Ramp
17. Old Jonesboro Road at I-81 Northbound Off/On-Loop
19. Cummings Street (SR 75) at U.S. Route 11 (Lee Highway)
21. Cummings Street at I-81 Southbound Off/On-Ramp
22. Cummings Street at I-81 Northbound Off/On-Ramp
24. Lee Highway (U.S. Route 11/58) at Hillman Highway (State Route 609)
26. Lee Highway at I-81 Southbound Off/On-Ramp/On-Loop

27. Lee Highway at I-81 Northbound Off/On-Ramp/On-Loop
28. Lee Highway (U.S. Route 11) at U.S. Route 58

To calibrate the existing models, simulated volumes and queues were compared to counted volumes (i.e., intersection turning movement count data) and observed queue lengths collected in the field by VDOT. Detailed summary sheets of the simulated volume and speed calibration process are provided in **Appendix G**. For the calibration process, 85 percent of the network/critical links (i.e., based on volume) must meet the following threshold:

- Simulated maximum queues needs to be within:
  - ± 25% on arterials
- Simulated volumes must be within:
  - ± 20% for < 100 vph
  - ± 15% for ≥ 100 vph to < 300 vph
  - ± 10% for ≥ 300 vph to < 1,000 vph
  - ± 5% for ≥ 1,000 vph

The results of the calibration effort indicate that the existing traffic models were validated and are able to simulate the study areas volumes and speeds adequately to meet the criteria set forth by the TOSAM. Any differences within the calibration results were only minor and justification and/or reasoning for these discrepancies are provided in **Appendix G**.

7.2.2.1 SAMPLE SIZE DETERMINATION

Per the TOSAM, an initial sample size of 10 simulation runs for the SimTraffic models were conducted before VDOT's Sample Size Determination process was performed. This ensures that an appropriate number of runs have been conducted and that simulation results are reasonable. For this analysis, simulated speeds were used from a critical link (i.e., Jonesboro Road, North of Exit 14) to validate the number of model simulations analyzed. Based on the sample size evaluation, a 10-simulation run sample size was verified as adequate for all models and scenarios analyzed in this study. The complete sample size evaluation results for the existing condition model simulation results are contained in **Appendix H**.

7.3 Existing Conditions Analysis

The existing traffic operations for this report consists of the analysis of the intersections and select roadway segment located within the study area.

7.3.1 Roadway Existing Conditions Results (HCS Results)

The results of the existing conditions analysis from the HCS software are shown in **Table 19**. Level of service (LOS) and the respective measures of effectiveness of the study area roadways were reported for the segments of I-81 and U.S. Route 11 between the following study area interchanges:

- Between Exit 7 and Exit 10
- Between Exit 10 and Exit 13
- Between Exit 13 and Exit 14
- Between Exit 14 and Exit 17
- Between Exit 17 and Exit 19
- Between Exit 19 and Exit 22

LOS describes the amount of traffic congestion on a roadway and ranges from A to F (e.g., 'A' indicating a condition of little to no congestion and 'F' a condition with severe congestion, unstable traffic flow, and stop-and-go conditions). Based on the results of the existing conditions analysis, the mainline freeway segments and roadway segments within the study area are currently operating at LOS D or better during the AM and PM peak hours.

Table 19: Existing HCS Operational Results for Study Area Roadways

Roadway Segment	Facility Type	Average Daily Traffic (ADT)	Peak Hour Flows (VPH)	Density (pc/mi/ln)	Level of Service	v/c Ratio	Speed (mph)
Between Exit 7 and Exit 10							
U.S. Route 11	Two-Lane	7,800	950	-	D	0.4	-
I-81 Northbound	Freeway	25,000	2,250	25.3	C	-	67.1
I-81 Southbound	Freeway	24,000	2,450	28.4	D	-	65.1
Between Exit 10 and Exit 13							
U.S. Route 11	Two-Lane	8,800	900	-	C	0.41	-
I-81 Northbound	Freeway	24,000	2,150	23.9	C	-	67.9
I-81 Southbound	Freeway	24,000	2,450	28.4	D	-	65.1
Between Exit 13 and Exit 14							
U.S. Route 11	Two-Lane	7,200	650	-	C	0.31	-
I-81 Northbound	Freeway	25,000	2,050	22.6	C	-	68.6
I-81 Southbound	Freeway	26,000	2,200	24.6	C	-	67.5
Between Exit 14 and Exit 17							
U.S. Route 11	Multi-Lane	21,000	1,950	12.9	B	-	-
I-81 Northbound	Freeway	23,000	2,150	23.9	C	-	67.9
I-81 Southbound	Freeway	23,000	2,350	26.8	D	-	66.2
Between Exit 17 and Exit 19							
U.S. Route 11	Two-Lane	12,000	1,000	-	D	0.37	-
I-81 Northbound	Freeway	24,000	1,900	20.7	C	-	69.7
I-81 Southbound	Freeway	23,000	2,350	26.8	D	-	66.2
Between Exit 19 and Exit 22							
U.S. Route 11	Two-Lane	4,600	400	-	C	0.21	-
I-81 Northbound	Freeway	20,000	1,900	20.7	C	-	69.4
I-81 Southbound	Freeway	19,000	2,000	21.9	C	-	68.9

7.3.2 Intersection Existing Conditions Results (Synchro Results)

The overall results of the existing conditions are shown in **Table 20** and **Table 21**, with more detailed results (i.e., movement LOS, approach LOS, and maximum queues) provided in **Appendix H**. Overall, all study area intersections currently operate at LOS D or better. Nearly each intersection's individual movements were noted to operate at LOS D or better as well. Intersections that had movements operating at LOS E or worse are also highlighted in the table below. Intersections with higher instances of delay were noted to generally occur more frequently at the intersections around the Town of Abingdon, specifically in the vicinity of Cummings Street (i.e., Exit 17 interchange).

Table 20: Existing Synchro Operational Results for Study Area Intersections

ID	Intersection	Traffic Control	Overall LOS (Delay in sec/veh)	
			AM Peak	PM Peak
1	Old Airport Road at U.S. Route 11 (Lee Highway)	Signal	C (33.5)	**D (40.9)**
2	Old Airport Road at Exit 7 / I-81 Southbound Off/On Ramp	Signal	B (13.2)	B (13.6)
3	Old Airport Road at Exit 7 / I-81 Northbound Off/On Ramp	Signal	C (22.9)	C (23.9)
4	Old Airport Road at Stagecoach Road	TWSC	A (1.8)	A (2.2)
5	F-310 at U.S. Route 11	Signal	B (14.2)	C (20.1)
6	F-310 at I-81 Southbound On Ramp/I-81 Southbound Off Ramp	TWSC	A (2.7)	A (2.6)
7	F-310 at I-81 Northbound On Ramp/I-81 Northbound Off Ramp	TWSC	A (9.4)	B (11.8)
8	Majestic Drive at F-310	TWSC	A (6.0)	A (6.0)
9	Spring Creek Road at U.S. Route 11	Signal	B (14.9)	B (16.6)
10	Spring Creek Road at I-81 Southbound On Ramp/I-81 Southbound Off Ramp	TWSC	A (3.8)	A (3.1)
11	Spring Creek Road at I-81 Northbound On Ramp/I-81 Northbound Off Ramp	TWSC	A (7.1)	A (8.8)
12	Spring Creek Road at Black Wolf Drive	TWSC	A (0.0)	A (0.2)
13	Old Jonesboro Road at Spring Creek Road	TWSC	A (4.3)	A (6.1)
14	Old Jonesboro Road at U.S. Route 11	Signal	C (27.2)	C (30.8)

Table 21: Existing Synchro Operational Results for Study Area Intersections (cont.)

Intersection		Traffic Control	Overall LOS (Delay in sec/veh)	
			AM Peak	PM Peak
15	Old Jonesboro Road at VHCC Drive	Signal	A (8.4)	B (15.8)
16	Old Jonesboro Road at I-81 Southbound On Ramp/I-81 Southbound Off Ramp	Signal	C (22.9)	C (21.0)
17	Old Jonesboro Road at Dennison Drive/I-81 Northbound Off/On Ramp	Signal	**C (29.7)**	C (30.0)
19	Cummings Street at U.S. Route 11	Signal	**D (39.7)**	**D (38.2)**
20	Cummings Street at Cook Street	Signal	A (5.9)	B (12.3)
21	Cummings Street at I-81 Southbound On Ramp/I-81 Southbound Off Ramp	Signal	**C (26.6)**	C (29.3)
22	Cummings Street at I-81 Northbound On Ramp/I-81 Northbound Off Ramp	Signal	**D (39.1)**	**C (24.0)**
23	Cummings Street at Vances Mill Road/Fairway Drive	TWSC	A (3.6)	A (3.0)
24	Residential Driveway/Hillman Highway at U.S. Route 11	Signal	B (12.4)	B (11.9)
25	I-81 Southbound On Ramp/Empire Drive at U.S. Route 11	TWSC	A (1.1)	A (1.2)
26	U.S. Route 11 at Southbound Off Ramp/On Loop	TWSC	A (4.3)	A (1.5)
27	I-81 Northbound Off/On Ramp/I-81 Northbound On Ramp at U.S. Route 11	Signal	B (13.0)	B (12.2)
28	Commercial Entrance/U.S. Route 11 at U.S. Route 11/U.S. Route 58	Signal	B (16.7)	B (18.5)
29	Enterprise Road/Distribution Center Site Entrance at Hillman Highway	TWSC	A (7.0)	A (5.3)
30	Enterprise Road at I-81 Southbound On Ramp/I-81 Southbound Off Ramp	TWSC	A (4.8)	A (2.3)
31	Enterprise Road at I-81 Northbound Off Ramp/I-81 Northbound On Ramp	TWSC	A (4.3)	A (3.7)
32	Enterprise Road at Newbanks Road	TWSC	A (0.2)	A (1.6)
33	Old Trail Road at Hillman Highway	TWSC	A (1.7)	A (1.7)
34	Harrison Road at Old Trail Road	TWSC	A (0.9)	A (2.1)
35	Commercial Entrance/Enterprise Road at Lee Highway	Signal	A (9.6)	A (9.9)

7.4 Future Operational Analysis

The results of the 2035 future conditions analysis was used as part of the alternatives analysis presented in this section. HCS models of the roadways segments within the study area were primarily used to assess future project conditions and provide comparisons in operations between the alternatives. **Table 22** through **Table 27** summarize the operational analysis results for the roadways between the study area interchanges, with further discussions provided in the following sections.

7.4.1 Future Conditions on Roadway Segments Between Exit 7 and Exit 10

Future operational results for the study area roadways (i.e., I-81, U.S. Route 11, and the proposed frontage road connections) between Exit 7 and Exit 10 are summarized in **Table 22**. These results reflect design hourly volumes (DHV) and were derived from the projected average daily traffic (ADT) volumes.

Under future No Build conditions, operations are expected to significantly deteriorate along the interstate, as LOS is projected to increases to 'E' and 'F' for the northbound and southbound directions, respectively. However, the addition of the proposed frontage road that connects Stagecoach Road (i.e., Exit 7 access) to Majestic Drive (i.e., Exit 10 access) is expected to help improve conditions along the interstate, as LOS is shown to improve to 'D' and 'E'. Additionally, the proposed frontage road is expected to operate at LOS C as a two-lane roadway during the design hour.

Under Alternative #2 and #3, traffic is diverting from I-81, freeing up additional capacity on the interstate, and utilizing the other parallel facilities between Exits 7 and 10. This is also noted to occur under Alternative #4, with traffic diverting from I-81 onto an improved section of U.S. Route 11, as well. Based on these results, improvements to the parallel routes are anticipated to help improve traffic flows along the interstate.

Table 22: 2035 HCS Results for Roadway Segments Between Exit 7 and Exit 10

Roadway Segment	Average Daily Traffic (ADT)	Peak Hour Flows (VPH)	Density (pc/mi/ln)	Level of Service	v/c Ratio	Speed (mph)
Alternative #1 - No-Build						
U.S. Route 11	8,600	1,050	-	D	0.44	-
I-81 Northbound	32,700	2,900	37.4	**E**	-	58.6
I-81 Southbound	31,300	3,200	45.8	**F**	-	52.8
Alternative #2 and #3 - Frontage Road Connections						
U.S. Route 11	9,500	1,150	-	D	0.47	-
I-81 Northbound	30,500	2,700	33	D	-	61.8
I-81 Southbound	30,300	3,100	42.7	**E**	-	54.8
Proposed Frontage Road	5,300	550	-	C	0.23	-
Alternative #4 - Widen US 11						
U.S. Route 11	19,200	2,300	16.1	B	-	50
I-81 Northbound	29,700	2,650	32	D	-	62.5
I-81 Southbound	29,900	3,100	42.7	**E**	-	54.8

7.4.2 Future Conditions on Roadway Segments Between Exit 10 and Exit 13

Future operational results for the study area roadways (i.e., I-81, U.S. Route 11, and the proposed frontage road connections) between Exit 10 and Exit 13 are summarized in **Table 23**. These results reflect design hourly volumes (DHV) and were derived from the projected average daily traffic (ADT) volumes.

Under future No Build conditions, operations are expected to significantly deteriorate along the interstate, as LOS is projected to increases to 'E' and 'F' for the northbound and southbound directions, respectively. However, the addition of the proposed frontage road that connects Majestic Drive (i.e., Exit 10 access) to Spring Creek Road (i.e., Exit 13 access) is also expected to help improve conditions along the interstate, as LOS is shown to improve to 'D' and 'E'. Additionally, the proposed frontage road is expected to operate at LOS C as a two-lane roadway during the design hour.

Under Alternative #2 and #3, traffic is diverting from I-81, freeing up additional capacity on the interstate, and utilizing the other parallel facilities between Exits 10 and 13. This is also noted to occur under Alternative #4, with traffic diverting from I-81 onto an improved section of U.S. Route 11, as well. Based on these results, improvements to the parallel routes are anticipated to help improve traffic flows along the interstate.

Table 23: 2035 HCS Results for Roadway Segments Between Exit 10 and Exit 13

Roadway Segment	Average Daily Traffic (ADT)	Peak Hour Flows (VPH)	Density (pc/mi/ln)	Level of Service	v/c Ratio	Speed (mph)
Alternative #1 - No-Build						
U.S. Route 11	10,500	1,100	-	D	0.48	-
I-81 Northbound	31,300	2,800	35.1	**E**	-	60.3
I-81 Southbound	31,300	3,200	45.8	**F**	-	52.8
Alternative #2 and #3 - Frontage Road Connections						
U.S. Route 11	13,200	1,350	-	D	0.59	-
I-81 Northbound	29,800	2,700	33	D	-	61.8
I-81 Southbound	29,900	3,100	42.7	**E**	-	54.8
Proposed Frontage Road	2,300	250	-	C	0.13	-
Alternative #4 - Widen US 11						
U.S. Route 11	22,400	2,350	17.4	B	-	50
I-81 Northbound	28,500	2,550	30.2	D	-	63.9
I-81 Southbound	28,800	2,950	38.6	**E**	-	57.7

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7.4.3 Future Conditions on Roadway Segments Between Exit 13 and Exit 14

Future operational results for the study area roadways (i.e., I-81, U.S. Route 11, and the proposed frontage road connections) between Exit 13 and Exit 14 are summarized in **Table 24**. These results reflect design hourly volumes (DHV) and were derived from the projected average daily traffic (ADT) volumes.

Under future No Build conditions, operations are expected to deteriorate slightly along the interstate, as LOS is projected to increases to 'D' and 'E' for the northbound and southbound directions, respectively. However, the addition of the proposed frontage road that connects Spring Creek Road (i.e., Exit 13 access) to Old Jonesboro Road (i.e., Exit 14 access) is also expected to help improve conditions along the interstate, as LOS is shown to improve to 'D' for both northbound and southbound directions. Additionally, the proposed frontage road is expected to operate at LOS B as a two-lane roadway during the design hour.

Under Alternative #2 and #3, traffic is diverting from I-81, freeing up some additional capacity on the interstate, and utilizing the other parallel facilities between Exits 13 and 14. Traffic on U.S. Route 11 is also expected to increase for the segment between Exit 13 and Exit 14, as its LOS increases from C to D with the addition of a frontage road connection. With the addition of a more complete local/parallel roadway network within the study area, local traffic not destined for the primary interchanges are more likely to stay off of the interstate facilities. This is also noted to occur under Alternative #4, with traffic diverting from I-81 onto an improved section of U.S. Route 11, as well. Based on these results, improvements to the parallel routes are anticipated to help improve traffic flows along the interstate and serve more local traffic.

Table 24: 2035 HCS Results for Roadway Segments Between Exit 13 and Exit 14

Roadway Segment	Average Daily Traffic (ADT)	Peak Hour Flows (VPH)	Density (pc/mi/ln)	Level of Service	v/c Ratio	Speed (mph)
Alternative #1 - No-Build						
U.S. Route 11	8,900	850	-	C	0.39	-
I-81 Northbound	32,700	2,700	33	D	-	61.8
I-81 Southbound	34,000	2,900	37.4	**E**	-	58.6
Alternative #2 and #3 - Frontage Road Connections						
U.S. Route 11	14,400	1,350	-	D	0.58	-
I-81 Northbound	29,200	2,400	27.6	D	-	65.6
I-81 Southbound	31,500	2,700	33	D	-	61.8
Proposed Frontage Road	2,000	200	-	B	0.1	-
Alternative #4 - Widen US 11						
U.S. Route 11	21,200	1,950	14.4	B	-	50
I-81 Northbound	28,600	2,350	26.8	D	-	66.2
I-81 Southbound	30,500	2,600	31.1	D	-	63.2

7.4.4 Future Conditions on Roadway Segments Between Exit 14 and Exit 17

Future operational results for the study area roadways (i.e., I-81, U.S. Route 11, and the proposed frontage road connections) between Exit 14 and Exit 17 are summarized in **Table 23**. These results reflect design hourly volumes (DHV) and were derived from the projected average daily traffic (ADT) volumes. Under future No Build conditions, operations are expected to significantly deteriorate along the interstate, as LOS is projected to increases to 'E' for the northbound and southbound directions.

For this segment, two frontage road alternatives were considered. Alternative #2 considers making a frontage road connection on the north side of I-81 as part of the French Moore Jr Boulevard extension. Under this alternative, northbound and southbound flows on I-81 are expected to improve to LOS D and E, respectively. Additionally, the proposed frontage road under this alternative is expected to operate at LOS C as a two-lane roadway during the design hour.

Likewise, Alternative #3 considers a frontage road connection to the south of I-81 that connects Old Jonesboro Road (i.e., Exit 14) to Cummings Street (i.e., Exit 17). This connection also has the ability to improve northbound and southbound flows on I-81 are expected to LOS D and E, respectively. Additionally, the proposed frontage road in this alternative is expected to operate at LOS B as a two-lane roadway during the design hour. Between the two frontage road connections for this segment, it is anticipated that Alternative #2 (i.e., French Moore Jr Boulevard extension) would draw slightly more traffic away from I-81 when compared to the other connection.

Under Alternative #2 and #3, traffic is diverting from I-81, freeing up additional capacity on the interstate, and utilizing the other parallel facilities between Exits 10 and 13.

It should be noted to portions of U.S. Route 11 cannot be widened in this segment, due to the historic downtown of Abingdon. As a result, Alternative #4 only shows a slight increase in traffic on U.S. Route 11, and less improved conditions along I-81 compared to either of the proposed frontage road connections.

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Table 25: 2035 HCS Results for Roadway Segments Between Exit 14 and Exit 17

Roadway Segment	Average Daily Traffic (ADT)	Peak Hour Flows (VPH)	Density (pc/mi/ln)	Level of Service	v/c Ratio	Speed (mph)
Alternative #1 - No-Build						
U.S. Route 11	23,600	2,200	14.6	B	-	-
I-81 Northbound	30,000	2,800	35.1	**E**	-	60.3
I-81 Southbound	30,000	3,100	42.7	**E**	-	54.8
Alternative #2 - Frontage Road (French Moore Jr Boulevard Extension)						
U.S. Route 11	22,900	2,150	14	B	-	-
I-81 Northbound	29,200	2,700	33	D	-	61.8
I-81 Southbound	29,300	3,000	39.9	**E**	-	56.8
Proposed Frontage Road	2,300	250	-	C	0.13	-
2035 Build Conditions Alternative #3 - Frontage Road (Southern Connection)						
U.S. Route 11	23,200	2,150	14	B	-	-
I-81 Northbound	29,000	2,700	33	D	-	61.8
I-81 Southbound	29,500	3,050	41.3	**E**	-	55.8
Proposed Frontage Road	1,700	150	-	B	0.08	
Alternative #4 - Widen US 11						
U.S. Route 11	25,800	2,400	15.8	B	-	45
I-81 Northbound	29,700	2,750	34	D	-	61.1
I-81 Southbound	30,300	3,100	42.7	**E**	-	54.8

7.4.5 Future Conditions on Roadway Segments Between Exit 17 and Exit 19

Future operational results for the study area roadways (i.e., I-81, U.S. Route 11, and the proposed frontage road connections) between Exit 17 and Exit 19 are summarized in **Table 26**. These results reflect design hourly volumes (DHV) and were derived from the projected average daily traffic (ADT) volumes.

Under future No Build conditions, operations are expected to deteriorate slightly along the interstate, as LOS is projected to increases to 'D' and 'E' for the northbound and southbound directions, respectively. However, the addition of the proposed frontage road that provides another way to connects Cummings Street (i.e., Exit 17 access) to U.S. Route 11/U.S. Route 58 (i.e., Exit 19 access) shows that LOS on the interstate is expected to remain at No-Build levels, or slightly worsen. Based on the project traffic volumes, a higher volume of traffic is anticipated to utilize the proposed frontage road connection than what is shown on future U.S. Route 11 through downtown Abingdon. This means that traffic is not expected to divert from I-81 to this segment of frontage road. Instead this section of frontage road is operating as a more attractive route options for vehicles that would normally rely on U.S. Route 11 who would have to traverse through downtown Abingdon.

Likewise, due to the bottleneck of downtown Abingdon, the segment of U.S. Route 11 between Exits 17 and Exit 19 did not see significant increases in traffic flow under Alternative #4. Therefore, conditions are projected to continue deteriorating on I-81.

Table 26: 2035 HCS Results for Roadway Segments Between Exit 17 and Exit 19

Roadway Segment	Average Daily Traffic (ADT)	Peak Hour Flows (VPH)	Density (pc/mi/ln)	Level of Service	v/c Ratio	Speed (mph)
Alternative #1 - No-Build						
U.S. Route 11	12,200	1,050	-	D	0.39	-
I-81 Northbound	31,300	2,450	28.4	D	-	65.1
I-81 Southbound	30,000	3,100	42.7	**E**	-	54.8
Alternative #2 and #3 - Frontage Road Connections						
U.S. Route 11	8,000	700	-	D	0.25	
I-81 Northbound	31,000	2,450	28.4	D	-	65.1
I-81 Southbound	31,400	3,250	47.5	**F**	-	51.7
Proposed Frontage Road	2,700	250	-	C	0.13	
Alternative #4 - Widen US 11						
U.S. Route 11	8,500	700	-	D	0.28	-
I-81 Northbound	31,700	2,500	29.3	D	-	64.5
I-81 Southbound	31,900	3,300	47.5	**F**	-	50.6

7.4.6 Future Conditions on Roadway Segments Between Exit 19 and Exit 22

Future operational results for the study area roadways (i.e., I-81, U.S. Route 11, and the proposed frontage road connections) between Exit 19 and Exit 22 are summarized in **Table 23**. These results reflect design hourly volumes (DHV) and were derived from the projected average daily traffic (ADT) volumes. Under future No Build conditions, operations are expected to significantly deteriorate along the interstate, as LOS is projected to increases to 'D' for the northbound and southbound directions.

For this segment, two frontage road alternatives were considered. Alternative #2 considers making a frontage road connection on the north side of I-81 that connects U.S. Route 11/U.S. Route 58 (i.e., Exit 19) to Enterprise Road (i.e., Exit 22) via a new roadway alignment. Under this alternative, LOS on I-81 is expected to improve to LOS C, as traffic diverts onto the parallel facilities.

For Alternative #3, the existing section of U.S. Route 11 between U.S. Route 58 and Enterprise Road to the south of I-81 would be widened to a four-lane roadway. Under this alternative, conditions are also expected to improve along I-81 as traffic diverts onto U.S. Route 11 to make use of this additional capacity. U.S. Route 11 is anticipated to operate at LOS A with the increase in capacity. Alternative #4 also shares the same benefits as Alternative #3 for these segments, as it utilizes the same proposed improvements.

Table 27: 2035 HCS Results for Roadway Segments Between Exit 19 and Exit 22

Roadway Segment	Average Daily Traffic (ADT)	Peak Hour Flows (VPH)	Density (pc/mi/ln)	Level of Service	v/c Ratio	Speed (mph)
Alternative #1 - No-Build						
U.S. Route 11	6,700	600	-	C	0.28	-
I-81 Northbound	26,100	2,500	29.3	D	-	64.5
I-81 Southbound	24,800	2,600	31.1	D	-	63.2
Alternative #2 - Frontage Road (Northern Connection)						
U.S. Route 11	11,700	1,050	-	C	0.44	-
I-81 Northbound	21,700	2,100	23.2	C	-	68.3
I-81 Southbound	21,100	2,200	24.6	C	-	67.5
Proposed Frontage Road	2,300	250	-	C	0.13	-
Alternative #3 - Frontage Road (Widen US 11)						
U.S. Route 11	12,400	1,100	7.8	A	-	50
I-81 Northbound	22,500	2,150	23.9	C	-	67.9
I-81 Southbound	22,000	2,300	26.1	D	-	66.6
Alternative #4 - Widen US 11						
U.S. Route 11	12,800	1,150	8.2	A	-	50
I-81 Northbound	21,700	2,100	23.2	C	-	68.3
I-81 Southbound	21,200	2,200	24.6	C	-	67.5

7.4.7 Future Intersection Operational Conditions

For the future analysis of the study area intersections under the preferred alternative, two processes were followed. First, the VDOT Junction Screening Tool (VJuST) was used to help determine if innovative intersections should be analyzed at select study area intersections along the preferred frontage road alignment and/or if consideration of traffic signalization was appropriate for unsignalized intersection. Second, the future operational results from Synchro/SimTraffic were used to determine if the assumed traffic control measure (i.e., traffic signal, unsignalized two-way stop control [TWSC], or roundabout) was able to function without significant delays or queues.

Based on the results of the VJuST analysis and future projected volumes, no innovative intersections were identified to be appropriate along the proposed frontage road corridor, as summarized in **Table 28**. Detailed outputs from the VJuST worksheets are provided in Appendix F. It should be noted that previous planning efforts conducted by Washington County have resulted in a preferred alternative of a two-lane roundabout at the existing intersection of U.S. Route 11 and U.S. Route 58 (ID #28). As such, this roundabout was carried forward as part of the proposed frontage road, as it would tie into this roundabout as its fourth leg. Otherwise, all intersections under consideration were shown to be able to function at adequate levels as unsignalized intersections, with the minor streets operating as stop controlled.

Table 28: 2035 VJuST Intersection Conditions and Proposed Traffic Control Measure

ID	Intersection	VJuST Traffic Control	AM Maximum v/c	PM Maximum v/c
4	Stagecoach Road at Old Airport Road	Signal ✓	0.46	0.43
		Roundabout	0.81	0.76
		TWSC	0.00	0.00
F1	Frontage Road at Halls Bottom Road	Signal	0.12	0.24
		Roundabout	0.08	0.17
		TWSC ✓	0.04	0.00
F2	Singing Wood Lane at Halls Bottom Road	Signal	0.15	0.18
		Roundabout	0.15	0.18
		TWSC ✓	0.00	0.00
12	Frontage Road at Spring Creek Road	Signal	0.27	0.26
		Roundabout	0.33	0.30
		TWSC ✓	0.40	0.41
F3	Frontage Road at Old Jonesboro Road	Signal	0.45	0.29
		Roundabout	0.56	0.25
		TWSC ✓	0.00	0.00
F4	Frontage Road at Stone Mill Road	Signal	0.23	0.29
		Roundabout	0.23	0.29
		TWSC ✓	0.19	0.22
F5	Gravel Lake Road at Cummings Street	Signal	0.49	0.35
		Roundabout	0.61	0.43
		TWSC ✓	0.00	0.00
35	Lee Highway at Enterprise Road	Signal	0.31	0.34
		Roundabout	0.28	0.45
		TWSC ✓	0.25	0.31

This was further confirmed through the future Synchro/SimTraffic analysis. The preferred frontage road network connections and intersections were analyzed by modifying the existing Synchro network. This was done to confirm the appropriate traffic control measures for study area intersection and determine if any other capacity or roadway improvements were needed to accommodate future traffic volumes associated with the preferred frontage road connections. It should be noted the that future Synchro network also reflects other planned and programmed infrastructure improvements within the study area, as previously discussed. Future 2035 intersection peak hour volumes developed in **Section 7.1.4** were used and modeled for the preferred alternative and assumed traffic control measures. The overall results of the future conditions analysis are shown in **Table 29** and **Table 30**, with more detailed results (i.e., movement LOS, approach LOS, and maximum queues) provided in **Appendix H**.

Table 29: Future Preferred Alternative Synchro Operational Results for Study Area Intersections

ID	Intersection	Traffic Control	Overall LOS (Delay in sec/veh)	
			AM Peak	PM Peak
1	Old Airport Road at U.S. Route 11 (Lee Highway)	Signal	C (32.0)	C (31.0)
2	Old Airport Road at Exit 7 / I-81 Southbound Off/On Ramp	Signal	B (16.4)	B (17.1)
3	Old Airport Road at Exit 7 / I-81 Northbound Off/On Ramp	Signal	C (28.1)	C (22.8)
4	Old Airport Road at Stagecoach Road	TWSC	A (3.2)	A (4.3)
5	F-310 at U.S. Route 11	Signal	B (18.4)	C (31.4)
6	F-310 at I-81 Southbound On Ramp/I-81 Southbound Off Ramp	TWSC	A (3.9)	A (6.0)
7	F-310 at I-81 Northbound On Ramp/I-81 Northbound Off Ramp	TWSC	B (10.9)	B (19.6)
8	Majestic Drive at F-310	TWSC	A (8.3)	B (11.1)
F1	Halls Bottom Road at Frontage Road (west)	TWSC	A (4.3)	A (3.2)
F2	Halls Bottom Road at Frontage Road (east)	TWSC	A (3.0)	A (5.5)
9	Spring Creek Road at U.S. Route 11	Signal	B (15.3)	B (15.5)
10	Spring Creek Road at I-81 Southbound On Ramp/I-81 Southbound Off Ramp	TWSC	A (5.9)	A (6.4)
11	Spring Creek Road at I-81 Northbound On Ramp/I-81 Northbound Off Ramp	TWSC	**D (33.1)**	**E (42.1)**
12	Spring Creek Road at Black Wolf Drive	TWSC	A (4.2)	A (5.3)
13	Old Jonesboro Road at Spring Creek Road	TWSC	A (5.3)	A (7.4)
14	Old Jonesboro Road at U.S. Route 11	Signal	D (37.0)	C (30.4)
15	Old Jonesboro Road at VHCC Drive	Signal	B (11.5)	B (15.8)
16	Old Jonesboro Road at I-81 Southbound On Ramp/I-81 Southbound Off Ramp	Signal	C (24.9)	C (22.4)
17	Old Jonesboro Road at Dennison Drive/I-81 Northbound Off/On Ramp	Signal	C (32.3)	C (28.3)

Table 30: Future Preferred Alternative Synchro Operational Results for Study Area Intersections (Cont.)

Intersection		Traffic Control	Overall LOS (Delay in sec/veh)	
			AM Peak	PM Peak
F3	Old Jonesboro Road at Frontage Road	TWSC	A (2.9)	A (3.1)
F4	Stone Mill Road at Frontage Road	TWSC	A (4.6)	A (5.3)
19	Cummings Street at U.S. Route 11	Signal	D (41.4)	**E (71.8)**
20	Cummings Street at Cook Street	Signal	B (19.0)	C (25.7)
21	Cummings Street at I-81 Southbound On Ramp/I-81 Southbound Off Ramp	Signal	**C (33.1)**	**D (45.0)**
22	Cummings Street at I-81 Northbound On Ramp/I-81 Northbound Off Ramp/Country Club Drive	Signal	C (27.8)	C (24.2)
F5	Cummings St at Gravel Lake Road	TWSC	A (1.5)	A (1.3)
23	Cummings Street at Vances Mill Road/Fairway Drive	TWSC	**A (6.1)**	A (3.9)
24	Residential Driveway/Hillman Highway at U.S. Route 11	Signal	B (14.5)	B (17.2)
25	I-81 Southbound On Ramp/Empire Drive at U.S. Route 11	TWSC	C (22.2)	C (34.6)
26	U.S. Route 11 at Southbound Off Ramp/On Loop	TWSC	C (34.3)	**B (19.6)**
27	I-81 Northbound Off/On Ramp/I-81 Northbound On Ramp at U.S. Route 11	Signal	C (24.4)	C (20.1)
28	Commercial Entrance/U.S. Route 11 at U.S. Route 11/U.S. Route 58	Roundabout		
30	Enterprise Road at I-81 Southbound On Ramp/I-81 Southbound Off Ramp	TWSC	A (4.8)	A (2.3)
31	Enterprise Road at I-81 Northbound Off Ramp/I-81 Northbound On Ramp	TWSC	A (6.2)	A (5.8)
35	Commercial Entrance/Enterprise Road at Lee Highway	TWSC	A (5.3)	A (7.5)

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Based on these results, the following intersections were noted to need additional improvements under future conditions:

- #11 - Spring Creek Road at I-81 Northbound On-Ramp/I-81 Northbound Off Ramp
  - Excessive delays for the eastbound left-turn movement
  - Added a dedicate left-turn lane on the off-ramp to help reduce delays and queues
  - Traffic signal maybe required if volumes continue to grow and conditions worsen in the future
- #19 - Cummings Street at U.S. Route 11
  - Excessive delays and poor LOS for many movements/approaches at this intersection
  - Capacity improvements constrained by ROW/Historic Downtown Abingdon
  - The addition of French Moore JR Boulevard extension could help divert traffic from this intersection, resulting in improved conditions.
- #22 - Cummings Street at I-81 Northbound On-Ramp/I-81 Northbound Off Ramp/Country Club Drive
  - Excessive delays for the westbound approach result in the need for dedicated left- and right-turn lanes on Country Club Drive to better accommodate frontage road traffic

7.5 Incident Management and Network Resiliency

Periods of severe congestions occur along I-81 when incidents occur, resulting in a significant proportion of volumes having to diverted to alternate parallel routes (i.e., primarily U.S. Route 11). This results in substantial operational impacts to the local street network and excess delays for travelers. With the addition of a frontage road network, traffic could have additional route options and help minimize the time it takes to vehicles to traverse through segments where incidents occur. Additionally, the presence of a frontage road can essentially serve as excess capacity for these incidents and help reduce the overall time it takes for travel patterns to resume to normal levels.

The intent is still for U.S. Route 11 to serve as the official detour/diversion route in times of severe congestions due to incidents, as that facility is generally better suited for heavy vehicles and higher volumes of traffic. However, the proposed frontage road is still anticipated to serve local traffic and minimize delays for those trips.

To consider the impacts of severe incidents along I-81 and how traffic might shift to parallel facilities, the Bristol Regional TDM was used to simulate lane and road closures on the interstate as the result of a crash. For this analysis, the TDM network was modified to constrain the flow of traffic along I-81, specifically between Exit 14 (i.e., Old Jonesboro Road) and Exit 17 (Cummings Street). The following four scenarios were modeled and analyzed as part of this analysis:

- Scenario 1 – Minor Northbound Incident Between Exit 14 and Exit 17
  - Simulated crash has resulted in <u>one lane closure</u> and reduced speeds on northbound I-81
  - Reduce posted speeds on I-81 for northbound traffic to 25 MPH and reduce number of through lanes to one
- Scenario 2 – Major Northbound Incident Between Exit 14 and Exit 17
  - Simulated crash has resulted in <u>full closure</u> of northbound I-81 traffic and reduced speeds for southbound traffic (i.e., rubber necking)
  - Reduce number of through lanes to zero for northbound I-81 and reduce the posted speed of southbound I-81 to 50 MPH
- Scenario 3 – Minor Southbound Incident Between Exit 14 and Exit 17
  - Simulated crash has resulted in <u>one lane closure</u> and reduced speeds on southbound I-81
  - Reduce posted speeds on I-81 for southbound traffic to 25 MPH and reduce number of through lanes to one
- Scenario 4 – Major Southbound Incident Between Exit 14 and Exit 17
  - Simulated crash has resulted in <u>full closure</u> of southbound I-81 traffic and reduced speeds for northbound traffic (i.e., rubber necking)
  - Reduce number of through lanes to zero for southbound I-81 and reduce the posted speed of northbound I-81 to 50 MPH

The resulting shift in traffic from northbound and southbound I-81 onto the parallel facilities of U.S. Route 11 and the preferred frontage road connection are summarized in **Table 31** and **Table 32**, respectively. When an incident occurs that results in the closure of one lane on the interstate, approximately 31% to 33% of traffic is expected to shift onto other roadways. This results in approximately 9% to 15% of this shifted traffic to utilize U.S. Route 11 and the proposed frontage road connection instead. During a major incident where both travel lanes are closed on the interstate (and assuming all traffic is diverted onto other routes), then approximately 29% to 56% of the interstate traffic shifts onto U.S. Route 11 and the proposed frontage road connection. This shift in traffic from the interstate onto these other facilities shows that ability for the proposed frontage road to help improve network resiliency and maintain route options for local and interstate options during periods of severe congestion.

Table 31: Peak Hour Traffic Diversion on Parallel Facilities due to Simulated Northbound Incident on Interstate

Northbound Direction				
		Scenario #1 - One-Lane Closure Incident		
Roadway	Typical DHV Flows (2035)	Diversion Percent	Volume Shift	Incident DHV Flows (2035)
Interstate 81	2,700	-31%	-850	1,850
U.S. Route 11	2,150	+9%	+250	2,400
Proposed Frontage Road	150	+12%	+300	450
		Scenario #2 - Two-Lane Closure Incident		
Roadway	Typical DHV Flows (2035)	Diversion Percent	Volume Shift	Incident DHV Flows (2035)
Interstate 81	2,700	-100%	-2,700	0
U.S. Route 11	2,150	+56%	+1,500	3,650
Proposed Frontage Road	150	+29%	+800	950

Table 32: Peak Hour Traffic Diversion on Parallel Facilities due to Simulated Southbound Incident on Interstate

Southbound Direction				
		Scenario #3 - One-Lane Closure Incident		
Roadway	Typical DHV Flows (2035)	Diversion Percent	Volume Shift	Incident DHV Flows (2035)
Interstate 81	3,050	-33%	-1,000	2,050
U.S. Route 11	2,150	+10%	+300	2,450
Proposed Frontage Road	150	+15%	+450	600
		Scenario #4 - Two-Lane Closure Incident		
Roadway	Typical DHV Flows (2035)	Diversion Percent	Volume Shift	Incident DHV Flows (2035)
Interstate 81	3,050	-100%	-3,050	0
U.S. Route 11	2,150	+51%	+1,550	3,700
Proposed Frontage Road	150	+33%	+1,000	1,150

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8.0 Cost Estimates and Prioritization

The scale, function, and prioritization of the recommended improvements are a reflection of the feedback received during this study process (to include two public information meetings and on-line survey/questionnaire) as well as extensive coordination with the VDOT project team members. This includes consideration of the operational benefits of the proposed improvements (i.e., the potential to attract local traffic away from/off of the study area segment of I-81), feasibility of construction, and estimated implementation costs.

Recommendations for specific improvements to the study area roadways and intersections correlate with the priority or time frame in which the proposed improvements need to be constructed and open for public use (i.e., short-term (five to ten years), mid-term (ten to fifteen years), and long-term (fifteen to twenty years)). This approach allows VDOT, the Bristol MPO, and local communities to prioritize and program projects in the near term that are anticipated to mitigate more immediate needs and have a higher return on investment. versus segments that are a less immediate need but are ultimately necessary to achieve the intent of the purpose and need for the proposed I-81 frontage road network.

8.1 Opinions of Probable Cost

Planning-level cost estimates, expressed in year 2020 dollars, were determined for the I-81 frontage road improvements associated with the preferred alternative. These planning-level cost estimates have been based on VDOT's statewide two-year cost averages for 2014, the VDOT Transportation & Mobility Planning Division's "Statewide Planning Level Cost Estimates" worksheet from 2009, an applied inflation rate of 2%, and familiarity with similar projects and improvements throughout Virginia. Due to fluctuations in the costs of labor, materials, and equipment, fluctuations in the market, and the outcome of competitive bidding as well as the general planning-level nature of the recommendations, these estimated costs are neither exact nor guaranteed.

The cost breakdown per scenario includes engineering/design costs, roadway/intersection improvement costs (e.g., cost per mile for a particular roadway typical section, turn-lane improvements, roundabout, bridges/box culverts, milling, overlay, sidewalks, multi-use paths, channelization, stormwater collection and conveyance, landscaping (e.g., trees, seeding), etc.), traffic signal equipment improvement costs (e.g., poles, mast arms, signal heads, pedestrian signal head equipment and construction), construction engineering and inspection (CEI) costs, right-of-way (ROW) acquisition as a percentage of construction cost by area type, and utility relocation costs as well as miscellaneous costs such as mobilization, erosion and sediment (E&S) control, and maintenance of traffic (MOT) during construction. Furthermore, a 15% contingency was calculated based on construction cost.

The recommendations and planning-level cost estimates, expressed in year 2020 dollars, are summarized in **Table 33** through **Table 39**. It is also recommended that the proposed improvements should be prioritized into projects involving VDOT, MPO, County, and Town of Abingdon input. Each project should be thoroughly evaluated then identified for priority order, time frame from implementation, and potential funding sources.

8.2 Recommended Improvements and Prioritization

8.2.1 Short-Term Recommendations (5 to 10 years)

Short-term recommendations were identified for the frontage road network to help address existing and/or more immediate needs along the corridor. These recommendations primarily represent improvements that will fill in the "gaps", have a high probability of attracting local traffic off of I-81 and/or U.S. Route 11, and result in enhanced connectivity for local traffic. Short-term priorities/recommendations consist of the following improvements:

Exit 7 to Exit 10

Phase I – Stage Coach Road Improvements

- Reconstruct existing typical section of Stagecoach Road from Bristol Flooring intersection to Hickory Drive to consist of:
  - Two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder
- From existing Terminus/Cul de Sac of Stage Coach Road to Flame Leaf Drive
  - Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder)
  - Existing northbound approach of Flame Leaf Drive will become STOP controlled
- From Flame Leaf Drive tie-in to Old Dominion Road intersection
  - Reconstruct two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder)
  - Realign/reconfigure Flame Leaf Drive/Old Dominion Road intersection to create 4-legged intersection
  - Implement 4-Way STOP
- Flame Leaf Drive at Old Dominion Road
  - Realign/reconfigure to create 4-legged intersection
  - Implement 4-Way STOP

Phase II – Stage Coach Road Improvements

- Stagecoach Road/Saul Drive at Old Airport Road (Exit 7)
  - Signalize intersection
- Stagecoach Road
  - New Alignment from Old Airport Road to Villages Circle Intersection
  - Mill and overlay from Villages Circle intersection to Bristol Flooring Entrance
- From the Flame Leaf Drive at Old Dominion Road Intersection to Majestic Drive (Private Road)
  - Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder)
  - Remove/replace existing private driveway/gateway
  - Existing northbound approach of Majestic Drive will become STOP controlled

- Majestic Drive
  - Mill and overlay from cul de sac (End of State Maintenance) to intersection with F-310
- Majestic Drive at F-310 (Exit 10)
  - Maintain STOP control on eastbound/westbound Majestic Drive approaches

Exit 13 to Exit 14

- From the New Alignment Frontage Road at Spring Creek Road (Exit 13) to tie in point along existing Dennison Drive
  - Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder)
  - Westbound approach of New Alignment Frontage Road at Spring Creek Road will be STOP controlled
  - Install box culvert to accommodate creek crossing
- Dennison Drive
  - Mill and overlay from the New Alignment Frontage Road at Dennison Drive tie in point to the Old Jonesboro Road intersection (Exit 14)
- Dennison Drive at Old Jonesboro Road will be served by existing traffic signal

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Table 33: Summary of Short-Term I-81 Frontage Road Priorities/Recommendations Exit 7 to Exit 10

Improvement	Planning Level Costs		
	PE/Design	ROW/Utility Relocations	Construction
Stagecoach Road Phase I ○ Reconstruct existing typical section of Stagecoach Road from Bristol Flooring intersection to Hickory Drive	$ 528,000	$557,000	$3,213,000
		$ 4,298,000	
From existing Terminus/Cul de Sac of Stage Coach Road/Hickory Drive to tie-in with Flame Leaf Drive ○ Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder) ○ Existing northbound approach of Flame Leaf Drive will become STOP controlled	$ 1,190,000	$ 1,164,000	$ 6,789,000
		$ 9,143,000	
From Flame Leaf Drive tie-in to Old Dominion Road intersection ○ Reconstruct two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder) ○ Realign/reconfigure Flame Leaf Drive/Old Dominion Road intersection to create 4-legged intersection ○ Implement 4-Way STOP	$ 512,000	$ 428,000	$ 2,592,000
		$ 3,532,000	
Stagecoach Road New Alignment Phase II ○ Install signal at Stagecoach Road/Saul Drive at Old Airport Road intersection ○ New Alignment from Old Airport Road to Villages Circle intersection ○ Mill and overlay from Villages Circle intersection to Bristol Flooring Entrance	$534,000	$1,725,000	$2,989,000
		$5,248,000	
From the Flame Leaf Drive at Old Dominion Road Intersection to Majestic Drive (Private Road) intersection ○ Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder) ○ Remove/replace existing private driveway/gateway ○ Existing northbound approach of Majestic Drive will become STOP controlled Majestic Drive ○ Mill and overlay from cul de sac (End of State Maintenance) to intersection with F-310 (Exit 10) ○ Maintain STOP control on eastbound/westbound Majestic Drive approaches	$ 1,535,000	$ 1,424,000	$ 8,327,000
		$ 11,286,000	

Table 34: Summary of Short-Term I-81 Frontage Road Priorities/Recommendations Exit 13 to Exit 14

Improvement	Planning Level Costs		
	PE/Design	ROW/Utility Relocations	Construction
From the New Alignment Frontage Road at Spring Creek Road (Exit 13) to tie in point along existing Dennison Drive ○ Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder) ○ Westbound approach of New Alignment Frontage Road at Spring Creek Road will be STOP controlled ○ Install box culvert to accommodate creek crossing.	$ 1,440,000	$ 1,676,000	$ 9,699,000
	$ 12,815,000		
Dennison Drive ○ Mill and overlay from the New Alignment Frontage Road at Dennison Drive tie-in point to the Old Jonesboro Road intersection (Exit 14) ○ Dennison Drive at Old Jonesboro Road will be served by existing traffic signal	$ 477,000	$ 367,000	$ 2,216,000
	$ 3,060,000		

8.2.2 Mid-Term Recommendations (10 to 15 years)

The mid-term recommendations are intended to address the next tier of frontage road improvements implementation. These segments also fill important gaps in the network, however they address a less immediate need than those identified as short-term priorities. These segments will also have some select implementation challenges (i.e., right-way, environmental permitting, and/or construction cost), that will likely result a longer time period otherwise associated with short-term improvements. Mid-term priorities/recommendations consist of the following improvements:

Exit 10 to Exit 13

- Majestic Drive (Exit 10)
  - Mill and overlay from F-310 intersection to Stables Road
- Majestic Drive at Stables Road
  - Northbound Stables Road approach will be STOP controlled
- From the Majestic Drive at Stables Road intersection to the Majestic Drive at Carson Lane intersection
  - Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder)
  - Northbound approach of Carson Lane will be STOP controlled
- From the Majestic Drive at Carson Lane intersection to the New Alignment Frontage Road at Halls Bottom Road intersection
  - Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder)
  - Eastbound approach of New Alignment Frontage Road will be STOP controlled
- Halls Bottom Road
  - Mill and overlay from the New Alignment Frontage Road at Halls Bottom Road intersection to the Halls Bottom Road at Singing Wood Lane intersection
- Singing Wood Lane - From the Halls Bottom Lane intersection to the Black Wolf Drive intersection
  - Reconstruct/Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder)
  - Northbound/Southbound approaches of Black Wolf Drive will be STOP controlled
- Singing Wood Lane/New Alignment Frontage Road – From the Black Wolf Drive intersection to the Spring Creek Road intersection
  - Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder)
  - Eastbound approach of New Alignment Frontage Road will be STOP controlled at Spring Creek Road intersection

Exit 14 to Exit 17 "North" – (French Moore Jr. Boulevard and Cook Street Extension)

- French Moore Jr. Boulevard Extension
  - Construct new two-lane roadway from existing cul de sac to new intersection with Stone Mill Road
  - Traffic control for the French Moore Jr. Boulevard Extension at Stone Mill Road will be a single lane roundabout
- Cook Street Extension – From the French Moore Jr. Boulevard Extension at Stone Mill Road intersection to the tie in point with Cook Street (i.e., vicinity of the Towne Center Drive intersection)
  - Construct new two-lane roadway from intersection with Stone Mill Road to tie-in point with existing Cook Street
  - Two-lane typical section with curb and gutter
  - 5-foot sidewalk to 10' Shared-Use Path along one side of the roadway

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Table 35: Summary of Mid-Term I-81 Frontage Road Priorities/Recommendations Exit 10 to Exit 13

Improvement	Planning Level Costs		
	PE/Design	ROW/Utility Relocations	Construction
• Majestic Drive (Exit 10) ○ Mill and overlay from F-310 intersection to Stables Road • Majestic Drive at Stables Road ○ Northbound Stables Road approach will be STOP controlled • From the Majestic Drive at Stables Road intersection to the Majestic Drive at Carson Lane intersection ○ Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder) ○ Northbound approach of Carson Lane will be STOP controlled	$ 324,000	$ 476,000	$ 2,008,000
	$ 2,808,000		
• From the Majestic Drive at Carson Lane intersection to the New Alignment Frontage Road at Halls Bottom Road intersection ○ Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder) ○ Eastbound approach of New Alignment Frontage Road will be STOP controlled • Halls Bottom Road ○ Mill and overlay from the New Alignment Frontage Road at Halls Bottom Road intersection to the Halls Bottom Road at Singing Wood Lane intersection ○ Construct exclusive right-turn lane along southbound Halls Bottom Road	$ 1,135,000	$ 1,679,000	$ 6,914,000
	$ 9,728,000		
• Singing Wood Lane - From the Halls Bottom Road intersection to the Black Wolf Drive intersection ○ Reconstruct/Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder) ○ Northbound/Southbound approaches of Black Wolf Drive will be STOP controlled • Singing Wood Lane/New Alignment Frontage Road - From the Black Wolf Drive intersection to the Spring Creek Road intersection ○ Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder) ○ Eastbound approach of New Alignment Frontage Road will be STOP controlled at Spring Creek Road intersection	$ 2,120,000	$ 3,008,000	$ 12,320,000
	$ 17,448,000		

Table 36: Summary of Mid-Term I-81 Frontage Road Priorities/Recommendations French Moore Jr. Boulevard Extension/Cook Street Extension (Exit 14 to Exit 17 "North")

Improvement	Planning Level Costs		
	PE/Design	ROW/Utility Relocations	Construction
• French Moore Jr. Boulevard Extension ○ Construct new two-lane roadway from existing cul de sac to new intersection with Stone Mill Road ○ Traffic control for the French Moore Jr. Boulevard Extension at Stone Mill Road will be a single lane roundabout	$ 2,342,000	$ 1,993,000	$ 12,426,000
	$ 16,761,000		
• Cook Street Extension ○ Construct new two-lane roadway from intersection with Stone Mill Road to tie-in point with existing Cook Street ○ Two-lane typical section with curb and gutter ○ 5-foot sidewalk to 10' Shared-Use Path along one side of the roadway	$ 1,124,000	$ 1,627,000	$ 6,967,000
	$ 9,718,000		

8.2.3 Long-Term Recommendations (15 to 20+ years)

Long-term improvements are intended to address the remaining "gaps" in the frontage road network. Although not as significant a priority as those identified for short-term and mid-term implementation, these final frontage road improvements help fulfill the intent of the frontage road system network. These final segments will be a part of a frontage road network that provides enhanced connectivity and mobility for local traffic, helps reduce local traffic demand on the I-81 study area corridor, and allows more throughput for the safe and efficient movement of people and goods at the regional level.

Exit 17 to Exit 19

- Cummings Street to Glenview Drive intersection
  - Mill and overlay from Cummings Street intersection to Glenview Drive intersection
- New Alignment Frontage Road – from the existing Country Club Drive at Glenview Drive intersection to the identified tie-in point with Wycoff Drive
  - Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder)
  - Northbound approach of Glenview Drive at Country Club Drive/New Alignment Frontage Road intersection will be STOP controlled
  - Westbound approach of Country Club Drive will be STOP controlled
  - This segment of roadway will include a bridge aligned adjacent to I-81 over the Creeper Trail to minimize potential environmental impacts

- Wycoff Drive – From the New Alignment Frontage Road tie-in point to the intersection with Trigg Street
  - Reconstruct/improve the existing two-lane typical section to match the proposed Frontage Road typical (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder)
  - Southbound approach of Trigg Street will be STOP controlled at the Wycoff Drive intersection
- New Alignment Frontage Road (Berry Creek Drive) at the Trigg Street intersection to the location of the New Frontage Road alignment tie-in point
  - Reconstruct/improve the existing two-lane typical section to match the proposed Frontage Road typical (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder)
  - Reconstruct two private driveway approaches at New Alignment Frontage Road
  - Northbound approach of Private Driveway shared access will become STOP controlled
- New Alignment Frontage Road from vicinity of Berry Creek Drive to the JEB Stuart Highway (U.S. Route 58)/Lee Highway (U.S. Route 11) intersection
  - Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder)
  - Traffic control for the New Alignment Frontage Road at JEB Stuart Highway will be a combination two-lane/single-lane roundabout
  - Realign U.S. Route 11 to tie into proposed roundabout
- Construct roundabout at the JEB Stuart Highway (U.S. Route 58)/Lee Highway (U.S. Route 11) intersection

Exit 14 to Exit 17 "South"

- From the New Alignment Frontage Road at Old Jonesboro Road intersection to the Bonneycastle Drive at Glenwood Drive intersection
  - Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder)
  - Westbound approach of New Alignment Frontage Road at Old Jonesboro Road will be STOP controlled
  - Northbound approach of Glenwood Drive at New Alignment Frontage Road intersection will be STOP controlled
- From the New Alignment Frontage Road at Glenwood Drive intersection to the Bonneycastle Drive at Stone Mill Road intersection
  - Reconstruct/improve the existing two-lane typical section to match the proposed Frontage Road typical (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder)
  - Eastbound/Westbound approaches of New Alignment Frontage Road will be STOP controlled at Stone Mill Road intersection
- From the New Alignment Frontage Road at Stone Mill Road intersection to the New Alignment Frontage Road at the Future Commerce Drive/Gravel Lake Road intersection
  - Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder)
  - Eastbound approach of New Alignment Frontage Road at Future Commerce Drive/Gravel Lake Road intersection will be STOP controlled

Exit 19 to Exit 22

- From the New Alignment Frontage Road/Lee Highway (U.S. Route 11) at JEB Stuart Highway (U.S. Route 58) intersection to vicinity of the Lee Highway (U.S. Route 11) at Johnston Memorial Hospital "East" intersection
  - Widen existing Lee Highway (U.S. Route 11) to a four-lane divided typical section
- Lee Highway at Johnston Memorial Hospital "West" Intersection
  - Signalize the improved intersection
  - Install necessary exclusive turn-lanes at the improved intersection
- From vicinity of the Johnston Memorial Hospital "East" intersection to the Lee Highway (U.S. Route 11) at Enterprise Road intersection
  - Widen existing Lee Highway (U.S. Route 11) to a four-lane divided typical section
- Lee Highway at Enterprise Road
  - Signalize the improved intersection
  - Install necessary exclusive turn-lanes at the improved intersection.

Table 37: Summary of Long-Term I-81 Frontage Road Priorities/Recommendations Exit 17 to Exit 19

Improvement	Planning Level Costs		
	PE/Design	ROW/Utility Relocations	Construction
• Cummings Street to Glenview Drive intersection ○ Mill and overlay from Cummings Street intersection to Glenview Drive intersection • New Alignment Frontage Road – from the existing Country Club Drive at Glenview Drive intersection to the identified tie-in point with Wycoff Drive ○ Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder) ○ Northbound approach of Glenview Drive at Country Club Drive/New Alignment Frontage Road intersection will be STOP controlled ○ This segment of roadway will include a bridge aligned adjacent to I-81 over the Creeper Trail to minimize potential environmental impacts	$ 1,698,000	$ 2,476,000	$ 10,196,000
	$ 14,370,000		
• Wycoff Drive - From the New Alignment Frontage Road tie-in point to the intersection with Trigg Street ○ Reconstruct/improve the existing two-lane typical section to match the proposed Frontage Road typical (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder) ○ Southbound approach of Trigg Street will be STOP controlled at the Wycoff Drive intersection	$ 286,000	$ 334,000	$ 1,414,000
	$ 2,034,000		
• New Alignment Frontage Road (Berry Creek Drive) at the Trigg Street intersection to the location of the New Frontage Road alignment tie-in point ○ Reconstruct/improve the existing two-lane typical section to match the proposed Frontage Road typical (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder) ○ Reconstruct two private driveway approaches at New Alignment Frontage Road ○ Northbound approach of Private Driveway shared access will become STOP controlled	$ 382,000	$ 474,000	$ 1,986,000
	$ 2,842,000		
• New Alignment Frontage Road from vicinity of Berry Creek Drive to the JEB Stuart Highway (U.S. Route 58)/Lee Highway (U.S. Route 11) intersection ○ Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder) ○ Traffic control for the New Alignment Frontage Road at JEB Stuart Highway will be a combination two-lane/single-lane roundabout ○ Realign U.S. Route 11 to tie into proposed roundabout location ○ Construct roundabout at the JEB Stuart Highway (U.S. Route 58)/Lee Highway (U.S. Route 11) intersection	$ 2,557,000	$ 3,669,000	$ 15,140,000
	$ 21,366,000		

Table 38: Summary of Long-Term I-81 Frontage Road Priorities/Recommendations Exit 14 to Exit 17 "South"

Improvement	Planning Level Costs		
	PE/Design	ROW/Utility Relocations	Construction
• From the New Alignment Frontage Road at Old Jonesboro Road intersection to the Bonneycastle Drive at Glenwood Drive intersection ○ Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder) ○ Westbound approach of New Alignment Frontage Road at Old Jonesboro Road will be STOP controlled ○ Northbound approach of Glenwood Drive at New Alignment Frontage Road intersection will be STOP controlled	$ 1,535,000	$ 1,667,000	$ 9,568,000
	$ 12,770,000		
• From the New Alignment Frontage Road at Glenwood Drive intersection to the Bonneycastle Drive at Stone Mill Road intersection ○ Reconstruct/improve the existing two-lane typical section to match the proposed Frontage Road typical (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder) ○ Eastbound/Westbound approaches of New Alignment Frontage Road will be STOP controlled at Stone Mill Road intersection	$ 393,000	$ 337,000	$ 1,978,000
	$ 2,708,000		
• From the New Alignment Frontage Road at Stone Mill Road intersection to the New Alignment Frontage Road at the Future Commerce Drive/Gravel Lake Road intersection ○ Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder) • Eastbound approach of New Alignment Frontage Road at Future Commerce Drive/Gravel Lake Road intersection will be STOP controlled	$ 895,000	$ 1,004,000	$ 5,768,000
	$ 7,667,000		

Table 39: Summary of Long-Term I-81 Frontage Road Priorities/Recommendations Exit 19 to Exit 22

Improvement	Planning Level Costs		
	PE/Design	ROW/Utility Relocations	Construction
• From the New Alignment Frontage Road/Lee Highway (U.S. Route 11) at JEB Stuart Highway (U.S. Route 58) intersection to vicinity of the Lee Highway (U.S. Route 11) at Johnston Memorial Hospital "West" intersection ○ Widen existing Lee Highway (U.S. Route 11) to a four-lane divided typical section ○ Signalize • Lee Highway at Johnston Memorial Hospital "East" Intersection ○ Signalize the improved intersection ○ Install necessary exclusive turn-lanes at the improved intersection	$ 2,686,000	$ 5,641,000	$ 16,174,000
	$ 24,501,000		
• From vicinity of the Johnston Memorial Hospital "East" intersection to the Lee Highway (U.S. Route 11 at Enterprise Road intersection ○ Widen existing Lee Highway (U.S. Route 11) to a four-lane divided typical section • Lee Highway at Enterprise Road ○ Signalize the improved intersection ○ Install necessary exclusive turn-lanes at the improved intersection.	$ 3,157,000	$ 6,328,000	$ 19,096,000
	$ 28,581,000		

8.3 Implementation

The next key step in the planning process is to determine how the recommended improvements will be implemented. VDOT Bristol District officials, along with the Bristol MPO, Washington County, the Town of Abingdon, and potentially the Mount Rogers Planning District Commission (PDC) will need to determine implementation strategies as well as further refine project priorities. Implementation strategies to consider include seeking and identifying funding streams, both public and private, to construct the proposed improvements. There are several potential public programs that could assist with funding the identified projects. At the federal level there are earmarks, National Highway System funds, bridge funds, and Regional Surface Transportation Program (RSTP) funds. At the state level there is the VDOT SMART Scale program that evaluates different projects based on a quantitative review that results in a prioritization process for making funding decisions for safety, economic impact, and capacity/operations enhancing projects within the six-year improvement program (SYIP). The SYIP can also help define which alternative funding sources the project may qualify for such as; Economic Development Access Program, or the Revenue Sharing Program. It is recommended that proposed improvements be prioritized into projects with VDOT, MPO, PDC, County, and Town input/involvement. Each project should be thoroughly evaluated then identified for priority order, time frame from implementation, and potential funding sources.

The following sections describe some of potential sources of funding for the recommended improvements identified for the study area.

8.3.1 Federal Funding Sources Alternatives

Surface Transportation Block Grant Program

The Surface Transportation Block Grant Program provides flexible funding that may be used by States and localities for projects to preserve and improve the conditions and performance on any Federal-aid highway, bridge and tunnel projects on any public road, pedestrian and bicycle infrastructure, and transit capital projects, including intercity bus terminals. Federal-aid highways are defined as those highways on the Federal-aid highway systems and all other public roads not classified as local roads or rural minor collectors.

The Federal-aid highway systems consist of the National Highway System (NHS) and the Dwight D. Eisenhower National System of Interstate and Defense Highways (the "Interstate System"). U.S. Route 58/U.S. Route 23 is located on the NHS as a principal arterial.

The typical split for STP projects between federal funding and the project sponsor is 80% federal and 20% state and/or local match.

8.3.2 State Funding Sources Alternatives

SMART Scale

Virginia uses the SMART Scale funding program to review and score which transportation projects should be funded into the Six-Year Improvement Plan (SYIP). The program is intended to improve the transparency and accountability of project selection, as well as provide improved stability in the SYIP by ensuring that all projects are fully funded through all phases. The process scores projects based on an objective and fair analysis process that is applied statewide. This process is intended to help the Commonwealth Transportation Board (CTB) members select projects that provide the maximum benefit for per the tax dollars invested.

The prioritization process will evaluate projects in the following factor areas: congestion mitigation, economic development, accessibility, safety, environmental quality and land use coordination. Factor areas are weighted in each highway construction district, and may be weighted differently within each highway construction district

Within the SMART Scale process, there are several types of projects that are eligible for funding. Highway, transit, rail, road, operational improvements and transportation demand management projects and strategies will be considered. However, projects must meet a need identified in VTrans 2040 for a Corridor of Statewide Significance (CoSS), Regional Network or Urban Development Area (UDA). Projects seeking funding from most state and Federal discretionary fund categories are required to go through the SMART Scale program. However, the following funding categories are exempt from the SMART Scale program: Congestion Mitigation and Air Quality, Highway Safety Improvement Program, Transportation Alternatives, Revenue Sharing program, and secondary/urban formula funds.

The SMART Scale will consist of a two-year cycle where projects applications are submitted, reviewed, and selected. Candidate projects will be solicited from eligible entities (i.e., Scott County). From there VDOT will screen, review, and evaluate the projects to determine the preliminary list of projects and scores for the CTB to consider. A draft SYIP will be released by the CTB, followed by public hearings to gather input. A final SYIP will be released and considered for adoption by the CTB.

Revenue Sharing

The "Revenue Sharing Program" provides additional funding for use by a county, city, or town to construct, reconstruct, or improve the highway systems within such county, city, or town. Locality funds are matched on a dollar-for-dollar basis with state funds, with statutory limitations on the amount of state funds authorized per locality. A locality may apply for up to a maximum of $10 million in matching allocations per fiscal year, with up to $5 million of these requested funds being utilized for maintenance projects. There is no limit to the amount of additional funds the locality may contribute. Priority will be given first to allocations that accelerate construction projects in the Commonwealth Six-Year Improvement Program or the locality's capital plan. Locality requests up to a total of $1 million will be evaluated first and funded first.

The Revenue Sharing Program is administered by the Virginia Department of Transportation, in cooperation with the participating localities, under the authority of Section 33.1-23.05 of the Code of Virginia and the Commonwealth Transportation Board's (CTB) Revenue Sharing Program Policy. Application for program funding must be made by resolution of the governing body of the jurisdiction requesting the funds. Applications for program funding are typically due by November for funding under the next fiscal year. Localities are typically notified by June prior to the effective fiscal year of application approvals.

The Revenue Sharing Program may be used to finance eligible work on highway systems within a locality. The Revenue Sharing Program is intended to provide funding for immediately needed improvements or to supplement funding for existing projects. Larger new projects may also be considered, provided the locality identifies any additional funding needed to implement the project. Revenue Sharing Program funds are generally expected to be used to finance project costs in the same fiscal year and projects should be in active development that is leading to their completion within the near term.

The total funds available each fiscal year will be determined by the Commonwealth Transportation Board. The maximum allocation the CTB may make to the Revenue Sharing Program is $200 million annually. The minimum allocation the CTB may make to the Revenue Sharing Program is $15 million annually.

Economic Development Access Program

The Economic Development Access Program is a state-funded incentive designed to assist Virginia localities in attracting sustainable businesses that create jobs and generate tax revenues within the locality. The program makes funds available to localities for road improvements needed to provide adequate access for new or substantially expanding qualifying establishments. These qualifying investments represent the cost of land, building and any manufacturing/processing equipment by an incoming establishment, including manufacturing, processing, research and development, distribution centers, regional service centers and corporate headquarters. Economic Development Access funds are allocated by the CTB. These funds may be used for financing the construction or improvement of secondary or local system roads within all counties and cities, and certain towns that are part of the Urban System. Ancillary improvements, such as turn lanes or intersection modifications may also be warranted as part of the access project, but are not to be considered as the primary objective of the project. The program is administered by VDOT, Local Assistance Division. Subject to available funding, the maximum unmatched allocation to a locality within any one fiscal year is $500,000, which may be used for one or more projects. The maximum allocation to any one project is limited to the lesser of either the access road construction cost or 20% of the qualifying investment.

8.3.3 Other Funding Sources

At the local level, Washington County and the Town of Abingdon are both a part of the Bristol MPO and the Mount Rogers Planning District Commission. Both the MPO and the PDC can assist with local planning efforts by providing services and guidance on funding strategies/coordination with VDOT.

Private funds can also be realized through rezoning action and proffer contributions, as well as dedication of right-of-way. All the referenced funding programs and strategies require some portion of commitment and/or match at the local level but serve as a means for communities to increase the effectiveness of their budgetary dollars toward priority projects. One source of local match funding could be the inclusion of specific transportation-match funds in Washington County's Capital Improvement Program (CIP), the Town of Abingdon's CIP, or other dedicated local funding sources.

Local fund matches or the use of additional local funds for some components may be necessary if it is determined their inclusion in the roadway project is cost prohibitive, a significant addition to anticipated costs, or inconsistent with the intent of the project. The vision for the frontage road network is to provide enhanced connectivity and mobility for local traffic, help reduce local traffic demand on the I-81 study area corridor, and allow more throughput for the safe and efficient movement of people and goods at the regional level.

8.4 Resiliency

In addition to the transportation improvement recommendations identified in this study, the VDOT Bristol District, along with the Bristol MPO, Washington County, the Town of Abingdon and the Mount Rogers PDC should work together with the Commonwealth to develop a formal incident management plan that outlines roles, responsibilities and procedures when an incident occurs along this segment of the I-81 corridor. The incident management plan should take into account the capacity and connectivity the frontage road system will provide local traffic as well as diverted traffic from the I-81 mainline and on to the adjacent roadway networks. Additionally, the capacity benefits of the frontage road network will result in less/shorter duration impacts to local traffic activity/mobility and allow the area transportation network to sustain and/or more quickly return back to normal operations.

9.0 Conclusions

The *I-81 Frontage Road Corridor Study* identifies potential locations/alignments of a frontage road network and intersection improvements/upgrades. The study will ultimately be used as a planning tool by the VDOT Bristol District, the Bristol Metropolitan Planning Organization (MPO), Washington County, and the Town of Abingdon to manage growth and assess the transportation network impacts created by regional influences internally and externally to the study corridor. It will also be used as a guide to determine future planning activities and levels of funding needed to support proposed improvements that will enhance network resiliency. It is anticipated that this will include a list of SMART Scale, Commonwealth Transportation Board (CTB) approved I-81 Corridor Improvement Plan, and/or other alternative funding eligible projects.

Based on a review of these operational characteristics, alignment alternatives, route attractiveness, and general network connectivity, recommendations were developed that are intended to support local traffic mobility, accommodate the safe and efficient movement of people and goods through the study area, and enhance network resiliency. Improvements identified through the evaluation process consist of the following:

- Frontage road network connections that parallel the I-81 and U.S. Route 11 corridors
- Operationally efficient and safe supplemental frontage roadway network connections
- Intersection capacity improvements where frontage road connections exist today
- Conventional or innovative intersection improvements where applicable
- Access management and safety improvements
- Bringing select roadways and intersections up to current VDOT design standards

The scale, function, and prioritization of the recommended improvements are a reflection of the feedback received during this study process (to include two public information meetings and on-line survey/questionnaire) as well as extensive coordination with the VDOT project team members. This includes consideration of the operational benefits of the proposed improvements (i.e., the potential to attract local traffic away from/off of the study area segment of I-81), feasibility of construction, and estimated implementation costs.

Recommendations for specific improvements to the study area roadways and intersections correlate with the priority or time frame in which the proposed improvements need to be constructed and open for public use (i.e., short-term (five to ten years), mid-term (ten to fifteen years), and long-term (fifteen to twenty years)). This approach allows VDOT, the Bristol MPO, and local communities to prioritize and program projects in the near term that are anticipated to mitigate more immediate needs and have a higher return on investment. versus segments that are a less immediate need but are ultimately necessary to achieve the intent of the purpose and need for the proposed I-81 frontage road network.

The I-81 Frontage Road improvements along with planning level cost estimates expressed in 2020 dollars, are summarized in **Table 40** and **Table 46**.

The recommendations have been organized into a general prioritization format (i.e., near-term to long-term). However, it is recommended that the proposed improvements be further prioritized into standalone or individual projects based on input and/or involvement from VDOT, the Bristol MPO, Washington County, and the Town of Abingdon. Each project should be thoroughly evaluated then identified for priority order, time frame for implementation, and potential funding sources.

Table 40: Summary of Short-Term I-81 Frontage Road Priorities/Recommendations Exit 7 to Exit 10

Improvement	Description	Planning Level Costs PE/RW/CN
Short-Term Recommendations (5 to 10 years)		
Exit 7 to Exit 10	**Stagecoach Road Phase I** ○ Reconstruct existing typical section of Stagecoach Road from Bristol Flooring intersection to Hickory Drive to consist of: ○ Two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder	$4,298,0000
	From existing Terminus/Cul de Sac of Stage Coach Road/Hickory Drive to tie-in with Flame Leaf Drive ○ Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder) ○ Existing northbound approach of Flame Leaf Drive will become STOP controlled	$9,143,000
	From Flame Leaf Drive tie-in to Old Dominion Road intersection ○ Reconstruct two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder) ○ Realign/reconfigure Flame Leaf Drive/Old Dominion Road intersection to create 4-legged intersection ○ Implement 4-Way STOP	$3,532,000
	Stagecoach Road Phase II ○ Install signal at Stagecoach Road/Saul Drive at Old Airport Road intersection ○ New Alignment from Old Airport Road to Villages Circle intersection ○ Mill and overlay from Villages Circle intersection to Bristol Flooring Entrance	$5,248,000
	From the Flame Leaf Drive at Old Dominion Road Intersection to Majestic Drive (Private Road) intersection ○ Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder) ○ Remove/replace existing private driveway/gateway ○ Existing northbound approach of Majestic Drive will become STOP controlled Majestic Drive ○ Mill and overlay from cul de sac (End of State Maintenance) to intersection with F-310 (Exit 10) ○ Maintain STOP control on eastbound/westbound Majestic Drive approaches	$11,286,000
	TOTAL	**$33,507,000**

Table 41: Summary of Short-Term I-81 Frontage Road Priorities/Recommendations Exit 13 to Exit 14

Improvement	Description	Planning Level Costs PE/RW/CN
Short-Term Recommendations (5 to 10 years)		
Exit 13 to Exit 14	• From the New Alignment Frontage Road at Spring Creek Road (Exit 13) to tie in point along existing Dennison Drive ○ Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder) ○ Westbound approach of New Alignment Frontage Road at Spring Creek Road will be STOP controlled ○ Install box culvert to accommodate creek crossing.	$12,815,000
	• Dennison Drive ○ Mill and overlay from the New Alignment Frontage Road at Dennison Drive tie-in point to the Old Jonesboro Road intersection (Exit 14) • Dennison Drive at Old Jonesboro Road will be served by existing traffic signal	$3,060,000
	TOTAL	**$15,875,000**

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Table 42: Summary of Mid-Term I-81 Frontage Road Priorities/Recommendations Exit 10 to Exit 13

Improvement	Description	Planning Level Costs PE/RW/CN
Mid-Term Recommendations (10 to 15 years)		
Exit 10 to Exit 13	• Majestic Drive (Exit 10) ○ Mill and overlay from F-310 intersection to Stables Road • Majestic Drive at Stables Road ○ Northbound Stables Road approach will be STOP controlled • From the Majestic Drive at Stables Road intersection to the Majestic Drive at Carson Lane intersection ○ Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder) ○ Northbound approach of Carson Lane will be STOP controlled	$2,808,000
	• From the Majestic Drive at Carson Lane intersection to the New Alignment Frontage Road at Halls Bottom Road intersection ○ Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder) ○ Eastbound approach of New Alignment Frontage Road will be STOP controlled • Halls Bottom Road ○ Mill and overlay from the New Alignment Frontage Road at Halls Bottom Road intersection to the Halls Bottom Road at Singing Wood Lane intersection ○ Construct exclusive right-turn lane along southbound Halls Bottom Road	$9,728,000
	• Singing Wood Lane - From the Halls Bottom Road intersection to the Black Wolf Drive intersection ○ Reconstruct/Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder) ○ Northbound/Southbound approaches of Black Wolf Drive will be STOP controlled • Singing Wood Lane/New Alignment Frontage Road - From the Black Wolf Drive intersection to the Spring Creek Road intersection ○ Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder) ○ Eastbound approach of New Alignment Frontage Road will be STOP controlled at Spring Creek Road intersection	$17,448,000
	TOTAL	**$29,984,000**

Table 43: Summary of Mid-Term I-81 Frontage Road Priorities/Recommendations French Moore Jr. Boulevard Extension/Cook Street Extension (Exit 14 to Exit 17 "North")

Improvement	Description	Planning Level Costs PE/RW/CN
Mid-Term Recommendations (10 to 15 years)		
Exit 14 to Exit 17 "North" **French Moore Jr. Boulevard Extension**	• French Moore Jr. Boulevard Extension ○ Construct new two-lane roadway from existing cul de sac to new intersection with Stone Mill Road ○ Traffic control for the French Moore Jr. Boulevard Extension at Stone Mill Road will be a single lane roundabout	$16,761,000
Cook Street Extension	• Cook Street Extension ○ Construct new two-lane roadway from intersection with Stone Mill Road to tie-in point with existing Cook Street ○ Two-lane typical section with curb and gutter ○ 5-foot sidewalk to 10' Shared-Use Path along one side of the roadway	$9,718,000
	TOTAL	**$26,479,000**

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Table 44: Summary of Long-Term I-81 Frontage Road Priorities/Recommendations Exit 17 to Exit 19

Improvement	Description	Planning Level Costs PE/RW/CN
Long-Term Recommendations (15 to 20 years)		
Exit 17 to Exit 19	• Cummings Street to Glenview Drive intersection ○ Mill and overlay from Cummings Street intersection to Glenview Drive intersection • New Alignment Frontage Road – from the existing Country Club Drive at Glenview Drive intersection to the identified tie-in point with Wycoff Drive ○ Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder) ○ Northbound approach of Glenview Drive at Country Club Drive/New Alignment Frontage Road intersection will be STOP controlled ○ Westbound approach of Country Club Drive will be STOP controlled ○ This segment of roadway will include a bridge aligned adjacent to I-81 over the Creeper Trail to minimize potential environmental impacts	$14,370,000
	• Wycoff Drive - From the New Alignment Frontage Road tie-in point to the intersection with Trigg Street ○ Reconstruct/improve the existing two-lane typical section to match the proposed Frontage Road typical (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder) ○ Southbound approach of Trigg Street will be STOP controlled at the Wycoff Drive intersection	$2,034,000
	• New Alignment Frontage Road (Berry Creek Drive) at the Trigg Street intersection to the location of the New Frontage Road alignment tie-in point ○ Reconstruct/improve the existing two-lane typical section to match the proposed Frontage Road typical (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder) ○ Reconstruct two private driveway approaches at New Alignment Frontage Road ○ Northbound approach of Private Driveway shared access will become STOP controlled	$2,842,000
	• New Alignment Frontage Road from vicinity of Berry Creek Drive to the JEB Stuart Highway (U.S. Route 58)/Lee Highway (U.S. Route 11) intersection ○ Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder) ○ Traffic control for the New Alignment Frontage Road at JEB Stuart Highway will be a combination two-lane/single-lane roundabout ○ Realign U.S. Route 11 to tie into proposed roundabout location • Construct roundabout at the JEB Stuart Highway (U.S. Route 58)/Lee Highway (U.S. Route 11) intersection	$21,366,000
	TOTAL	**$40,612,000**

Table 45: Summary of Long-Term I-81 Frontage Road Priorities/Recommendations Exit 14 to Exit 17 "South"

Improvement	Description	Planning Level Costs PE/RW/CN
Long-Term Recommendations (15 to 20 years)		
Exit 14 to Exit 17 "South"	• From the New Alignment Frontage Road at Old Jonesboro Road intersection to the Bonneycastle Drive at Glenwood Drive intersection ○ Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder) ○ Westbound approach of New Alignment Frontage Road at Old Jonesboro Road will be STOP controlled ○ Northbound approach of Glenwood Drive at New Alignment Frontage Road intersection will be STOP controlled	$12,770,000
	• From the New Alignment Frontage Road at Glenwood Drive intersection to the Bonneycastle Drive at Stone Mill Road intersection ○ Reconstruct/improve the existing two-lane typical section to match the proposed Frontage Road typical (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder) ○ Eastbound/Westbound approaches of New Alignment Frontage Road will be STOP controlled at Stone Mill Road intersection	$2,708,000
	• From the New Alignment Frontage Road at Stone Mill Road intersection to the New Alignment Frontage Road at the Future Commerce Drive/Gravel Lake Road intersection ○ Construct new two-lane roadway (i.e., two 12-foot travel lanes, 4-foot paved shoulder, and 4-foot graded shoulder) • Eastbound approach of New Alignment Frontage Road at Future Commerce Drive/Gravel Lake Road intersection will be STOP controlled	$7,667,000
	TOTAL	**$23,145,000**

Table 46: Summary of Long-Term I-81 Frontage Road Priorities/Recommendations Exit 19 to Exit 22

Improvement	Description	Planning Level Costs PE/RW/CN
Long-Term Recommendations (15 to 20 years)		
Exit 19 to Exit 22	• From the New Alignment Frontage Road/Lee Highway (U.S. Route 11) at JEB Stuart Highway (U.S. Route 58) intersection to vicinity of the Lee Highway (U.S. Route 11) at Johnston Memorial Hospital "East" intersection ○ Widen existing Lee Highway (U.S. Route 11) to a four-lane divided typical section • Lee Highway at Johnston Memorial Hospital "West" Intersection ○ Signalize the improved intersection ○ Install necessary exclusive turn-lanes at the improved intersection	$24,501,000
	• From vicinity of the Johnston Memorial Hospital "East" intersection to the Lee Highway (U.S. Route 11) at Enterprise Road intersection ○ Widen existing Lee Highway (U.S. Route 11) to a four-lane divided typical section • Lee Highway at Enterprise Road ○ Signalize the improved intersection Install necessary exclusive turn-lanes at the improved intersection.	$28,581,000
	TOTAL	**$53,082,000**

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