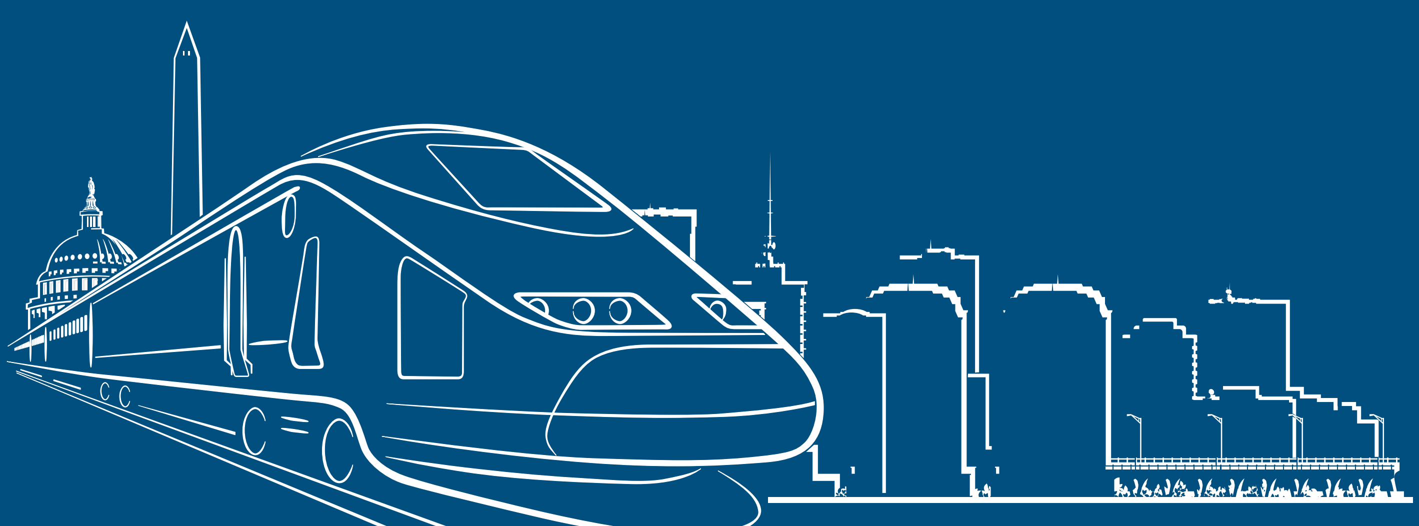
DC TO RICHMOND
SOUTHEAST HIGH SPEED RAIL

S TRANSPORTATION TECHNICAL REPORT



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September 2017

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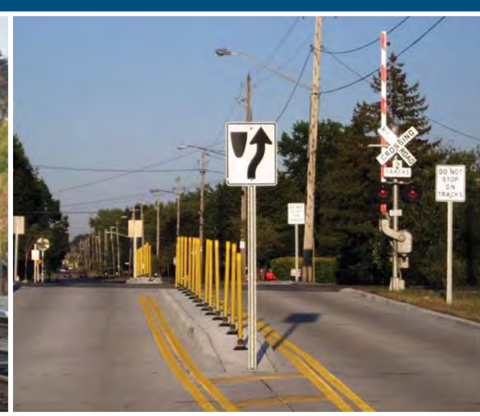

DRPT
Virginia Department of Rail and Public Transportation

U.S. Department of Transportation
Federal Railroad Administration

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1 INTRODUCTION

The Federal Railroad Administration (FRA) and Virginia Department of Rail and Public Transportation (DRPT) propose passenger rail service and rail infrastructure improvements in the north-south travel corridor between Washington, D.C. and Richmond, VA. These passenger rail service and rail infrastructure improvements are collectively known as the Washington, D.C. to Richmond Southeast High Speed Rail (DC2RVA) Project. The Project will increase capacity to deliver higher speed passenger rail, expand commuter rail, and accommodate growth of freight rail service, in an efficient and reliable multimodal rail corridor. The increased capacity will improve passenger rail service frequency, reliability and travel time in a corridor shared by growing volumes of passenger, commuter, and freight rail traffic, thereby providing a door-to-door time-competitive option for travelers between Washington, D.C. and Richmond and those traveling to and from adjacent connecting corridors. The Project is part of the larger Southeast High Speed Rail (SEHSR) corridor, which extends from Washington, D.C. through Richmond, and continues east to Hampton Roads (Norfolk), VA, and south to Raleigh, NC, and Charlotte, NC, and then continues west to Atlanta, GA and south to Florida. The Project connects to the National Railroad Passenger Corporation (Amtrak) Northeast Corridor (NEC) at Union Station in Washington, D.C.

The purpose of the SEHSR program, as stated in the 2002 Tier I Final Environmental Impact Statement (EIS) completed for the full SEHSR corridor, is to provide a competitive transportation choice to travelers within the Washington, D.C. to Charlotte travel corridor. The current DC2RVA Project carries forward the purpose of the SEHSR Tier I EIS within the Washington, D.C. to Richmond segment of the larger SEHSR corridor by identifying the infrastructure improvements necessary to provide a competitive transportation choice for current and future conditions.

The Purpose of the DC2RVA Project is to increase the capacity between Washington, D.C. and Richmond to deliver higher speed passenger rail, improve conventional speed passenger rail, expand commuter rail, and accommodate growth of freight rail service in an efficient and reliable multimodal rail corridor. This Project will enable passenger rail to be a competitive transportation choice for intercity travelers between Washington, D.C. and Richmond and beyond.

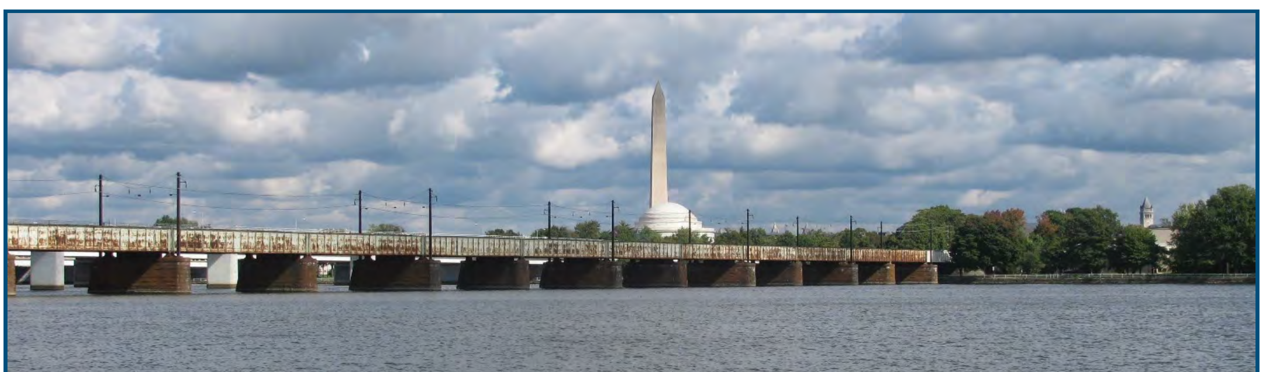
The purpose of this Transportation Technical Report is to identify the existing transportation conditions along the DC2RVA corridor and analyze potential effects that could result from implementation of the Build Alternatives. Information in this Technical Report supports discussions presented in the Draft EIS.

2 PROJECT OVERVIEW

The Washington, D.C. to Richmond corridor spans 123 miles along an existing rail corridor owned by CSXT between Control Point Rosslyn (RO) at milepost (MP) CFP 110 in Arlington County, VA to the junction of the CSXT North End Subdivision (referred to as the A-Line) between West Acca Yard in Richmond and Centralia, VA, and the CSXT Bellwood Subdivision (referred to as the S-Line) between Control Point Hermitage in Richmond and Centralia, VA (CE) at MP A-11 in Chesterfield County, VA (Figure 2-1). At the northern terminus in Arlington County, the Project limit is marked by the southern approach to Long Bridge, a double-track rail bridge connecting the rail corridor over the Potomac River to Washington, D.C. The Project corridor follows the CSXT Richmond, Fredericksburg & Potomac (RF&P) Subdivision from the Potomac River to Richmond. The southern terminus in Centralia is the junction of two CSXT routes (the A-Line and the S-Line) that begin in Richmond and rejoin approximately 11 miles south of the city.

Additional sections evaluated as part of the Project included approximately 8.3 miles of the CSXT Peninsula Subdivision CA-Line from Beulah Road (MP CA-76.1) in Henrico County, VA east of Richmond to AM Junction in downtown Richmond, and the approximately 26-mile Buckingham Branch Railroad (BBR) from AM Junction to the RF&P Crossing (MP CA-111.8) north of Richmond in Doswell, VA.

In Arlington, the Project connects to existing CSXT track extending across the Potomac River on the Long Bridge into Washington, D.C. and Union Station, the southern terminus of Amtrak's NEC. In downtown Richmond and at Centralia, the Project connects to both the Richmond to Raleigh segment of the SEHSR corridor and the Richmond to Hampton Roads segment of the SEHSR corridor. The Washington, D.C. to Richmond segment is an integral part of the overall Washington, D.C. to Charlotte SEHSR corridor and provides a critical link between high speed passenger service from Boston to Washington, D.C. and the southeastern United States (U.S.).



Long Bridge Over the Potomac River

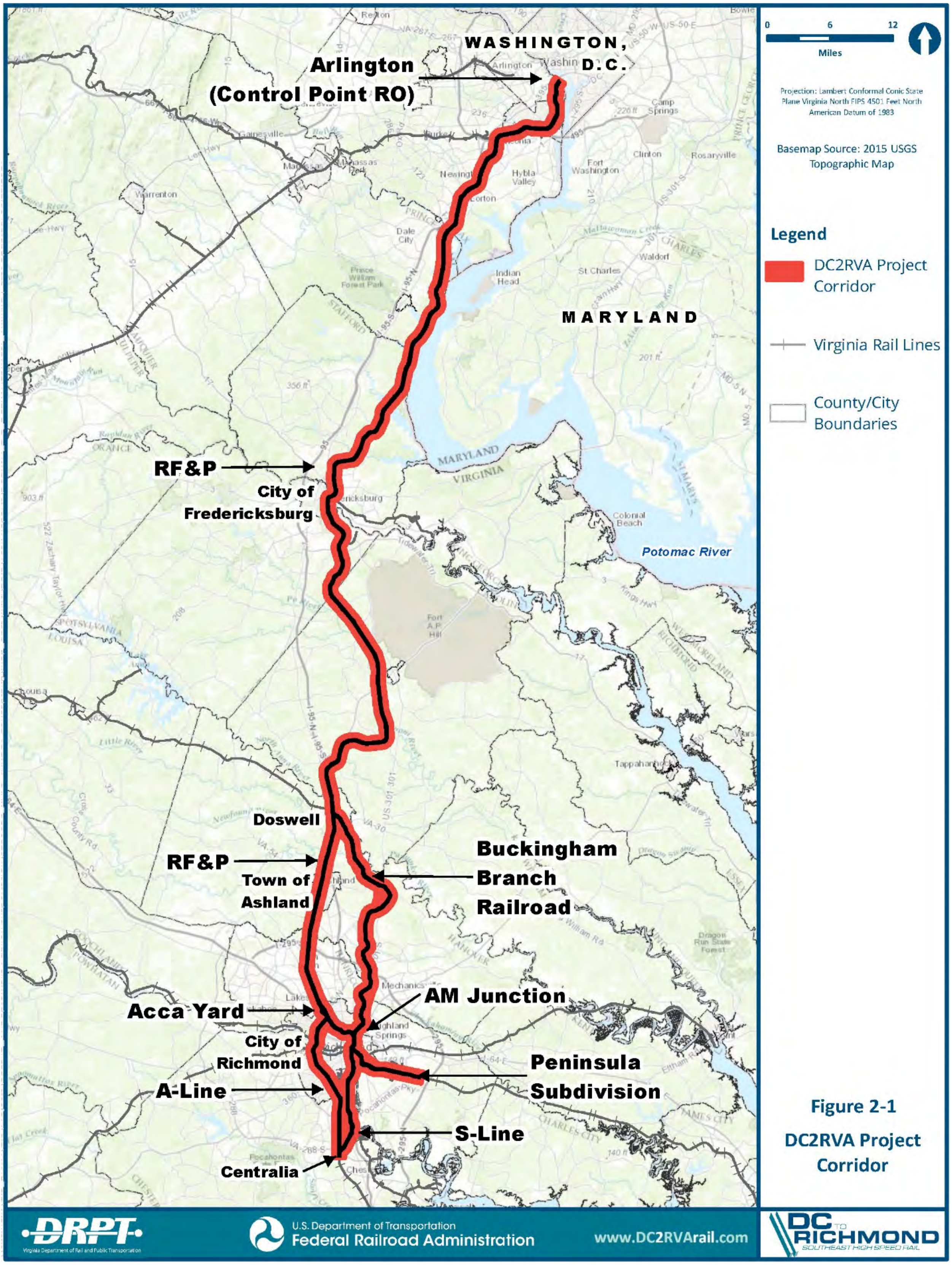


Figure 2-1
DC2RVA Project Corridor

2.1 PROJECT DESCRIPTION

Alternatives developed as part of the DC2RVA Project include two elements: proposed train service that would run throughout the corridor (see Section 2.1.1), and physical improvements along the rail alignment (see Section 2.2). The Project will include specific rail infrastructure improvements and service upgrades to deliver higher speed passenger rail, expand commuter rail, and accommodate growth of freight rail service in an efficient and reliable multimodal rail corridor. The increased capacity will improve passenger rail service frequency, reliability, and door-to-door competitive travel time in a corridor shared by growing volumes of passenger, commuter, and freight rail traffic. Specific improvements to the existing rail infrastructure between Arlington, VA, and Centralia, VA, include:

- Corridor-wide improvements to train operating capacity to accommodate efficient operation of passenger, commuter, and freight rail service with increased frequency, reliability, and speed, including an additional main track along most of the corridor, additional sidings, crossovers, yard bypasses and leads, and other capacity and reliability improvements at certain locations.
- Corridor-wide upgrades to existing track and signal systems to achieve higher operating speeds, including curve realignments, higher-speed crossovers between tracks, passing sidings, and grade crossing improvements.
- New or replacement station, platform, and parking improvements at intercity passenger stations in the corridor to improve the efficiency of railroad operations, improve quality of service, and accommodate increased ridership.
- Safety improvements to roadway crossing treatments, to include median treatment, grade separations, and/or closure of existing at-grade crossings of the rail corridor.

The environmental impacts of these improvements and measures to avoid, minimize, or otherwise mitigate such impacts are described in the EIS.

Studies in support of the Project addressed passenger and freight rail operations and service between Union Station in Washington, D.C. and Richmond and beyond, but the Project will not include physical improvements to the Long Bridge across the Potomac River or to rail infrastructure within Washington, D.C. Other projects will address these improvements as well as improvements to the rail infrastructure north of Arlington and south of Centralia along the SEHSR corridor.

2.1.1 Passenger Rail Service in Project Corridor

Amtrak operates four types of passenger service in the DC2RVA corridor:

- Northeast Regional (Virginia) Amtrak service provides regional passenger rail service along the length of the Northeast Corridor from Boston and New York and continues south to serve routes in Virginia. Trains make local station stops.
- Interstate Corridor (Carolinian) Amtrak operates between New York and North Carolina (one single daily round trip) through Virginia, making fewer stops in the DC2RVA corridor than the Northeast Regional service.
- Long Distance Amtrak service operates from New York and continues through Washington, D.C. and Virginia to other out-of-state locations. Long distance trains serve the fewest of Amtrak station stops within the DC2RVA corridor.

- Auto Train Amtrak service operates as a daily nonstop, overnight train between dedicated station facilities in Lorton, VA and Florida, and carries passengers and their automobiles.

DRPT is proposing to add nine daily roundtrip SEHSR intercity passenger trains to the corridor:

- Four new roundtrips of Northeast Regional (SEHSR) service, to provide additional frequencies on the same routes of existing Amtrak Northeast Regional (Virginia) services, terminating within Virginia (either Newport News, Norfolk, or Richmond).
- Five new roundtrips of Interstate Corridor (SEHSR) service, to complement Amtrak's current Interstate Corridor (North Carolina) service. The SEHSR trains have slightly different service patterns in the DC2RVA corridor than the existing Amtrak service, and use different routes south of the DC2RVA corridor, where SEHSR trains are expected to provide a faster and more direct route to Raleigh and Charlotte, NC.

From Washington, D.C., all new SEHSR trains would continue on to Philadelphia, New York, and Boston. The plan is to incorporate this service in to Amtrak's regional and long-distance intercity passenger rail network. Refer to Section 4.2 of this Technical Report for additional details; Chapter 2 of the Draft EIS provides full summary of the service plan inputs that DRPT will use to prepare the Service Development Plan, which will occur at the conclusion of the NEPA process.

2.1.2 Tier II EIS Planning Dates

For this EIS, FRA and DRPT established two important planning dates. The first planning date is 2025, which is FRA and DRPT's current best estimate of when construction of the DC2RVA infrastructure could be completed and the new DC2RVA service would be placed in operation. FRA and DRPT's estimate of the year 2025 as the "opening day" is dependent on many factors, not the least of which is finalizing the EIS and Record of Decision. The date also assumes that federal funding in addition to other funding sources will be available at the level required to build all of the proposed infrastructure improvements and acquire the necessary equipment and train-sets. DRPT based this date on an aggressive but potentially achievable schedule assumption that all necessary permits, approvals, agreements, and funding could be finalized by 2020, final design would take one year (2021), right-of-way acquisition (if needed) would take one year (2022), and construction would take three years (2023 – 2025). FRA and DRPT also used 2025 as the date when the physical impacts associated with DC2RVA Project construction would take place. Thus, all of the physical impact analyses within this Draft EIS on human and natural resources are estimated for 2025, and compared to the No Build Alternative conditions projected for 2025.

The second key planning date established by FRA and DRPT is the planning horizon date of 2045, 20 years after the projected implementation of the new rail service in 2025. Both the Passenger Rail Investment and Improvement Act (PRIIA) and FRA guidance require that DRPT demonstrate that the proposed project is sufficient to deliver the proposed passenger rail benefits and an efficient and reliable multimodal rail corridor over a 20-year time horizon following the completion of the passenger project. DRPT uses operational simulations analysis, as discussed in Section 2.6.2, to test the proposed alternatives to determine if the rail capacity is adequate for both the opening day (2025) levels of projected freight, commuter and passenger rail traffic and to determine if the infrastructure remains adequate over the 20 year planning horizon or until 2045. DRPT also used the 2045 planning horizon date to estimate some of the longer term effects of the proposed service such as ridership, energy use, and effects on air quality, as well as indirect and cumulative effects.

2.2 PROJECT ALTERNATIVES

Developing potential rail alignments was an iterative process. DRPT relied on previous studies and public scoping comment as the starting point for developing potential rail alignments. Rail alignment modifications were made to avoid or minimize potential adverse effects on environmental resources and existing infrastructure, and to minimize the need for additional new infrastructure, while preserving the ability of that alignment to meet the Project's Purpose and Need. The final screening evaluation—to determine the Build Alternatives to be carried forward for evaluation in the Draft EIS—focused on each rail alignment's ability to reduce trip times based on increased track design speed and to increase the reliability of rail operations based upon added capacity, with the least potential environmental impact and consideration of cost to construct.

As part of the Build Alternatives, DRPT evaluated both existing and potential new passenger rail stations in the DC2RVA corridor. DRPT plans to incorporate the DC2RVA SEHSR passenger train service into Amtrak's intercity passenger rail network (see Section 2.1); along the DC2RVA corridor, these existing stations include: Alexandria, Woodbridge, Quantico, Fredericksburg, Ashland, and Staples Mill Road and Main Street in Richmond. Additionally, in Richmond, DRPT is considering two proposed new locations under some Build Alternatives: Boulevard Station and Broad Street Station. However, not all proposed trains would necessarily serve all existing or proposed stations.

For evaluation in the Tier II Draft EIS, DRPT combined and categorized Build Alternatives into six alternative areas along the corridor (Figure 2-2):

- Alternative Area 1: Arlington (Long Bridge Approach): 1-mile section that includes approach alignments to the Long Bridge, which crosses the Potomac River between VA and DC.
- Alternative Area 2: Northern Virginia: 47-mile section that includes additional track within existing railroad right-of-way.
- Alternative Area 3: Fredericksburg (Dahlgren Spur to Crossroads): 14-mile section that includes alignments through or around the city.
- Alternative Area 4: Central Virginia (Crossroads to Doswell): 29-mile section that includes additional track primarily within the existing railroad right-of-way.
- Alternative Area 5 Ashland: Ashland (Doswell to I-295): 10-mile section including alignments through or around the town.
- Alternative 6 Richmond (I-295 to Centralia): 23-mile section including different station locations and routing options along the A-Line and/or S-Line.

Project Build Alternatives were developed separately, specific to the existing conditions, constraints, and/or needs of each of the six areas, and will be linked to form a single DRPT Recommended Preferred Alternative for the corridor, to be confirmed in the Final EIS and Record of Decision (ROD).

Refer to Chapter 2 of the Draft EIS for full summary of the alternatives development process and description of Build Alternatives, and Chapter 7 of the Draft EIS for description of the DRPT Recommended Preferred Alternative.

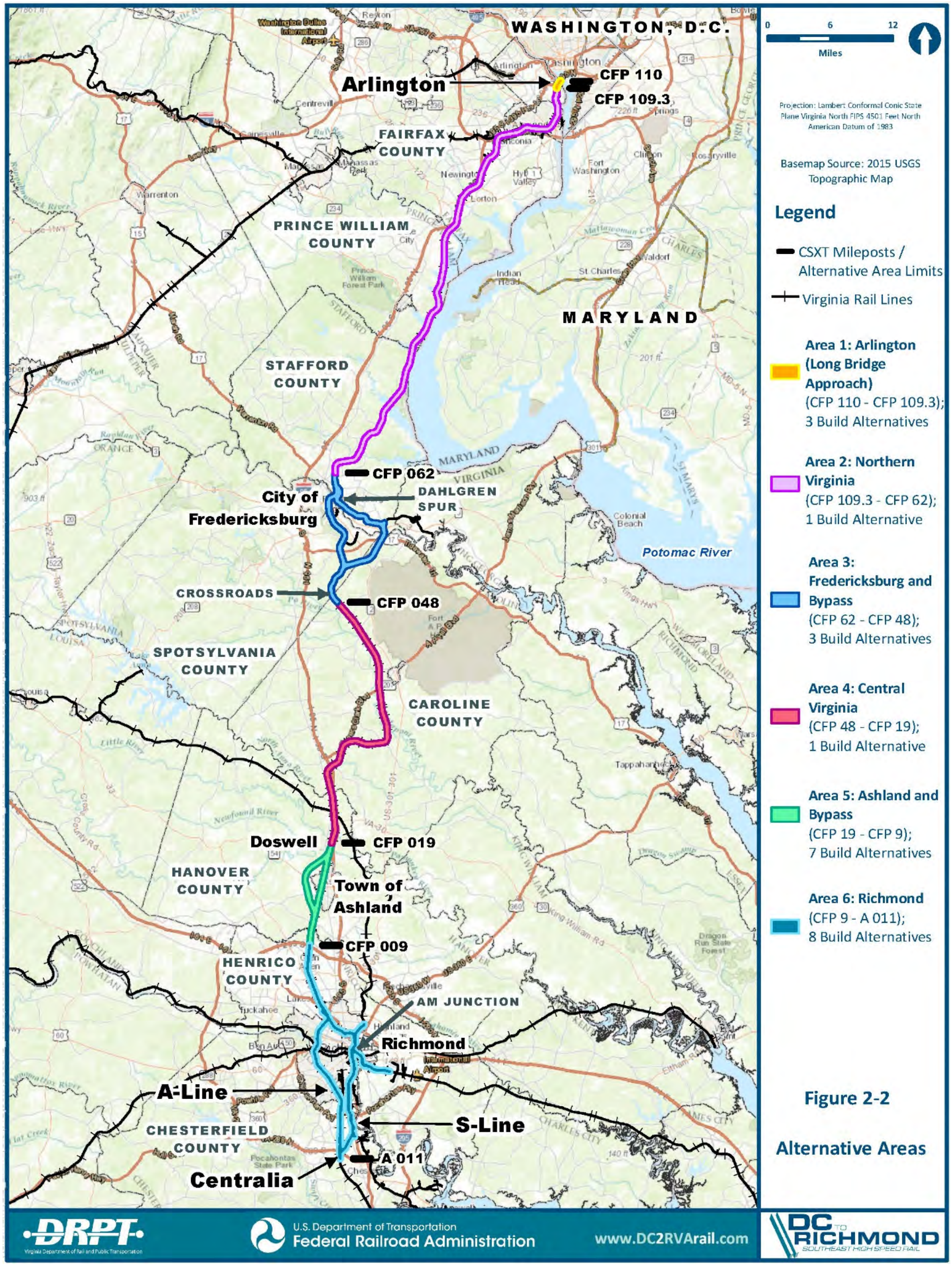


Figure 2-2

Alternative Areas

In general, the DC2RVA Project proposes to increase capacity by adding one additional main track. In most areas, the Project will add a new third track in addition to two existing tracks. The determination of the location of the new track on the east or west of existing trackage varies by location within the corridor based on physical constraints and minimization of impacts. For each alternative, DRPT also evaluated the potential to realign the tracks to improve speeds. The proposed Build Alternatives vary within the City of Fredericksburg and the Town of Ashland, where alignments outside of the existing right-of-way were considered (i.e., bypass alignments around the downtown areas); the typical section of the new bypass alignments consists of two tracks.

From a wide range of options that were considered during the alternatives development process, 23 Build Alternatives, which vary within each alternative area, were included for evaluation in the Draft EIS (Table 2-1).

Table 2-1: Build Alternatives

Alternative Area	Alternative	Description
Area 1: Arlington (Long Bridge Approach)	1A	Add Two Tracks on the East
	1B	Add Two Tracks on the West
	1C	Add One Track East and One Track West
Area 2: Northern Virginia (Long Bridge to Dahlgren Spur)	2A	Add One Track/Improve Existing Track
Area 3: Fredericksburg (Dahlgren Spur to Crossroads)	3A	Maintain Two Tracks Through Town
	3B	Add One Track East of Existing
	3C	Add Two-Track Bypass East
Area 4: Central Virginia (Crossroads to Doswell)	4A	Add One Track/Improve Existing Track
Area 5: Ashland (Doswell to I-295)	5A	Maintain Two Tracks Through Town
	5A–Ashcake	Maintain Two Tracks Through Town (Relocate Station to Ashcake)
	5B	Add One Track East of Existing
	5B–Ashcake	Add One Track East of Existing (Relocate Station to Ashcake)
	5C	Add Two-Track West Bypass
	5C–Ashcake	Add Two-Track West Bypass (Relocate Station to Ashcake)
	5D–Ashcake	Three Tracks Centered Through Town (Add One Track, Relocate Station to Ashcake)
Area 6: Richmond (I-295 to Centralia)	6A	Staples Mill Road Station Only
	6B–A-Line	Boulevard Station Only, A-Line
	6B–S-Line	Boulevard Station Only, S-Line
	6C	Broad Street Station Only
	6D	Main Street Station Only
	6E	Split Service, Staples Mill Road/Main Street Stations
	6F	Full Service, Staples Mill Road/Main Street Stations
	6G	Shared Service, Staples Mill Road/Main Street Stations

As shown in the table, the eight Build Alternatives in Richmond include four single-station options that would consolidate passenger service to one station, and three two-station alternatives that offer combinations of services and rail line routes using Main Street Station and Staples Mill Road Station. These Richmond station options drive the corridor-wide operations of the DC2RVA Project. Ridership, travel time, and on-time performance vary by Build Alternative based on the different Richmond station options. Estimated travel time between Washington, D.C. and Richmond is dependent on the number and location of station stops as well as the track design.

Each Build Alternative includes build-alternative-specific improvements to features such as stations and at-grade roadway crossings, as applicable. The following sections provide details of each of these Build Alternatives, as well as the No Build Alternative.

2.2.1 No Build Alternative

The No Build Alternative defines the future infrastructure and service levels that will result from planned investments in the Washington, D.C. to Richmond rail corridor, independent of the improvements planned by the DC2RVA Project.

Information about planned physical improvements and rail service additions in the corridor was gathered from fiscally-constrained Metropolitan Planning Organization (MPO) planning documents, Commonwealth multiyear improvement programs, and from transit agency planning documents. If a project was under construction, fully-funded, or was the focus of advanced collaborative planning (evidenced by partial funding, board-level commitments, or interagency agreements), it was assumed to be complete by 2025 for the purposes of the Draft EIS evaluation. Chapter 2 of the Draft EIS provides full description of elements included in the No Build Alternative.

The purpose of the No Build Alternative is to serve as a baseline for comparison of potential effects and impacts of the DC2RVA Build Alternatives. The No Build alternative was fully evaluated and dismissed by the FRA in the 2002 SEHSR Tier I ROD because it does not meet the SEHSR Purpose and Need. Although previously dismissed as not a viable alternative, it is fully considered as part of the Tier II Draft EIS for the DC2RVA Project because the baseline is required by the National Environmental Policy Act (NEPA).

2.2.2 Build Alternatives

The 23 Build Alternatives that are evaluated in the Tier II EIS for the DC2RVA Project are summarized below. Chapter 2 of the Draft EIS provides full information, including lists of specific improvements for track and station improvements, for each Build Alternative.

Figures 2-3 through 2-23 show the proposed rail alignment improvements by alternative. Figures 2-24 through 2-40 show the proposed station improvements. Note that all figures are provided at the end of this section.

2.2.2.1 Build Alternatives in Area 1: Arlington (Long Bridge Approach)

There are three Build Alternatives in Area 1, which are described in Table 2-2. Build Alternative 1A, 1B, and 1C are shown in Figure 2-3. There are no stations within this alternative area.

Table 2-2: Arlington Area Build Alternatives: 1A, 1B, and 1C

TRACK
All three Build Alternatives would: ▪ Equally support expanded intercity passenger service (all types), expanded VRE commuter service, and expanded CSXT freight service ▪ Add two main tracks, with minor shifts to improve speed ▪ Be constructed within existing railroad right-of-way The difference between the alternatives is on which side(s) of the existing track the new track is added (as indicated in Build Alternative names): two tracks on the east (1A); two tracks on the west (1B); one track east and one track west (1C) Final decision deferred to the completion of the Long Bridge Study (separate study by DDOT) Track maximum authorized speed: ≤ 45 mph
STATIONS
No stations within area
CROSSINGS
No changes to existing public roadway crossings

2.2.2.2 Build Alternatives in Area 2: Northern Virginia

There is one Build Alternative in Area 2, which is described in Table 2-3. Build Alternative 2A is shown in Figure 2-4.

Table 2-3: Northern Virginia Build Alternative 2A

TRACK
One main track would be added, with realignment of some curves to improve speed, to create: ▪ Fourth track from Alexandria to Crystal City ▪ Third track from Spotsylvania to Alexandria Improvements are generally within existing right-of-way Track maximum authorized speed: ≤ 79 mph
STATIONS
Station improvements are mainly platform improvements and to be performed by VRE Proposed new DC2RVA service includes: ▪ Alexandria: Northeast Regional (SEHSR) and Interstate Corridor (SEHSR) *(Figure 2-24)* ▪ Woodbridge: Northeast Regional (SEHSR) *(Figure 2-25)* ▪ Quantico: Northeast Regional (SEHSR) *(no figure)* ▪ All other stations: VRE service only *(no figure)* No changes to the locations of Amtrak (Interstate Corridor (Carolinian), Northeast Regional (Virginia), Long Distance, or Auto Train) or VRE commuter stations served
CROSSINGS
Close one existing public roadway crossing (Mount Hope Church Road), with alternate access provided; no grade separations of at-grade crossings All other public roadway crossings would remain at-grade, with safety improvements Major water crossings at Occoquan River, Neabsco Creek, and Aquia Creek

2.2.2.3 Build Alternatives in Area 3: Fredericksburg

There are three Build Alternatives in Area 3, which are described in Table 2-4, Table 2-5, and Table 2-6. Build Alternative 3A, 3B, and 3C are shown in Figure 2-5, Figure 2-6, and Figure 2-7 respectively. All three Build Alternatives would support expanded intercity passenger (all types), VRE commuter, and CSXT freight service, without change to stations served by existing Amtrak Interstate Corridor (Carolinian), Northeast Regional (Virginia), and Long Distance passenger service or VRE commuter service. Due to constraints of the geography through this location, the maximum authorized speed in this section is designed for 79 mph where feasible. Build Alternative 3B is consistent with the City of Fredericksburg Comprehensive Plan (2015).

Table 2-4: Fredericksburg Area Build Alternative 3A

TRACK
No construction of new track / no additional rail capacity within Fredericksburg ▪ Existing two main tracks would be maintained, which are used by freight, passenger, and commuter trains, similar to existing conditions ▪ Tracks would be shifted in some areas to improve speed Construction of one additional track, with some track shifts to improve speed, north and south of the city All improvements are within existing right-of-way Track maximum authorized speed: ≤ 79 mph
STATIONS
Improvements to Fredericksburg Station would include a new station building, side platform improvements, and a new parking structure *(Figure 2-26)* Proposed new DC2RVA service at Fredericksburg Station: Northeast Regional (SEHSR) and Interstate Corridor (SEHSR) The other station in this alternative area is located in Spotsylvania County and provides VRE service only
CROSSINGS
All public roadway crossings would remain at-grade, with safety improvements (no roadway crossing closures or grade separations of public at-grade crossings) Improvements to major rail bridge over the Rappahannock River

Table 2-5: Fredericksburg Area Build Alternative 3B

TRACK
One main track would be added in most areas, with track shifts to improve speed ▪ Within Fredericksburg, the additional track would be added east of the existing two tracks ▪ A third track already exists between Fredericksburg and Spotsylvania stations; therefore, no improvements are required in this section Improvements are generally within existing right-of-way Track maximum authorized speed: ≤ 79 mph
STATIONS
Improvements to Fredericksburg Station would include a new station building, a new elevated railway, side and center platform improvements, and a new parking structure *(Figure 2-27)* Proposed new DC2RVA service at Fredericksburg Station: Northeast Regional (SEHSR) and Interstate Corridor (SEHSR)

Table 2-5: Fredericksburg Area Build Alternative 3B

The other station in this alternative area is located in Spotsylvania County and provides VRE service only
CROSSINGS
Proposed new DC2RVA service at Fredericksburg Station: Northeast Regional (SEHSR) and Interstate Corridor (SEHSR) The other station in this alternative area is located in Spotsylvania County and provides VRE service only Improvements to major rail bridge over the Rappahannock River

Table 2-6: Fredericksburg Area Build Alternative 3C

TRACK
Existing two-track corridor through the city would be maintained, with some track shifts to improve speed New two-track bypass would be constructed east of the city ▪ Would serve all freight rail as well as some or all of Interstate Corridor (SEHSR) and Amtrak Interstate Corridor (Carolinian), Long Distance, and Auto Train passenger trains ▪ Would require new right-of-way Construction of one additional track, with some track shifts to improve speed, north and south of the bypass Track maximum authorized speed: ≤ 79 mph
STATIONS
Improvements to Fredericksburg station would include a new station building, side platform improvements, and a new parking structure *(Figure 2-26)* Proposed new DC2RVA service at Fredericksburg Station: Northeast Regional (SEHSR) and Interstate Corridor (SEHSR) The other station in this alternative area is located in Spotsylvania County and provides VRE service only
CROSSINGS
Public roadway crossings along existing Dahlgren Spur would remain at-grade, with safety improvements All new public roadway crossings on the bypass would be grade-separated All other public roadway crossings would remain at-grade, with safety improvements Improvements to major rail bridge over the Rappahannock River

2.2.2.4 Build Alternatives in Area 4: Central Virginia

There is one Build Alternative in Area 4, which is described in Table 2-7. Build Alternative 4A is shown in Figure 2-8. Based on geography throughout this area, this section is most suitable for higher speed passenger rail service, and therefore provides the greatest contiguous section along the DC2RVA corridor with a maximum authorized speed up to 90 mph. There are no stations within this alternative area.

Table 2-7: Central Virginia area Build Alternative: 4A

TRACK
One main track would be added, with track shifts to improve speed Improvements are generally within existing right-of-way Supports expanded intercity passenger service (all types) and CSXT freight service Track maximum authorized speed: ≤ 90 mph

Table 2-7: Central Virginia area Build Alternative: 4A

STATIONS
No stations within the area Would not preclude the development of a proposed future station at Carmel Church (not included as part of this study)
CROSSINGS
Close one existing public roadway crossing (Colemans Mill Road); no grade separations of at-grade crossings All other public roadway crossings would remain at-grade, with safety improvements Multiple crossings of small waterways and wetlands

2.2.2.5 Build Alternatives in Area 5: Ashland

There are seven Build Alternatives in Area 5, which are described in Table 2-8 through Table 2-11 below. Build Alternative 5A, 5A–Ashcake, 5B, 5B–Ashcake, 5C, 5C–Ashcake, and 5D–Ashcake are shown in Figure 2-9, Figure 2-10, Figure 2-11, Figure 2-12, Figure 2-13, Figure 2-14, and Figure 2-15, respectively.

The Ashland Build Alternatives include different station locations: either maintaining the station at the existing downtown station with improvements (Build Alternatives 5A, 5B, and 5C) or relocating the station to south of Ashcake Road (all Build Alternatives with "–Ashcake" in their name). The Build Alternatives with the same letter, with and without the "–Ashcake" designation, are otherwise similar in terms rail alignment through Ashland and identical north and south of Town. For ease of comparison, they are presented together in the tables below.

Due to constraints of the geography through this location, the maximum authorized speed in this section is designed for 79 mph where feasible, with an existing 35 mph municipal slow order through the Town of Ashland.

Table 2-8: Ashland Area Build Alternatives: 5A and 5A–Ashcake

TRACK
Both alternatives would maintain two existing tracks (no construction of new track/no additional rail capacity) within Ashland Both alternatives would construct one additional track, with some track shifts to improve speed, north and south of the town All rail improvements are generally within existing right-of-way
STATIONS
Both alternatives would provide Northeast Regional (SEHSR and Virginia) service at different station locations: ▪ 5A: Would maintain existing station location with improvements, including 850-foot platforms, which would require closure of the existing roadway crossing at College Avenue; use of shorter, 350-foot platforms is an option to minimize impacts *(Figure 2-28 A & B)* ▪ 5A–Ashcake: Would close the existing station location and relocate service to a new the station south of Ashcake Road *(Figure 2-29)*
CROSSINGS
Both alternatives include the grade separation of two existing at-grade roadway crossings in Ashland: West Vaughan Road and Ashcake Road All other existing public roadway crossings would remain at-grade, with safety improvements

Table 2-9: Ashland Area Build Alternatives: 5B and 5B–Ashcake

TRACK
Both alternatives would maintain two existing tracks and construct one additional track east of the existing tracks within Ashland ▪ The addition of a third track through town would require closure of a short portion of Railroad Avenue/Center Street ▪ New right-of-way would be required for rail improvements within the town Both alternatives would construct one additional track, with some track shifts to improve speed, north and south of the town ▪ Rail improvements north and south of the town are generally within existing right-of-way
STATIONS
Both alternatives would provide Northeast Regional (SEHSR and Virginia), with different station locations: ▪ 5B: Would maintain existing station location with improvements, including 850-foot platforms, which requires closure of the existing roadway crossing at College Avenue; use of shorter, 350-foot platforms is an option to minimize impacts *(Figure 2-30 A & B)* ▪ 5B–Ashcake: Would close the existing station location and relocate service to a new the station south of Ashcake Road *(Figure 2-29)*
CROSSINGS
Both alternatives include the grade separation of two existing at-grade roadway crossings in Ashland: West Vaughan Road and Ashcake Road All other existing public roadway crossings would remain at-grade, with safety improvements

Table 2-10: Ashland Area Build Alternatives: 5C and 5C–Ashcake

TRACK
Both alternatives would construct a two-track bypass, west of Ashland, to serve all freight rail as well as all Interstate Corridor (SEHSR) and Amtrak Interstate Corridor (Carolinian), Long Distance, and Auto Train passenger trains ▪ New right-of-way would be required on bypass alignment Both alternatives would maintain the existing two-track corridor through town ▪ No additional right-of-way needed in town Both alternatives would construct one additional track, with some track shifts to improve speed, north and south of thebypass ▪ Rail improvements north and south of the town are generally within existing right-of-way
STATIONS
Both alternatives would provide Northeast Regional (SEHSR and Virginia) service at different station locations: ▪ 5C: Would maintain existing station location with improvements, including 850-foot platforms, which requires closure of the existing roadway crossing at College Avenue; use of shorter, 350-foot platforms is an option to minimize impacts *(Figure 2-28 A & B)* ▪ 5C–Ashcake: Would close the existing station location and relocate service to a new the station south of Ashcake Road *(Figure 2-29)*
CROSSINGS
All new roadway crossings on the bypass would be grade-separated All existing public roadway crossings within town would remain at-grade, with safety improvements

Table 2-11: Ashland Area Build Alternatives: 5D–Ashcake

TRACK
One additional main line track, with centering of all main line tracks on the existing alignment, would be constructed through the entire area, which generally requires additional railroad right-of-way, especially within the town of Ashland

Table 2-11: Ashland Area Build Alternatives: 5D–Ashcake

▪ The addition of a third track through town would require closure of a short portion of Railroad Avenue/Center Street
STATIONS
This rail alignment would require removal of the existing station building and platforms, resulting in the relocation of service to a new station south of Ashcake Road, to provide Northeast Regional (SEHSR and Virginia) service *(Figure 2-29)*
CROSSINGS
Includes the grade separation of two existing at-grade roadway crossings in Ashland: West Vaughan Road and Ashcake Road All other existing public roadway crossings within town would remain at-grade, with safety improvements

2.2.2.6 Build Alternatives in Area 6: Richmond

There are eight Build Alternatives in Area 6. All Build Alternatives generally add one main track (though they vary whether they use the A-Line or S-Line through the city), and they vary in whether they consolidate passenger train service to a single station (including two potential new stations at Boulevard Station or Broad Street Station) or provide combinations of service at two stations. There are no changes to CSXT freight service routes due to proposed changes to passenger train routes as part of the DC2RVA Project. The Amtrak Auto Train does not stop in Richmond.

Five of the Richmond area Build Alternatives are single-station alternatives, which are presented in Table 2-12 through Table 2-16. The single station alternatives are Build Alternative 6A, 6B–A-Line, 6B–S-Line, 6C, and 6D, which are shown in Figure 2-16, Figure 2-17, Figure 2-18, Figure 2-19, and Figure 2-20, respectively. All single-station alternatives consolidate Northeast Regional (SEHSR) and Interstate Corridor (SEHSR) service, as well as all Amtrak Long Distance, Interstate Corridor (Carolinian), and Northeast Regional (Virginia) service, to one station.

Three of the Richmond area Build Alternatives are two-station alternatives, which are presented in Table 2-17 through Table 2-19. All two station alternatives use the existing Staples Mill Road and Main Street Stations. The two station Build Alternatives are Build Alternatives 6E, 6F, and 6G, which are shown in Figure 2-21, Figure 2-22, and Figure 2-23, respectively. All two-station alternatives provide Northeast Regional (SEHSR) and Interstate Corridor (SEHSR) service to at least one station, and serves Amtrak Long Distance, Interstate Corridor (Carolinian), and Northeast Regional (Virginia) to one or both stations.

Table 2-12: Richmond Single Station Build Alternative: 6A (Staples Mill Road Station Only)

TRACK
One main track would be added along portions of RF&P (north of Richmond) and A-Line (through Richmond), with track shifts to improve speed
STATIONS
Existing Main Street Station would be closed to passenger rail service, and all service consolidated at Staples Mill Road Station Staples Mill Road Station would be improved and becomes the one passenger rail station to serve Richmond *(Figure 2-31)* ▪ Does not meet FRA requirement for CBD location ▪ Would be served by all passenger trains, including new proposed Interstate Corridor (SEHSR) and Northeast Regional (SEHSR) service Freight and passenger rail service operating together on the A-Line, CSXT's principal freight corridor, would increase rail congestion/delay

Table 2-12: Richmond Single Station Build Alternative: 6A (Staples Mill Road Station Only)

CROSSINGS
Close four existing public roadway crossings; grade separate three at-grade roadway crossings All other public roadway crossings would remain at-grade, with safety improvements Major waterway crossing of James River

Table 2-13: Richmond Single Station Build Alternative: 6B–A-Line (Boulevard Station Only)

TRACK
One of two Boulevard Station-Only alternatives in Area 6 One main track would be added along portions of existing RF&P (north of Richmond) and A-Line (through Richmond), with track shifts to improve speed Elevated loop track at new station
STATIONS
Main Street and Staples Mill Road stations would be closed to passenger rail service and all service relocated and consolidated to a new station at Boulevard Road New Boulevard Road Station would be the one passenger rail station to serve Richmond *(Figure 2-32)* ▪ May not meet FRA requirement for CBD location ▪ Would be served by all passenger trains, including new proposed Interstate Corridor (SEHSR) and Northeast Regional (SEHSR) service Freight and passenger rail service operating together on the A-Line, CSXT's principal freight corridor, would increase rail congestion/delay
CROSSINGS
Close four existing public roadway crossings; grade separate three at-grade roadway crossings All other public roadway crossings would remain at-grade, with safety improvements Major waterway crossing of James River

Table 2-14: Richmond Single Station Build Alternative: 6B–S-Line (Boulevard Station Only)

TRACK
Second of two Boulevard Station-Only alternatives in Area 6 One main track would be added along portions of existing RF&P (north of Richmond) and S-Line (through Richmond), with track shifts to improve speed
STATIONS
Existing Main Street and Staples Mill Road stations would be closed to passenger rail service and all service relocated and consolidated to a new station at Boulevard Road New Boulevard Road Station would be the one passenger rail station to serve Richmond *(Figure 2-32)* ▪ May not meet FRA requirement for CBD location ▪ Would be served by all passenger trains, including new proposed Interstate Corridor (SEHSR) and Northeast Regional (SEHSR) service Locating all passenger train service (except Auto Train, which does not stop in Richmond) to S-Line, separate from CSXT's principal freight corridor through Richmond (the A-Line), would reduce rail congestion/delay
CROSSINGS
Close five existing public roadway crossings; grade separate four at-grade roadway crossings All other public roadway crossings would remain at-grade, with safety improvements Major waterway crossing of James River

Table 2-15: Richmond Single Station Build Alternative: 6C (Broad Street Station Only)

TRACK
One main track would be added along portions of existing RF&P (north Richmond) and A-Line (through Richmond), with track shifts to improve speed At-grade loop track at new station
STATIONS
Existing Main Street and Staples Mill Road stations would be closed to passenger rail service New Broad Street Station would be the one passenger rail station to serve Richmond *(Figure 2-33)* ▪ May not meet FRA requirement for CBD location ▪ Would be served by all passenger trains, including new proposed Interstate Corridor (SEHSR) and Northeast Regional (SEHSR) service Freight and passenger rail service operating together on the A-Line, CSXT's principal freight corridor, would increase rail congestion/delay
CROSSINGS
Station location would require two new at-grade crossings on West Leigh Street adjacent to proposed station, which would require a variance from state code and/or coordination with VDOT Close four existing public roadway crossings; grade separate three at-grade roadway crossings All other public roadway crossings would remain at-grade, with safety improvements Major waterway crossing of James River

Table 2-16: Richmond Single Station Build Alternative: 6D (Broad Street Station Only)

TRACK
One main track would be added along portions of existing RF&P (north of Richmond) and S-Line (through Richmond), with track shifts to improve speed
STATIONS
Existing Staples Mill Road Station would be closed to passenger rail service and all service consolidated at Main Street Station Main Street Station would be improved and be the one passenger rail station to serve Richmond *(Figure 2-34)* ▪ Meets FRA requirement for CBD location ▪ Would be served by all passenger trains, including new proposed Interstate Corridor (SEHSR) and Northeast Regional (SEHSR) service ▪ Potential increases in passenger and freight delay may occur as proximity to I-95 prevents adding sufficient station platforms / track on the west side of the station Locating all passenger train service (except Auto Train, which does not stop in Richmond) to S-Line, separate from CSXT's principal freight corridor through Richmond (the A-Line), would reduce rail congestion/delay
CROSSINGS
Close five existing public roadway crossings; grade separate three at-grade crossings All other public roadway crossings would remain at-grade, with safety improvements Major waterway crossing of James River

Table 2-17: Richmond Two Station Build Alternative: 6E (Split Service)

TRACK
One main track would be added along portions of existing RF&P (north of Richmond) and A-Line (through Richmond), with track shifts to improve speed
STATIONS
Both existing stations would remain operational. All passenger trains would serve Staples Mill Road Station; trains to and from Newport News would additionally serve Main Street Station. ▪ Staples Mill Road Station would be expanded and would be served by all passenger trains that stop in Richmond, including new proposed Northeast Regional (SEHSR) to Norfolk and Interstate Corridor (SEHSR) trains *(Figure 2-35)*

Table 2-17: Richmond Two Station Build Alternative: 6E (Split Service)

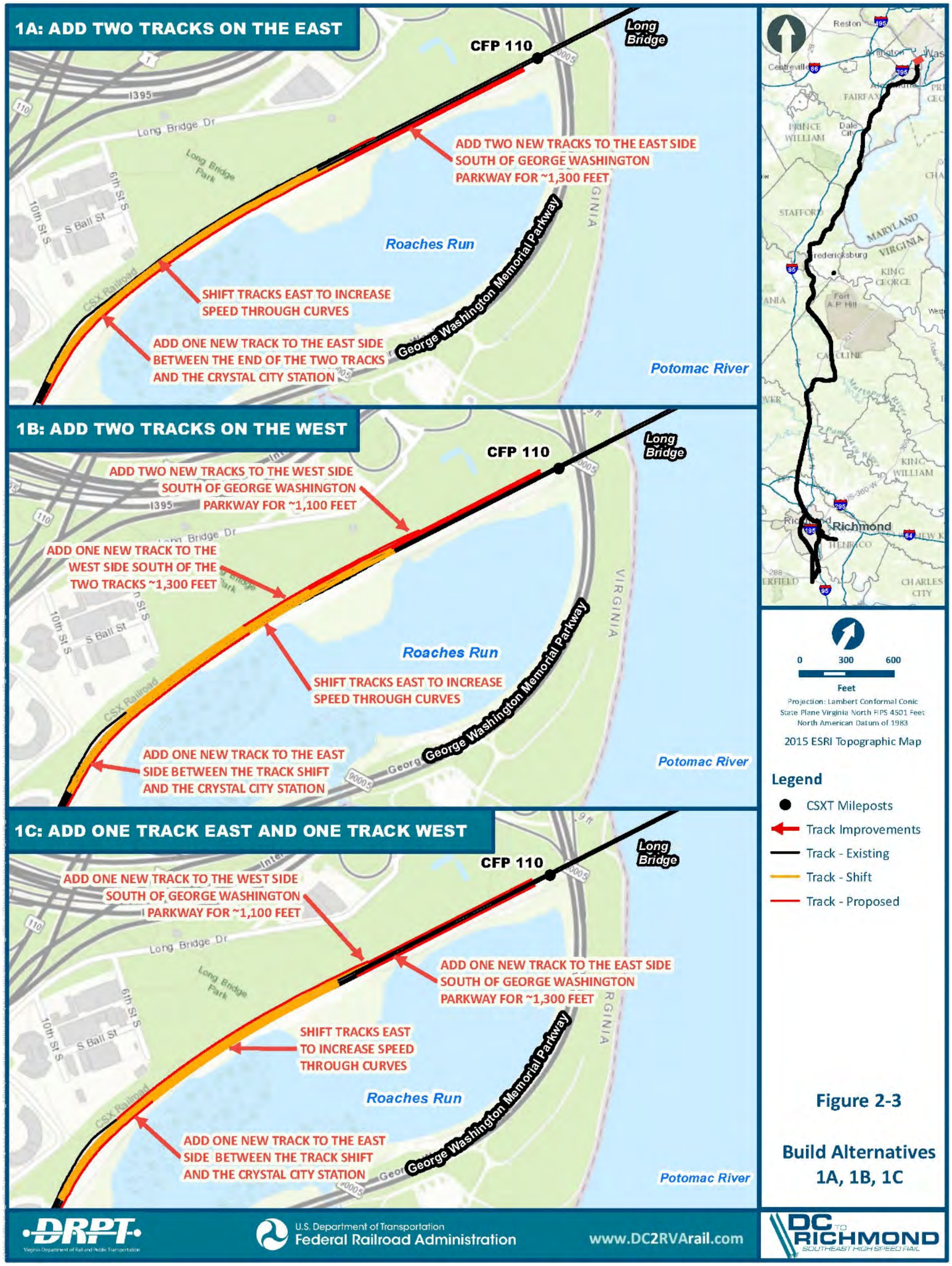
▪ Main Street Station would have platform and parking improvements and would be served by all Northeast Regional (SEHSR and Virginia) passenger trains to Newport News *(Figure 2-36)* Freight and passenger rail service operating together on the A-Line, CSXT's principal freight corridor, would increase rail congestion/delay
CROSSINGS
Close four existing public roadway crossings; grade separate three at-grade roadway crossings All other public roadway crossings would remain at-grade, with safety improvements Major waterway crossing of James River

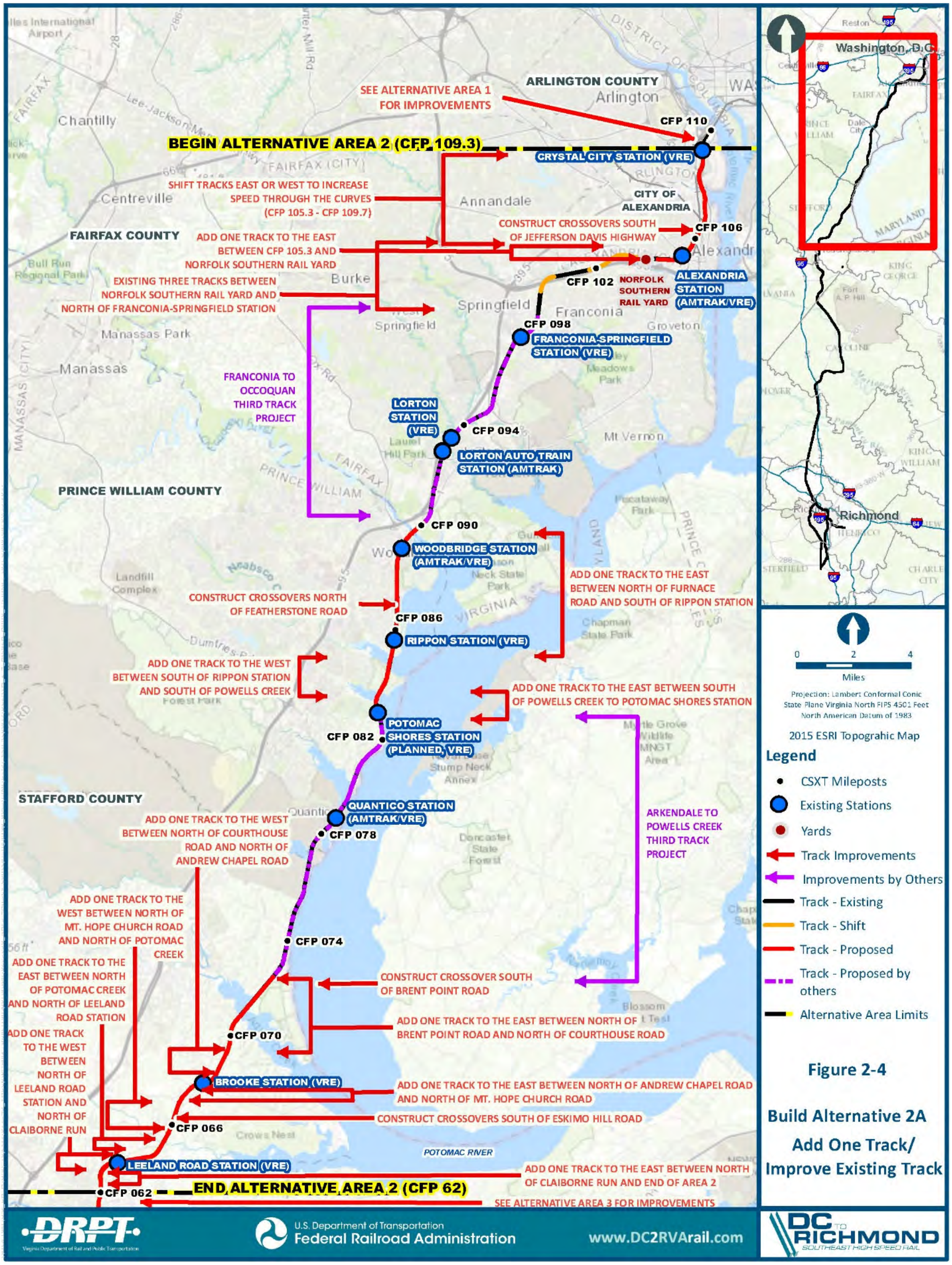
Table 2-18: Richmond Two Station Build Alternative: 6F (Full Service)

TRACK
One main track would be added along portions of existing RF&P (north of Richmond) and S-Line (through Richmond), with track shifts to improve speed
STATIONS
Both existing stations would remain operational, with all passenger trains serving both stations. ▪ Both stations would be improved, including new/modified station buildings, platforms, and parking *(Figure 2-37 and Figure 2-38)* ▪ Both stations would be served by all passenger trains that stop in Richmond, including new proposed Northeast Regional (SEHSR) and Interstate Corridor (SEHSR) service Locating all passenger train service (except Auto Train, which does not stop in Richmond) to S-Line, separate from CSXT's principal freight corridor through Richmond (the A-Line), would reduce rail congestion/delay
CROSSINGS
Close five existing public roadway crossings; grade separate three at-grade roadway crossings All other public roadway crossings would remain at-grade, with safety improvements Major waterway crossing of James River

Table 2-19: Richmond Two Station Build Alternative: 6G (Shared Service)

TRACK
One main track would be added along portions of existing RF&P (north of Richmond) and the S-Line (through Richmond), with track shifts to improve speed ▪ The A-Line is used for service but does not require proposed track
STATIONS
Both existing stations would remain operational, with both stations being served by all new proposed SEHSR service and other Amtrak passenger train services to either one or both stations. ▪ Both stations would be improved, including new/modified station buildings, platforms, and parking *(Figure 2-39 and Figure 2-40)* ▪ Both stations would be served by all Interstate Corridor (SEHSR) and Northeast Regional (SEHSR and Virginia) trains ▪ Long Distance (Amtrak) and Interstate Corridor (Carolinian) would serve Staples Mill Station only Freight and passenger rail service operating together on the A-Line, CSXT's principal freight corridor, would increase rail congestion/delay
CROSSINGS
Close five existing public roadway crossings; grade separate three at-grade roadway crossings All other public roadway crossings would remain at-grade, with safety improvements Major waterway crossing of James River


1A: ADD TWO TRACKS ON THE EAST
CFP 110
Long Bridge
ADD TWO NEW TRACKS TO THE EAST SIDE SOUTH OF GEORGE WASHINGTON PARKWAY FOR ~1,300 FEET
SHIFT TRACKS EAST TO INCREASE SPEED THROUGH CURVES
ADD ONE NEW TRACK TO THE EAST SIDE BETWEEN THE END OF THE TWO TRACKS AND THE CRYSTAL CITY STATION
Roaches Run
George Washington Memorial Parkway
Potomac River
1B: ADD TWO TRACKS ON THE WEST
CFP 110
Long Bridge
ADD TWO NEW TRACKS TO THE WEST SIDE SOUTH OF GEORGE WASHINGTON PARKWAY FOR ~1,100 FEET
ADD ONE NEW TRACK TO THE WEST SIDE SOUTH OF THE TWO TRACKS ~1,300 FEET
SHIFT TRACKS EAST TO INCREASE SPEED THROUGH CURVES
ADD ONE NEW TRACK TO THE EAST SIDE BETWEEN THE TRACK SHIFT AND THE CRYSTAL CITY STATION
Roaches Run
George Washington Memorial Parkway
Potomac River
1C: ADD ONE TRACK EAST AND ONE TRACK WEST
CFP 110
Long Bridge
ADD ONE NEW TRACK TO THE WEST SIDE SOUTH OF GEORGE WASHINGTON PARKWAY FOR ~1,100 FEET
ADD ONE NEW TRACK TO THE EAST SIDE SOUTH OF GEORGE WASHINGTON PARKWAY FOR ~1,300 FEET
SHIFT TRACKS EAST TO INCREASE SPEED THROUGH CURVES
ADD ONE NEW TRACK TO THE EAST SIDE BETWEEN THE TRACK SHIFT AND THE CRYSTAL CITY STATION
Roaches Run
George Washington Memorial Parkway
Potomac River
Richmond
0 300 600
Feet
Projection: Lambert Conformal Conic
State Plane Virginia North FIPS 4501 Feet
North American Datum of 1983
2015 ESRI Topographic Map
Legend
CSXT Mileposts
Track Improvements
Track - Existing
Track - Shift
Track - Proposed
Figure 2-3
Build Alternatives 1A, 1B, 1C
U.S. Department of Transportation Federal Railroad Administration
www.DC2RVArail.com
DC TO RICHMOND SOUTHEAST HIGH SPEED RAIL



SEE ALTERNATIVE AREA 1 FOR IMPROVEMENTS
ARLINGTON COUNTY
BEGIN ALTERNATIVE AREA 2 (CFP 109.3)
CFP 110
CRYSTAL CITY STATION (VRE)
SHIFT TRACKS EAST OR WEST TO INCREASE SPEED THROUGH THE CURVES (CFP 105.3 - CFP 109.7)
CITY OF ALEXANDRIA
CONSTRUCT CROSSOVERS SOUTH OF JEFFERSON DAVIS HIGHWAY
CFP 106
FAIRFAX COUNTY
ADD ONE TRACK TO THE EAST BETWEEN CFP 105.3 AND NORFOLK SOUTHERN RAIL YARD
EXISTING THREE TRACKS BETWEEN NORFOLK SOUTHERN RAIL YARD AND NORTH OF FRANCONIA-SPRINGFIELD STATION
CFP 102
NORFOLK SOUTHERN RAIL YARD
ALEXANDRIA STATION (AMTRAK/VRE)
CFP 098
FRANCONIA-SPRINGFIELD STATION (VRE)
FRANCONIA TO OCCOQUAN THIRD TRACK PROJECT
LORTON STATION (VRE)
CFP 094
LORTON AUTO TRAIN STATION (AMTRAK)
PRINCE WILLIAM COUNTY
CFP 090
WOODBRIDGE STATION (AMTRAK/VRE)
ADD ONE TRACK TO THE EAST BETWEEN NORTH OF FURNACE ROAD AND SOUTH OF RIPPON STATION
CONSTRUCT CROSSOVERS NORTH OF FEATHERSTONE ROAD
CFP 086
RIPPON STATION (VRE)
ADD ONE TRACK TO THE WEST BETWEEN SOUTH OF RIPPON STATION AND SOUTH OF POWELLS CREEK
ADD ONE TRACK TO THE EAST BETWEEN SOUTH OF POWELLS CREEK TO POTOMAC SHORES STATION
POTOMAC SHORES STATION (PLANNED, VRE)
CFP 082
STAFFORD COUNTY
QUANTICO STATION (AMTRAK/VRE)
ADD ONE TRACK TO THE WEST BETWEEN NORTH OF COURTHOUSE ROAD AND NORTH OF ANDREW CHAPEL ROAD
CFP 078
ARKENDALE TO POWELLS CREEK THIRD TRACK PROJECT
ADD ONE TRACK TO THE WEST BETWEEN NORTH OF MT. HOPE CHURCH ROAD AND NORTH OF POTOMAC CREEK
CFP 074
ADD ONE TRACK TO THE EAST BETWEEN NORTH OF POTOMAC CREEK AND NORTH OF LEELAND ROAD STATION
CONSTRUCT CROSSOVER SOUTH OF BRENT POINT ROAD
ADD ONE TRACK TO THE EAST BETWEEN NORTH OF BRENT POINT ROAD AND NORTH OF COURTHOUSE ROAD
CFP 070
ADD ONE TRACK TO THE WEST BETWEEN NORTH OF LEELAND ROAD STATION AND NORTH OF CLAIBORNE RUN
BROOKE STATION (VRE)
ADD ONE TRACK TO THE EAST BETWEEN NORTH OF ANDREW CHAPEL ROAD AND NORTH OF MT. HOPE CHURCH ROAD
CONSTRUCT CROSSOVERS SOUTH OF ESKIMO HILL ROAD
CFP 066
POTOMAC RIVER
LEELAND ROAD STATION (VRE)
ADD ONE TRACK TO THE EAST BETWEEN NORTH OF CLAIBORNE RUN AND END OF AREA 2
CFP 062
END ALTERNATIVE AREA 2 (CFP 62)
SEE ALTERNATIVE AREA 3 FOR IMPROVEMENTS
Washington, D.C.
Richmond
0 2 4
Miles
Projection: Lambert Conformal Conic State Plane Virginia North FIPS 4501 Feet North American Datum of 1983
2015 ESRI Topographic Map
Legend
CSXT Mileposts
Existing Stations
Yards
Track Improvements
Improvements by Others
Track - Existing
Track - Shift
Track - Proposed
Track - Proposed by others
Alternative Area Limits
Figure 2-4
Build Alternative 2A
Add One Track/ Improve Existing Track
DRPT
U.S. Department of Transportation Federal Railroad Administration
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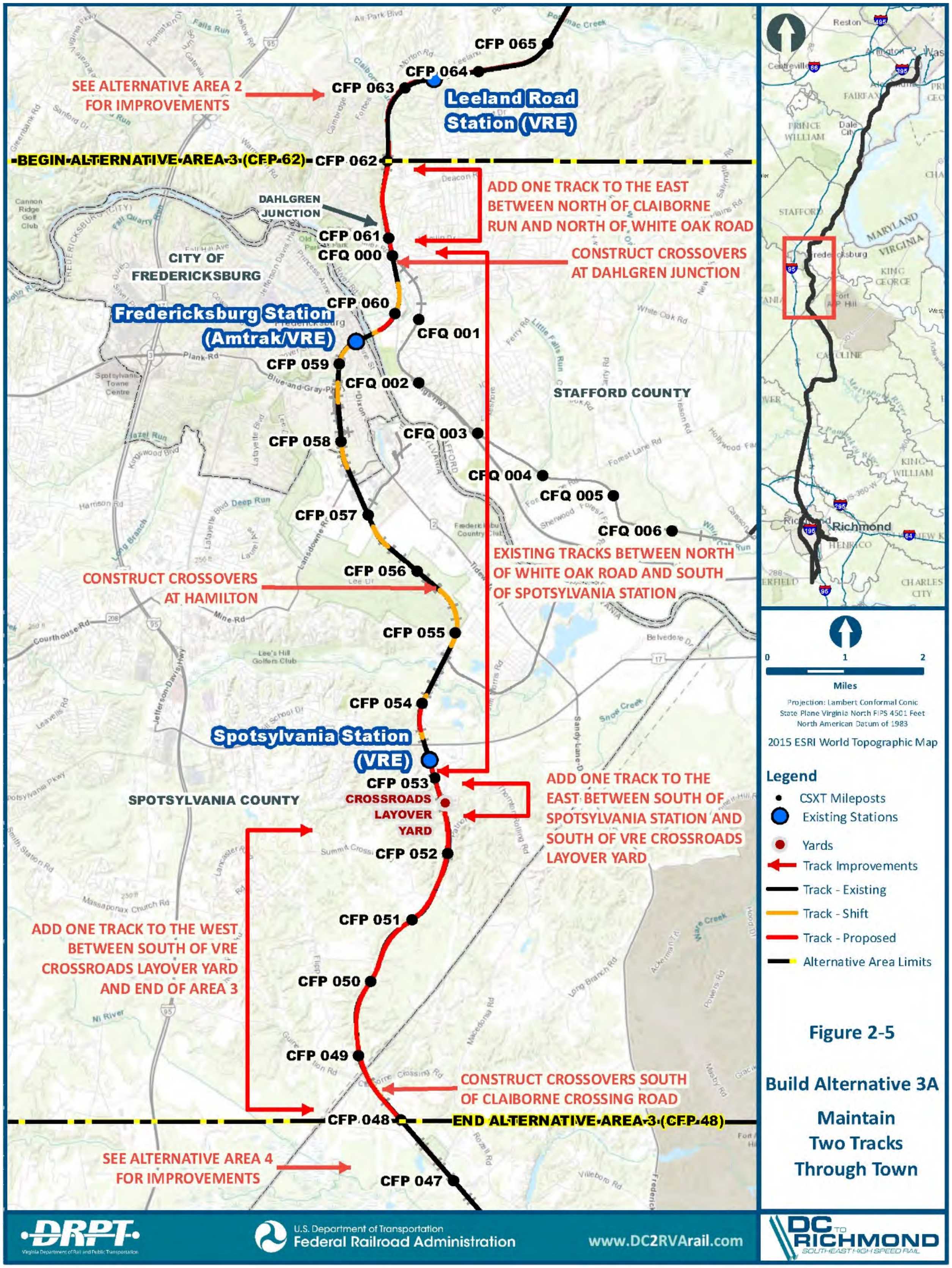
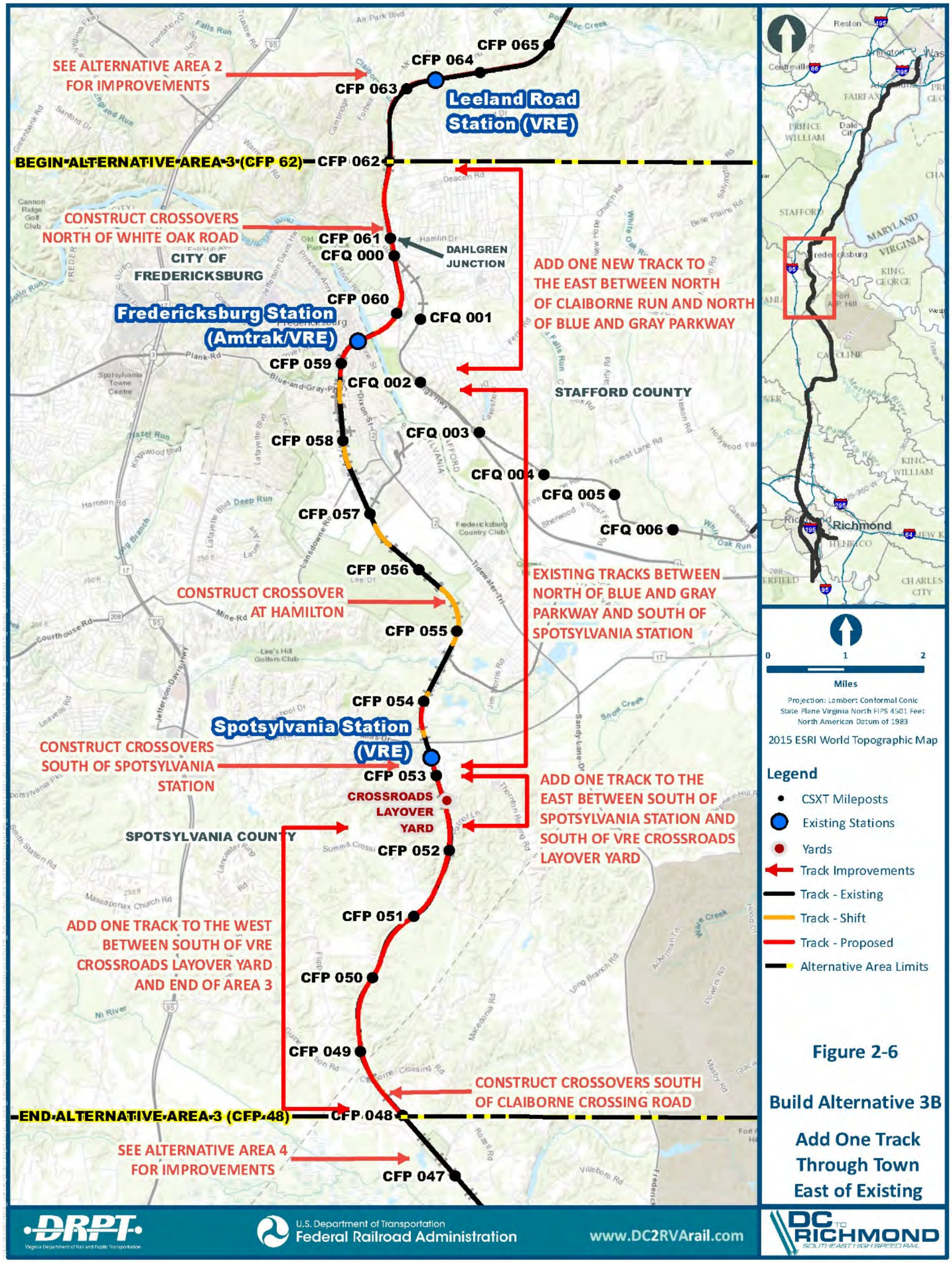
DC TO RICHMOND SOUTHEAST HIGH SPEED RAIL


SEE ALTERNATIVE AREA 2
FOR IMPROVEMENTS
CFP 065
CFP 064
CFP 063
Leeland Road
Station (VRE)
BEGIN ALTERNATIVE AREA 3 (CFP 62)
CFP 062
ADD ONE TRACK TO THE EAST
BETWEEN NORTH OF CLAIBORNE
RUN AND NORTH OF WHITE OAK ROAD
DAHLGREN
JUNCTION
CFP 061
CFQ 000
CONSTRUCT CROSSOVERS
AT DAHLGREN JUNCTION
CITY OF
FREDERICKSBURG
CFP 060
Fredericksburg Station
(Amtrak/VRE)
CFQ 001
CFP 059
CFQ 002
STAFFORD COUNTY
CFP 058
CFQ 003
CFQ 004
CFQ 005
CFP 057
CFQ 006
EXISTING TRACKS BETWEEN NORTH
OF WHITE OAK ROAD AND SOUTH
OF SPOTSYLVANIA STATION
CFP 056
CONSTRUCT CROSSOVERS
AT HAMILTON
CFP 055
CFP 054
Spotsylvania Station
(VRE)
CFP 053
CROSSROADS
LAYOVER
YARD
ADD ONE TRACK TO THE
EAST BETWEEN SOUTH OF
SPOTSYLVANIA STATION AND
SOUTH OF VRE CROSSROADS
LAYOVER YARD
SPOTSYLVANIA COUNTY
CFP 052
CFP 051
ADD ONE TRACK TO THE WEST
BETWEEN SOUTH OF VRE
CROSSROADS LAYOVER YARD
AND END OF AREA 3
CFP 050
CFP 049
CONSTRUCT CROSSOVERS SOUTH
OF CLAIBORNE CROSSING ROAD
CFP 048
END ALTERNATIVE AREA 3 (CFP 48)
SEE ALTERNATIVE AREA 4
FOR IMPROVEMENTS
CFP 047
Richmond
0 1 2
Miles
Projection: Lambert Conformal Conic
State Plane Virginia North FIPS 4501 Feet
North American Datum of 1983
2015 ESRI World Topographic Map
Legend
CSXT Mileposts
Existing Stations
Yards
Track Improvements
Track - Existing
Track - Shift
Track - Proposed
Alternative Area Limits
Figure 2-5
Build Alternative 3A
Maintain
Two Tracks
Through Town
DRPT
U.S. Department of Transportation
Federal Railroad Administration
www.DC2RVArail.com
DC TO RICHMOND
SOUTHEAST HIGH SPEED RAIL


SEE ALTERNATIVE AREA 2 FOR IMPROVEMENTS
CFP 065
CFP 064
CFP 063
Leeland Road Station (VRE)
BEGIN ALTERNATIVE AREA 3 (CFP 62)
CFP 062
CONSTRUCT CROSSOVERS NORTH OF WHITE OAK ROAD
CFP 061
CFQ 000
DAHLGREN JUNCTION
CITY OF FREDERICKSBURG
ADD ONE NEW TRACK TO THE EAST BETWEEN NORTH OF CLAIBORNE RUN AND NORTH OF BLUE AND GRAY PARKWAY
CFP 060
CFQ 001
Fredericksburg Station (Amtrak/VRE)
CFP 059
CFQ 002
STAFFORD COUNTY
CFP 058
CFQ 003
CFQ 004
CFQ 005
CFP 057
CFQ 006
CFP 056
EXISTING TRACKS BETWEEN NORTH OF BLUE AND GRAY PARKWAY AND SOUTH OF SPOTSYLVANIA STATION
CONSTRUCT CROSSOVER AT HAMILTON
CFP 055
CFP 054
Spotsylvania Station (VRE)
CONSTRUCT CROSSOVERS SOUTH OF SPOTSYLVANIA STATION
CFP 053
CROSSROADS LAYOVER YARD
ADD ONE TRACK TO THE EAST BETWEEN SOUTH OF SPOTSYLVANIA STATION AND SOUTH OF VRE CROSSROADS LAYOVER YARD
SPOTSYLVANIA COUNTY
CFP 052
ADD ONE TRACK TO THE WEST BETWEEN SOUTH OF VRE CROSSROADS LAYOVER YARD AND END OF AREA 3
CFP 051
CFP 050
CFP 049
CONSTRUCT CROSSOVERS SOUTH OF CLAIBORNE CROSSING ROAD
END ALTERNATIVE AREA 3 (CFP 48)
CFP 048
SEE ALTERNATIVE AREA 4 FOR IMPROVEMENTS
CFP 047
Richmond
MARYLAND
VIRGINIA
Miles
0
1
2
Projection: Lambert Conformal Conic
State Plane Virginia North FIPS 4501 Feet
North American Datum of 1983
2015 ESRI World Topographic Map
Legend
CSXT Mileposts
Existing Stations
Yards
Track Improvements
Track - Existing
Track - Shift
Track - Proposed
Alternative Area Limits
Figure 2-6
Build Alternative 3B
Add One Track Through Town East of Existing
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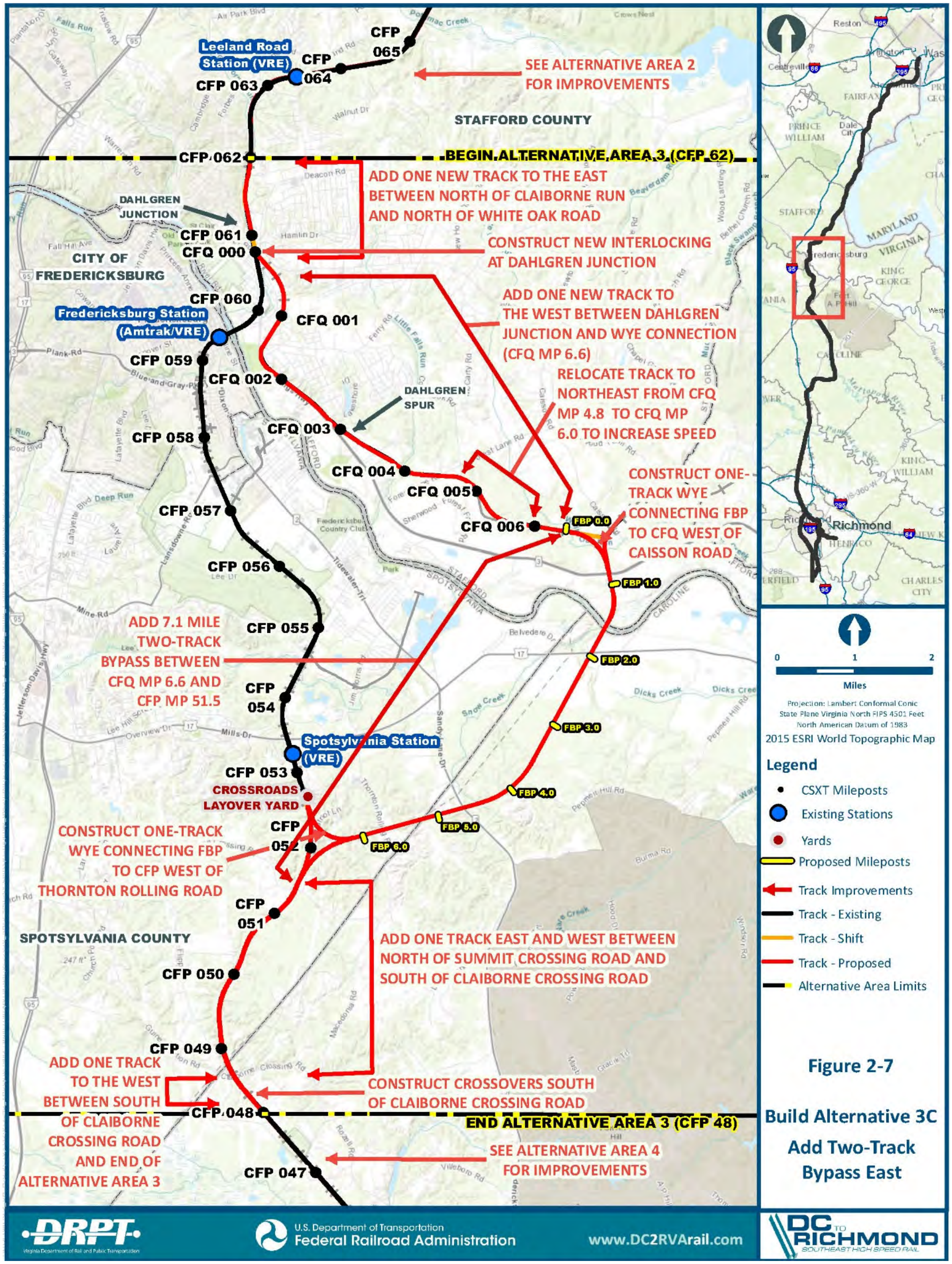

SEE ALTERNATIVE AREA 2 FOR IMPROVEMENTS
Leeland Road Station (VRE)
CFP 065
CFP 064
CFP 063
STAFFORD COUNTY
CFP 062
BEGIN ALTERNATIVE AREA 3 (CFP 62)
ADD ONE NEW TRACK TO THE EAST BETWEEN NORTH OF CLAIBORNE RUN AND NORTH OF WHITE OAK ROAD
DAHLGREN JUNCTION
CFP 061
CFQ 000
CONSTRUCT NEW INTERLOCKING AT DAHLGREN JUNCTION
CITY OF FREDERICKSBURG
CFP 060
Fredericksburg Station (Amtrak/VRE)
CFQ 001
ADD ONE NEW TRACK TO THE WEST BETWEEN DAHLGREN JUNCTION AND WYE CONNECTION (CFQ MP 6.6)
CFP 059
CFQ 002
DAHLGREN SPUR
RELOCATE TRACK TO NORTHEAST FROM CFQ MP 4.8 TO CFQ MP 6.0 TO INCREASE SPEED
CFP 058
CFQ 003
CFQ 004
CFQ 005
CONSTRUCT ONE-TRACK WYE CONNECTING FBP TO CFQ WEST OF CAISSON ROAD
CFP 057
CFQ 006
FBP 0.0
CFP 056
FBP 1.0
ADD 7.1 MILE TWO-TRACK BYPASS BETWEEN CFQ MP 6.6 AND CFP MP 51.5
CFP 055
FBP 2.0
CFP 054
FBP 3.0
Spotsylvania Station (VRE)
CFP 053
CROSSROADS LAYOVER YARD
FBP 4.0
FBP 5.0
FBP 6.0
CONSTRUCT ONE-TRACK WYE CONNECTING FBP TO CFP WEST OF THORNTON ROLLING ROAD
CFP 052
CFP 051
SPOTSYLVANIA COUNTY
ADD ONE TRACK EAST AND WEST BETWEEN NORTH OF SUMMIT CROSSING ROAD AND SOUTH OF CLAIBORNE CROSSING ROAD
CFP 050
CFP 049
ADD ONE TRACK TO THE WEST BETWEEN SOUTH OF CLAIBORNE CROSSING ROAD AND END OF ALTERNATIVE AREA 3
CONSTRUCT CROSSOVERS SOUTH OF CLAIBORNE CROSSING ROAD
CFP 048
END ALTERNATIVE AREA 3 (CFP 48)
SEE ALTERNATIVE AREA 4 FOR IMPROVEMENTS
CFP 047
Miles
0 1 2
Projection: Lambert Conformal Conic
State Plane Virginia North FIPS 4501 Feet
North American Datum of 1983
2015 ESRI World Topographic Map
Legend
CSXT Mileposts
Existing Stations
Yards
Proposed Mileposts
Track Improvements
Track - Existing
Track - Shift
Track - Proposed
Alternative Area Limits
Figure 2-7
Build Alternative 3C
Add Two-Track Bypass East
DRPT
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DC TO RICHMOND SOUTHEAST HIGH SPEED RAIL

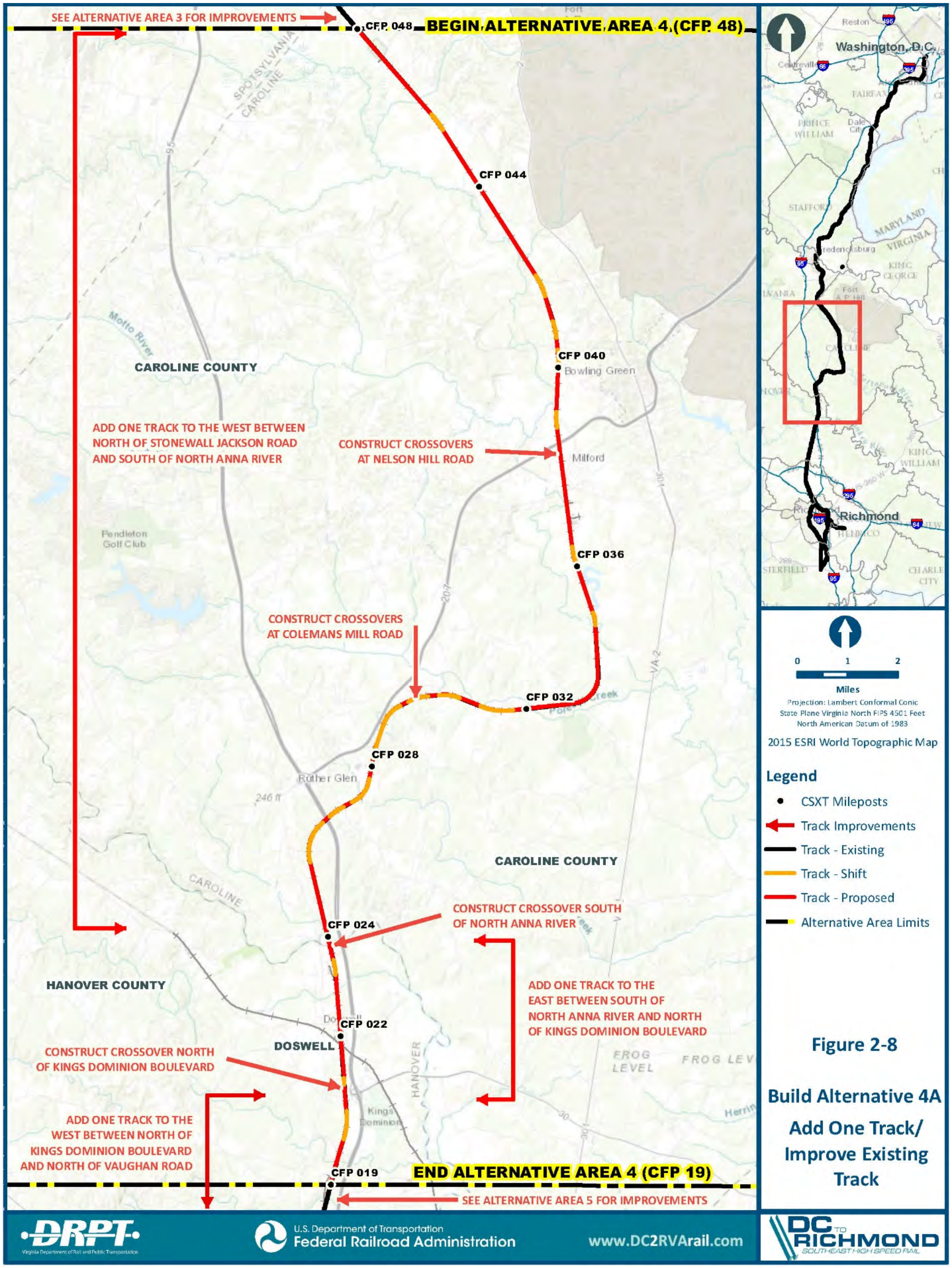


Figure 2-8

Build Alternative 4A

Add One Track/ Improve Existing Track

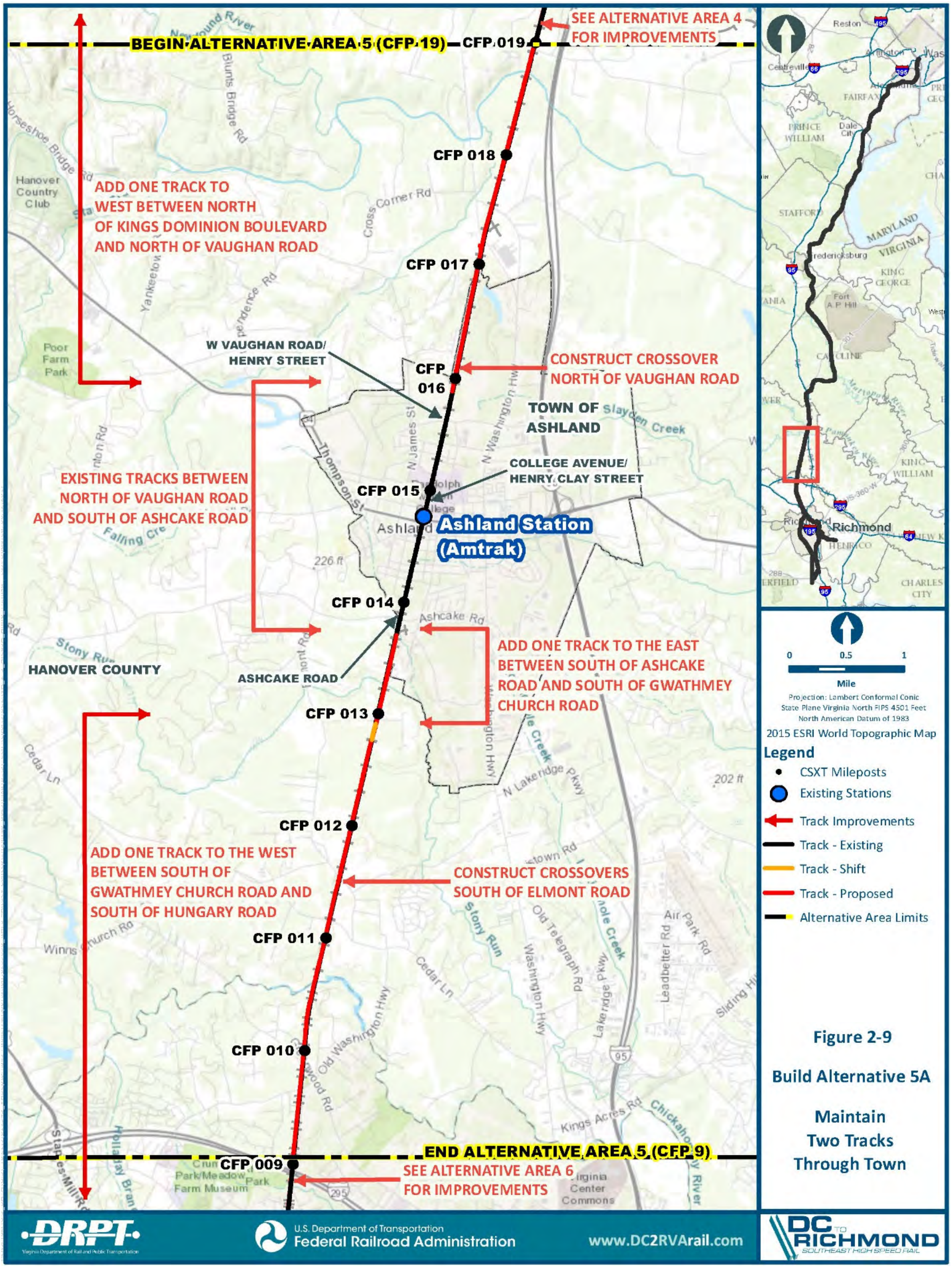
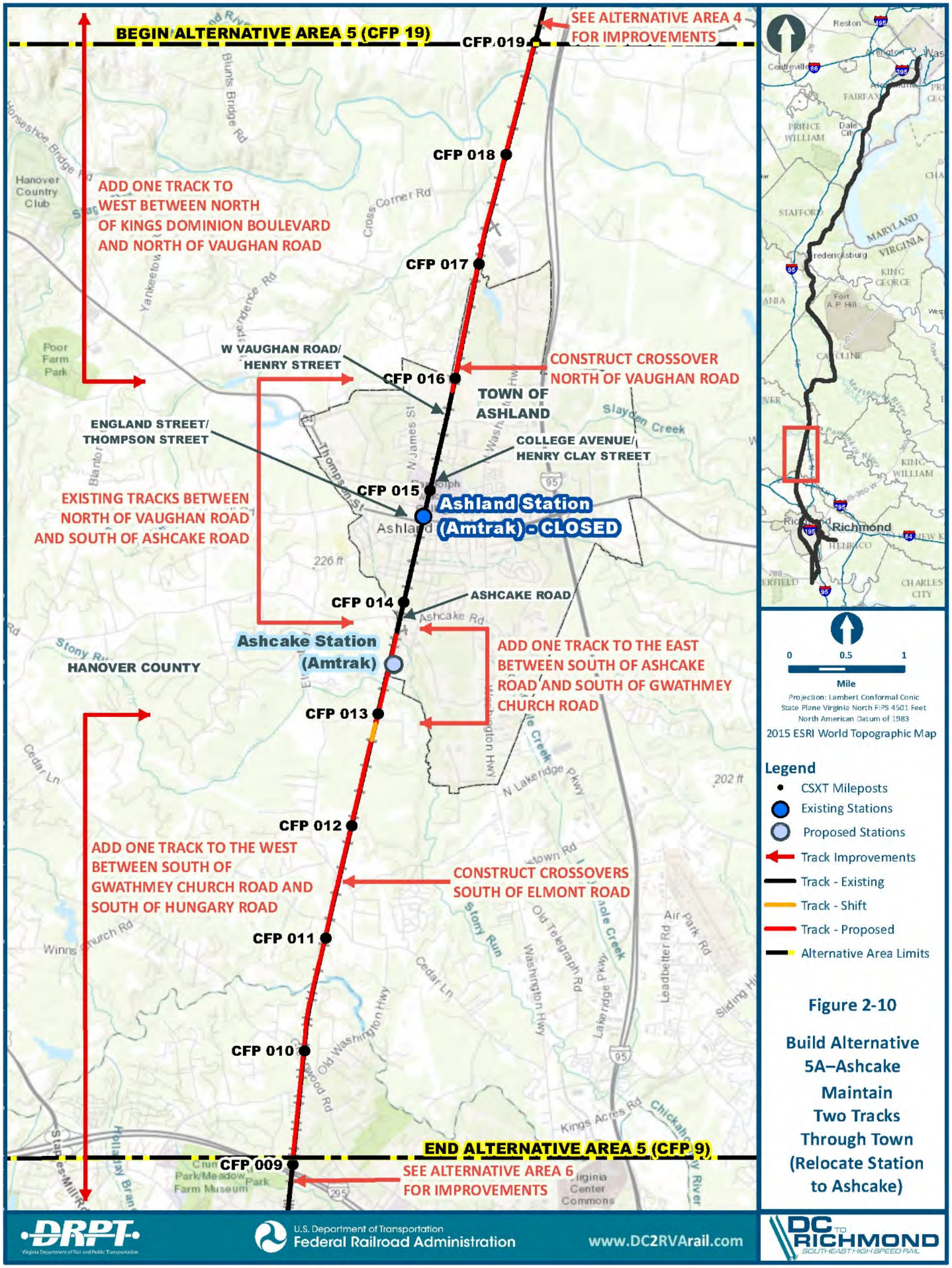


Figure 2-9

Build Alternative 5A

Maintain Two Tracks Through Town



BEGIN ALTERNATIVE AREA 5 (CFP 19)
SEE ALTERNATIVE AREA 4 FOR IMPROVEMENTS
CFP 019
CFP 018
ADD ONE TRACK TO WEST BETWEEN NORTH OF KINGS DOMINION BOULEVARD AND NORTH OF VAUGHAN ROAD
CFP 017
W VAUGHAN ROAD/ HENRY STREET
CFP 016
CONSTRUCT CROSSOVER NORTH OF VAUGHAN ROAD
TOWN OF ASHLAND
ENGLAND STREET/ THOMPSON STREET
COLLEGE AVENUE/ HENRY CLAY STREET
CFP 015
Ashland Station (Amtrak) - CLOSED
EXISTING TRACKS BETWEEN NORTH OF VAUGHAN ROAD AND SOUTH OF ASHCAKE ROAD
CFP 014
ASHCAKE ROAD
Ashcake Station (Amtrak)
HANOVER COUNTY
ADD ONE TRACK TO THE EAST BETWEEN SOUTH OF ASHCAKE ROAD AND SOUTH OF GWATHMEY CHURCH ROAD
CFP 013
CFP 012
ADD ONE TRACK TO THE WEST BETWEEN SOUTH OF GWATHMEY CHURCH ROAD AND SOUTH OF HUNGARY ROAD
CONSTRUCT CROSSOVERS SOUTH OF ELMONT ROAD
CFP 011
CFP 010
END ALTERNATIVE AREA 5 (CFP 9)
CFP 009
SEE ALTERNATIVE AREA 6 FOR IMPROVEMENTS
Richmond
0 0.5 1
Mile
Projection: Lambert Conformal Conic
State Plane Virginia North FIPS 4501 Feet
North American Datum of 1983
2015 ESRI World Topographic Map
Legend
CSXT Mileposts
Existing Stations
Proposed Stations
Track Improvements
Track - Existing
Track - Shift
Track - Proposed
Alternative Area Limits
Figure 2-10
Build Alternative 5A–Ashcake Maintain Two Tracks Through Town (Relocate Station to Ashcake)
DRPT
U.S. Department of Transportation Federal Railroad Administration
www.DC2RVArail.com
DC TO RICHMOND SOUTHEAST HIGH SPEED RAIL

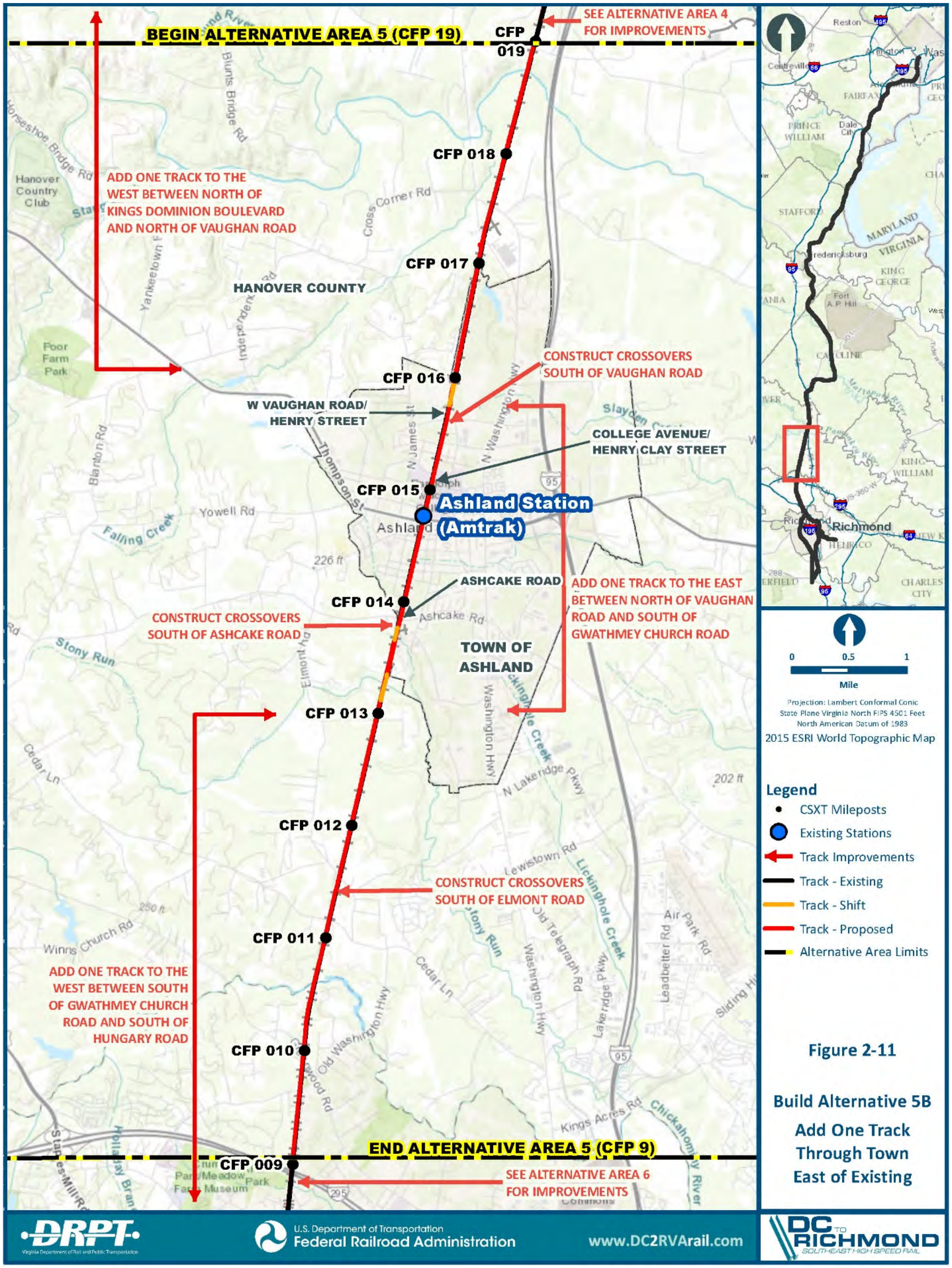


Figure 2-11

Build Alternative 5B
Add One Track Through Town East of Existing

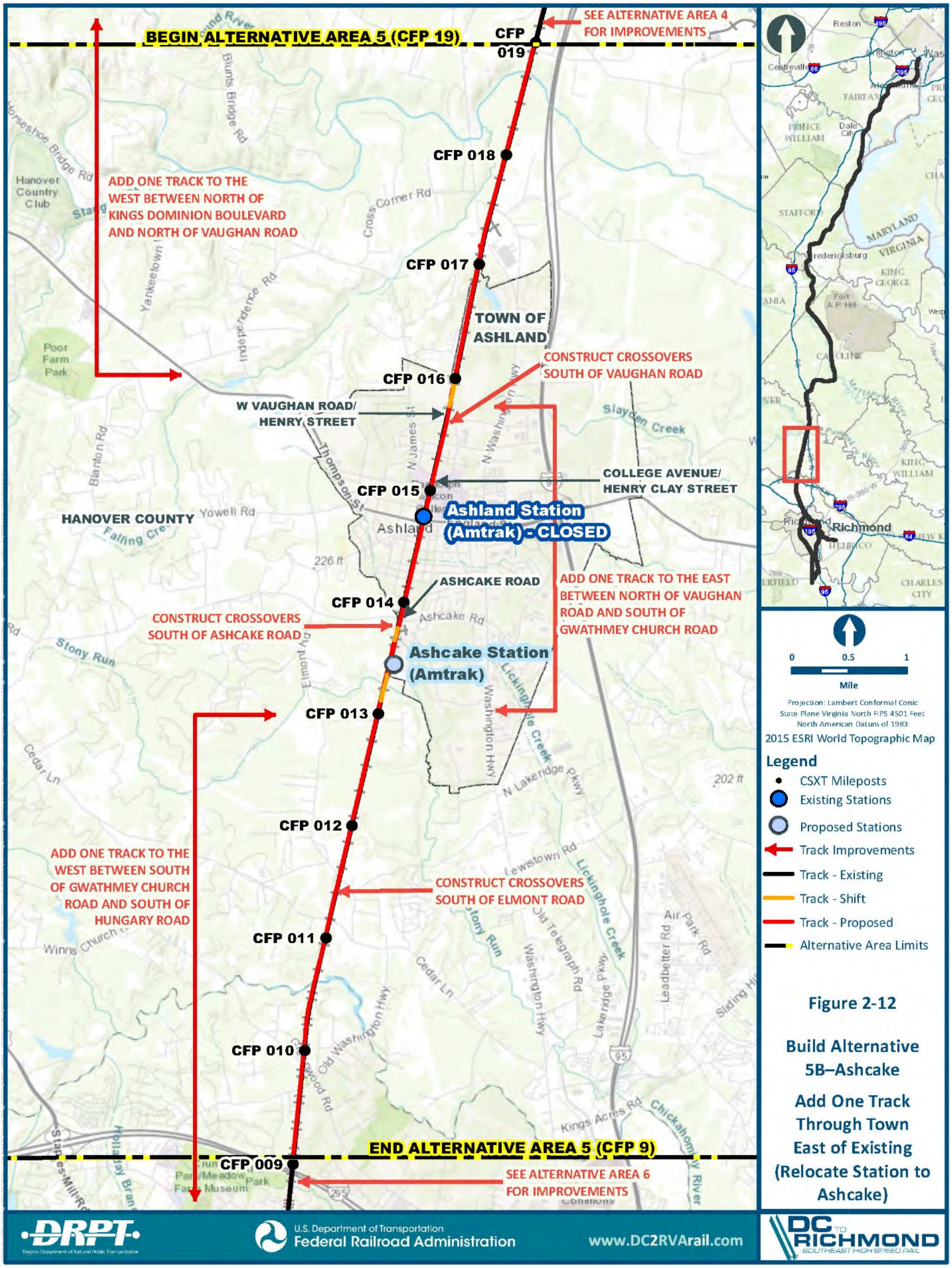


Figure 2-12

Build Alternative 5B–Ashcake

Add One Track Through Town East of Existing (Relocate Station to Ashcake)

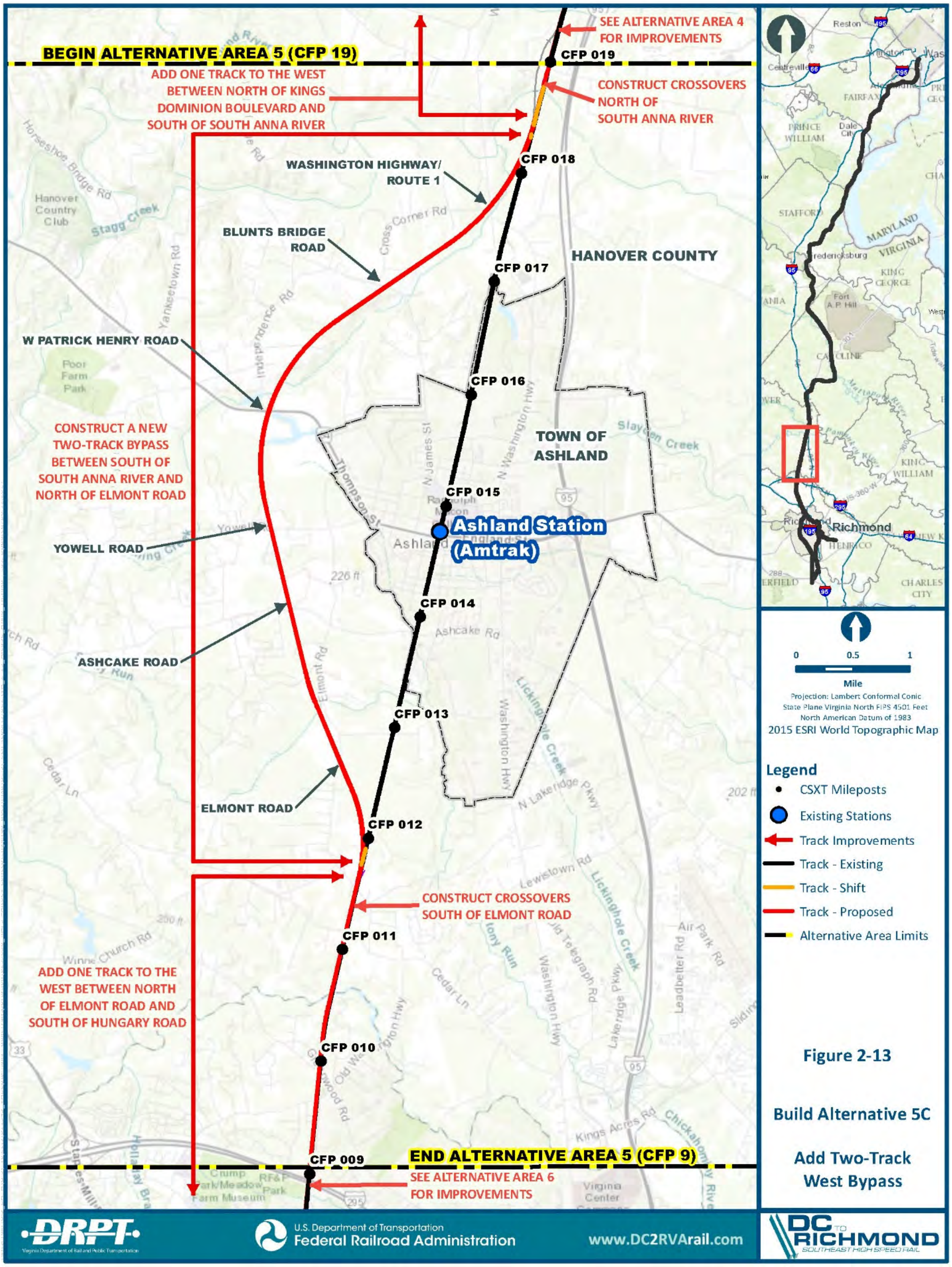


Figure 2-13

Build Alternative 5C

Add Two-Track West Bypass

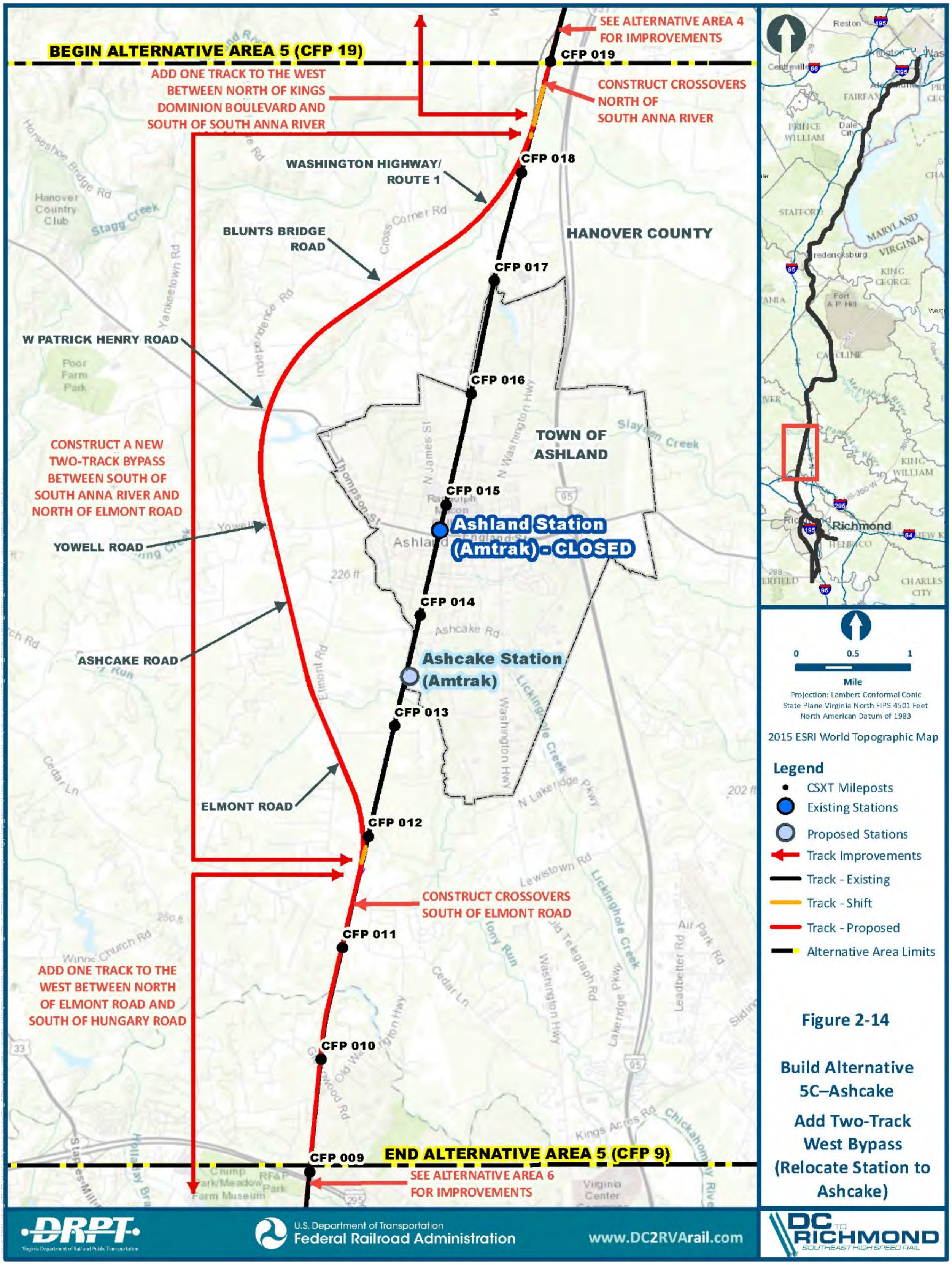


Figure 2-14

Build Alternative 5C–Ashcake

Add Two-Track West Bypass (Relocate Station to Ashcake)

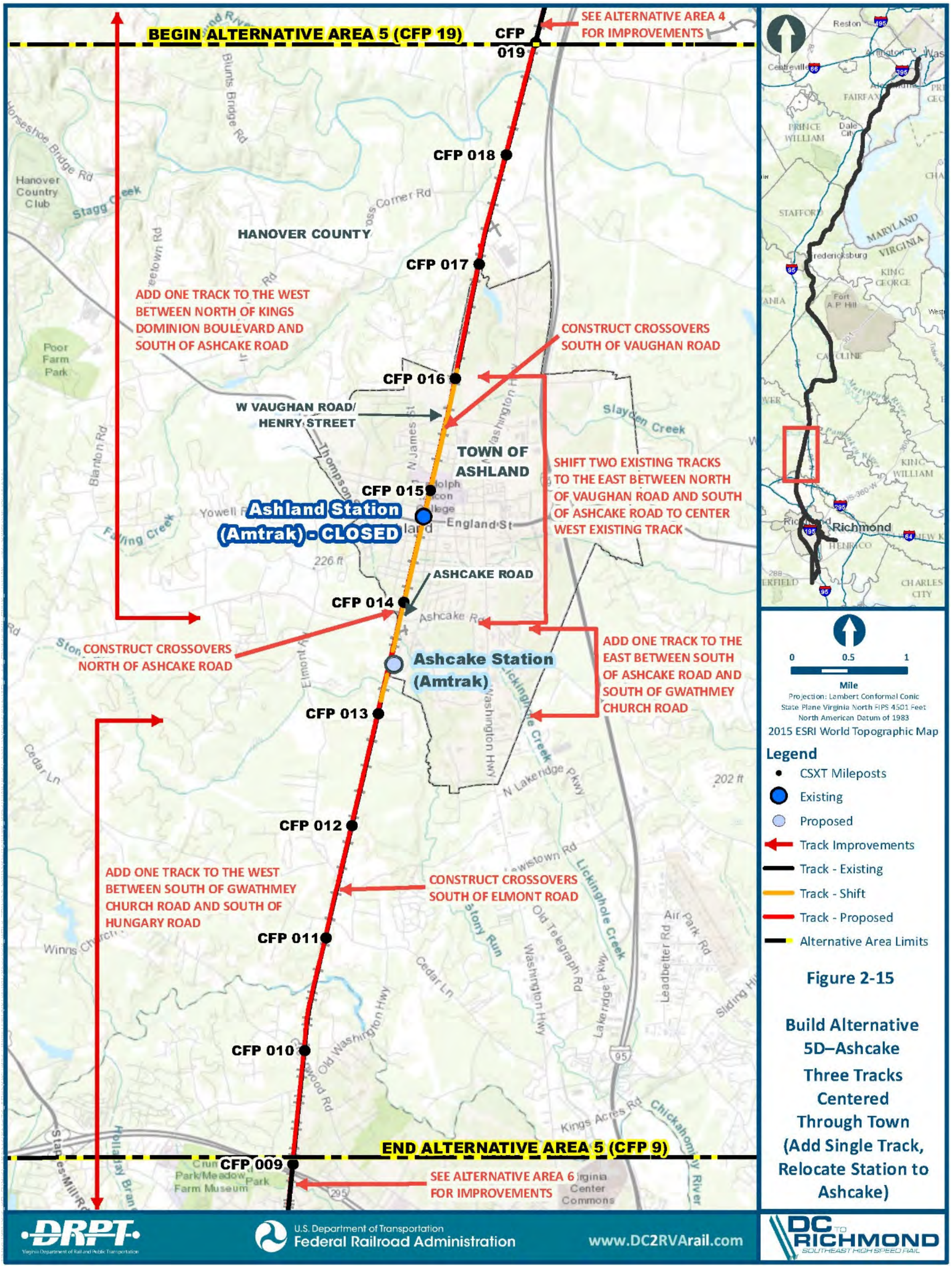
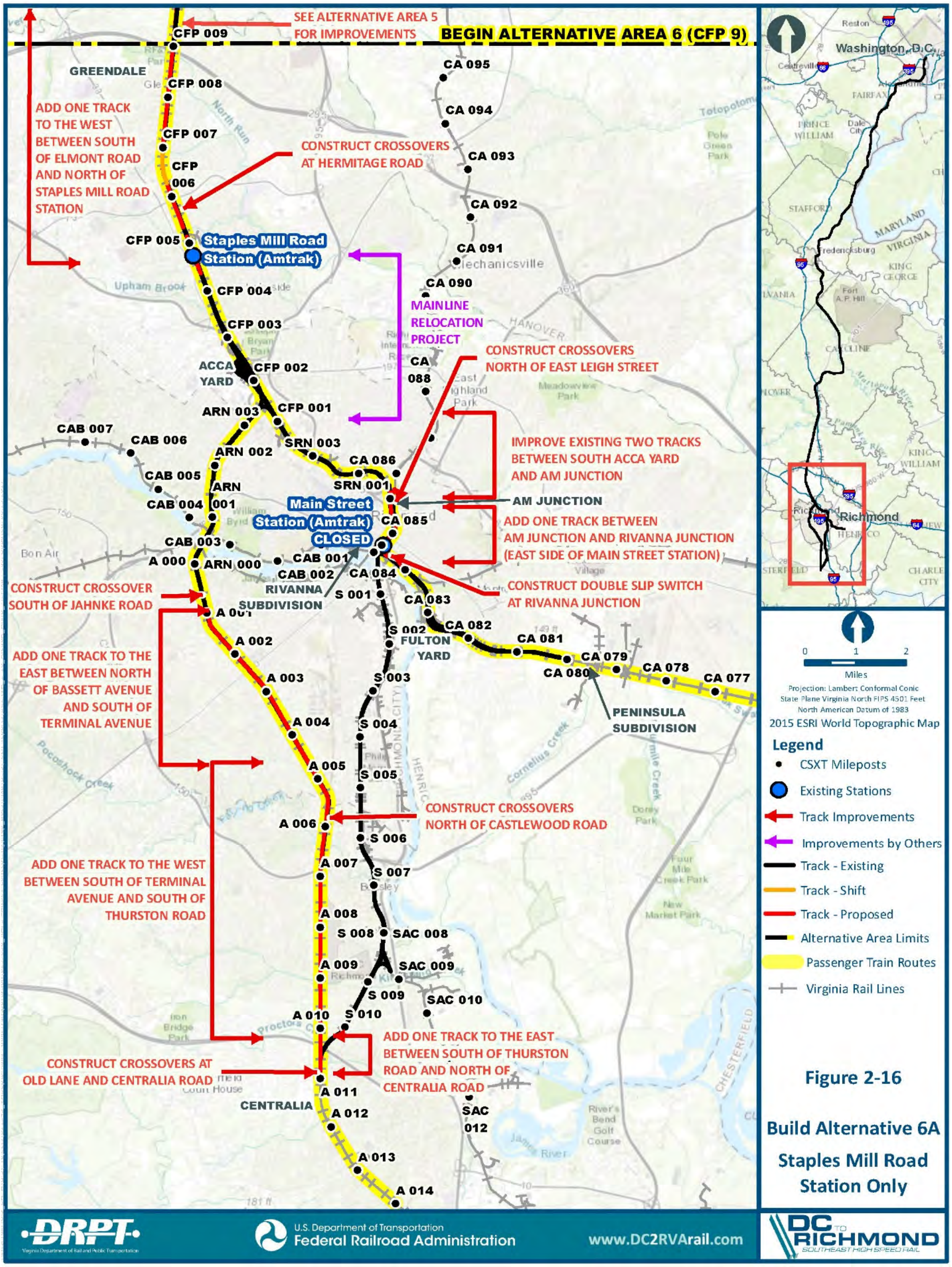


Figure 2-15

Build Alternative 5D–Ashcake

Three Tracks Centered Through Town (Add Single Track, Relocate Station to Ashcake)



SEE ALTERNATIVE AREA 5 FOR IMPROVEMENTS
BEGIN ALTERNATIVE AREA 6 (CFP 9)
ADD ONE TRACK TO THE WEST BETWEEN SOUTH OF ELMONT ROAD AND NORTH OF STAPLES MILL ROAD STATION
CONSTRUCT CROSSOVERS AT HERMITAGE ROAD
Staples Mill Road Station (Amtrak)
MAINLINE RELOCATION PROJECT
CONSTRUCT CROSSOVERS NORTH OF EAST LEIGH STREET
ACCA YARD
IMPROVE EXISTING TWO TRACKS BETWEEN SOUTH ACCA YARD AND AM JUNCTION
AM JUNCTION
Main Street Station (Amtrak) CLOSED
ADD ONE TRACK BETWEEN AM JUNCTION AND RIVANNA JUNCTION (EAST SIDE OF MAIN STREET STATION)
CONSTRUCT DOUBLE SLIP SWITCH AT RIVANNA JUNCTION
RIVANNA SUBDIVISION
CONSTRUCT CROSSOVER SOUTH OF JAHNKE ROAD
FULTON YARD
PENINSULA SUBDIVISION
ADD ONE TRACK TO THE EAST BETWEEN NORTH OF BASSETT AVENUE AND SOUTH OF TERMINAL AVENUE
CONSTRUCT CROSSOVERS NORTH OF CASTLEWOOD ROAD
ADD ONE TRACK TO THE WEST BETWEEN SOUTH OF TERMINAL AVENUE AND SOUTH OF THURSTON ROAD
ADD ONE TRACK TO THE EAST BETWEEN SOUTH OF THURSTON ROAD AND NORTH OF CENTRALIA ROAD
CONSTRUCT CROSSOVERS AT OLD LANE AND CENTRALIA ROAD
GREENDALE
CENTRALIA
Mechanicsville
CFP 009
CFP 008
CFP 007
CFP 006
CFP 005
CFP 004
CFP 003
CFP 002
CFP 001
ARN 003
ARN 002
ARN 001
ARN 000
SRN 003
SRN 001
CAB 007
CAB 006
CAB 005
CAB 004
CAB 003
CAB 002
CAB 001
A 000
A 001
A 002
A 003
A 004
A 005
A 006
A 007
A 008
A 009
A 010
A 011
A 012
A 013
A 014
S 001
S 002
S 003
S 004
S 005
S 006
S 007
S 008
S 009
S 010
SAC 008
SAC 009
SAC 010
SAC 012
CA 095
CA 094
CA 093
CA 092
CA 091
CA 090
CA 088
CA 086
CA 085
CA 084
CA 083
CA 082
CA 081
CA 080
CA 079
CA 078
CA 077
Washington, D.C.
Richmond
Miles
Projection: Lambert Conformal Conic State Plane Virginia North FIPS 4501 Feet North American Datum of 1983
2015 ESRI World Topographic Map
Legend
CSXT Mileposts
Existing Stations
Track Improvements
Improvements by Others
Track - Existing
Track - Shift
Track - Proposed
Alternative Area Limits
Passenger Train Routes
Virginia Rail Lines
Figure 2-16
Build Alternative 6A
Staples Mill Road Station Only
DRPT
U.S. Department of Transportation Federal Railroad Administration
www.DC2RVArail.com
DC TO RICHMOND SOUTHEAST HIGH SPEED RAIL

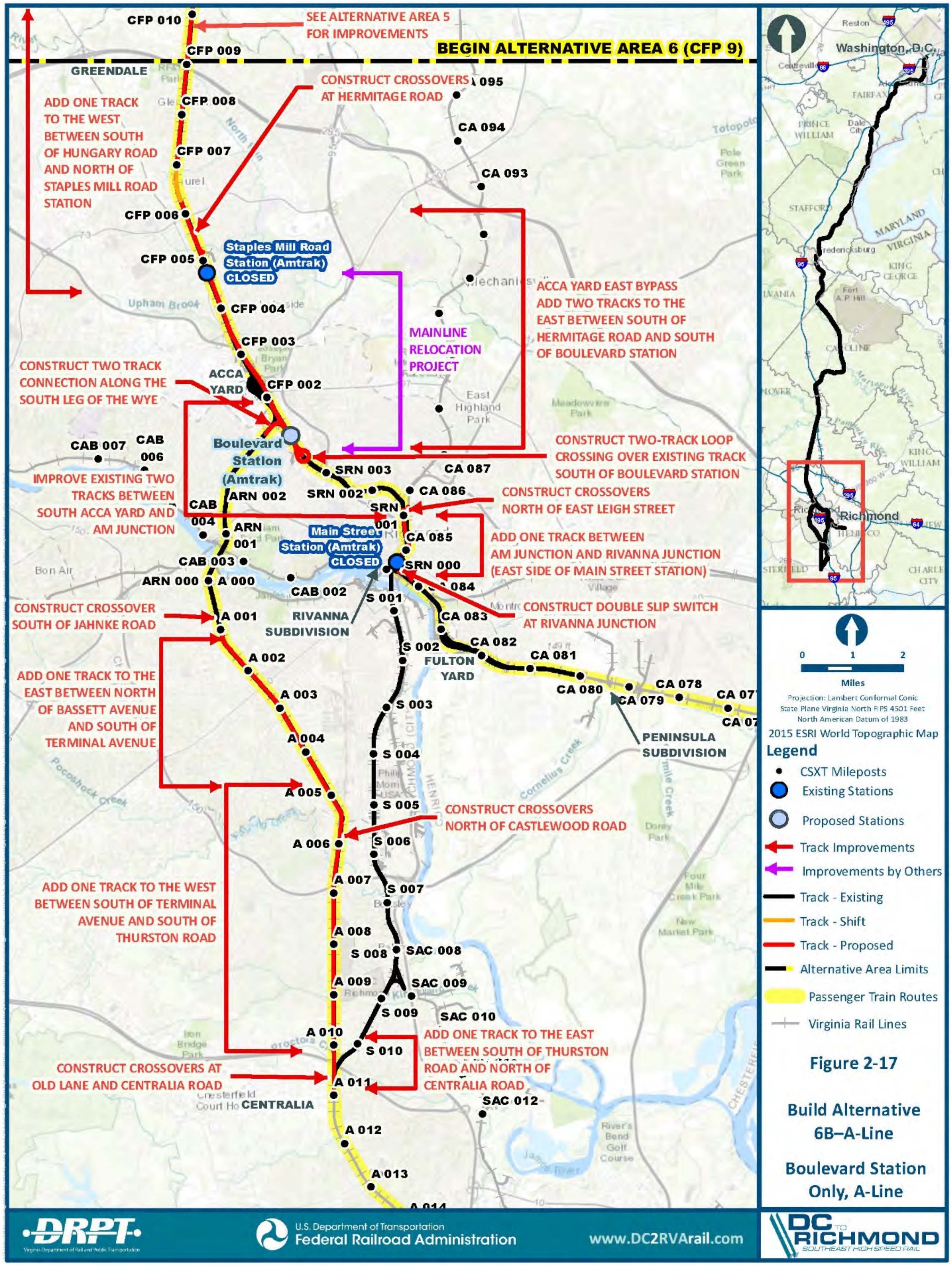
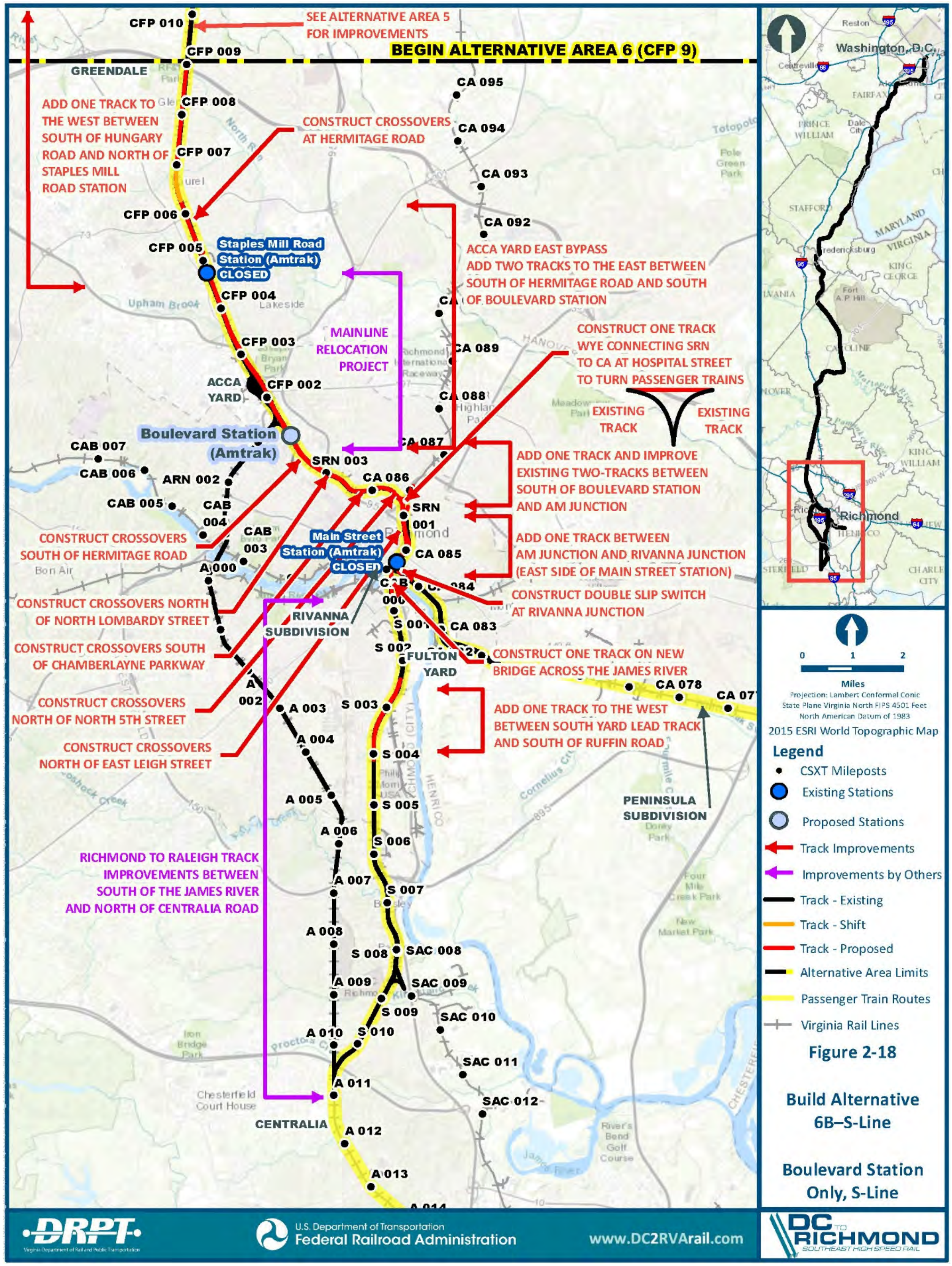
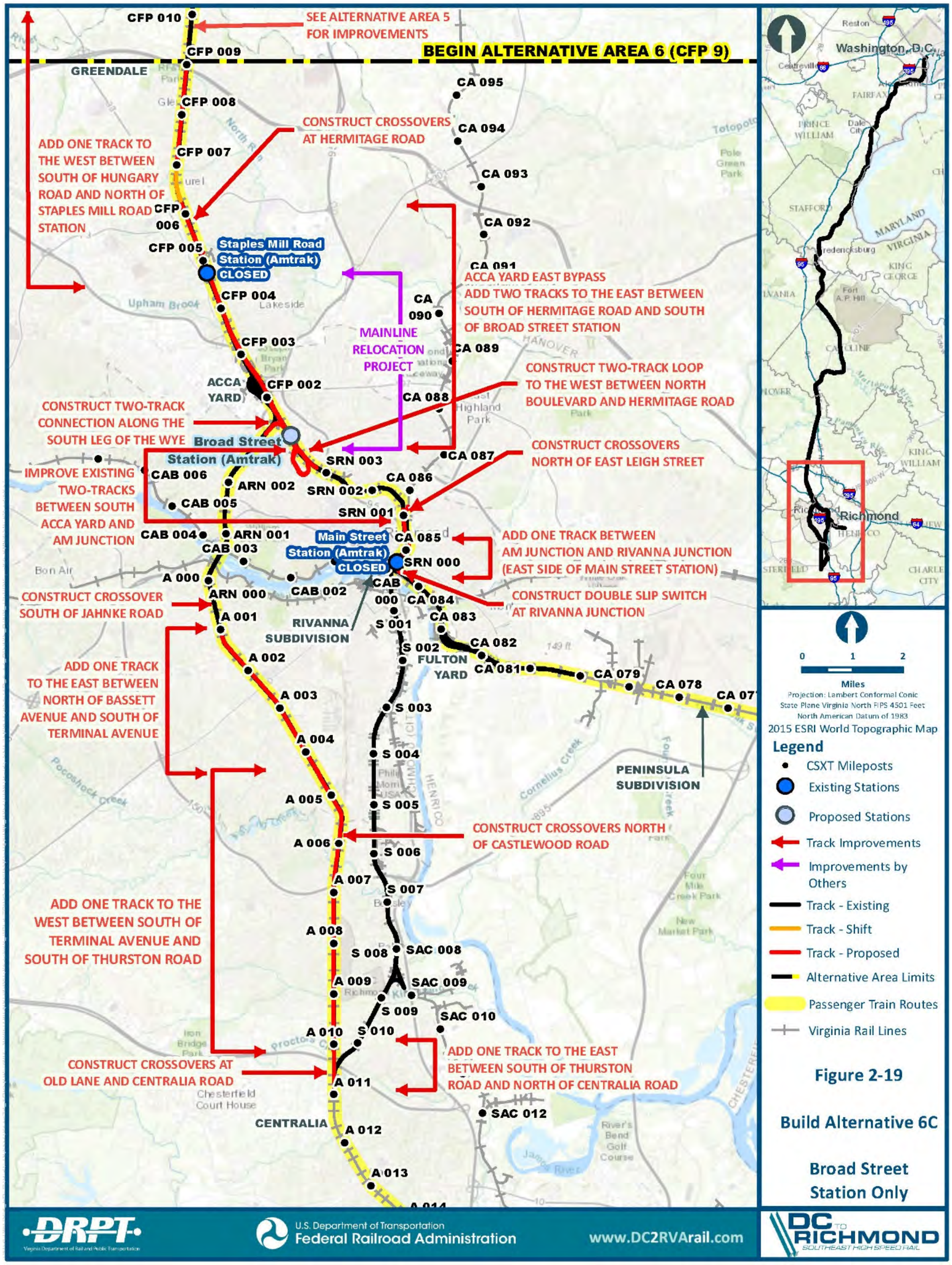
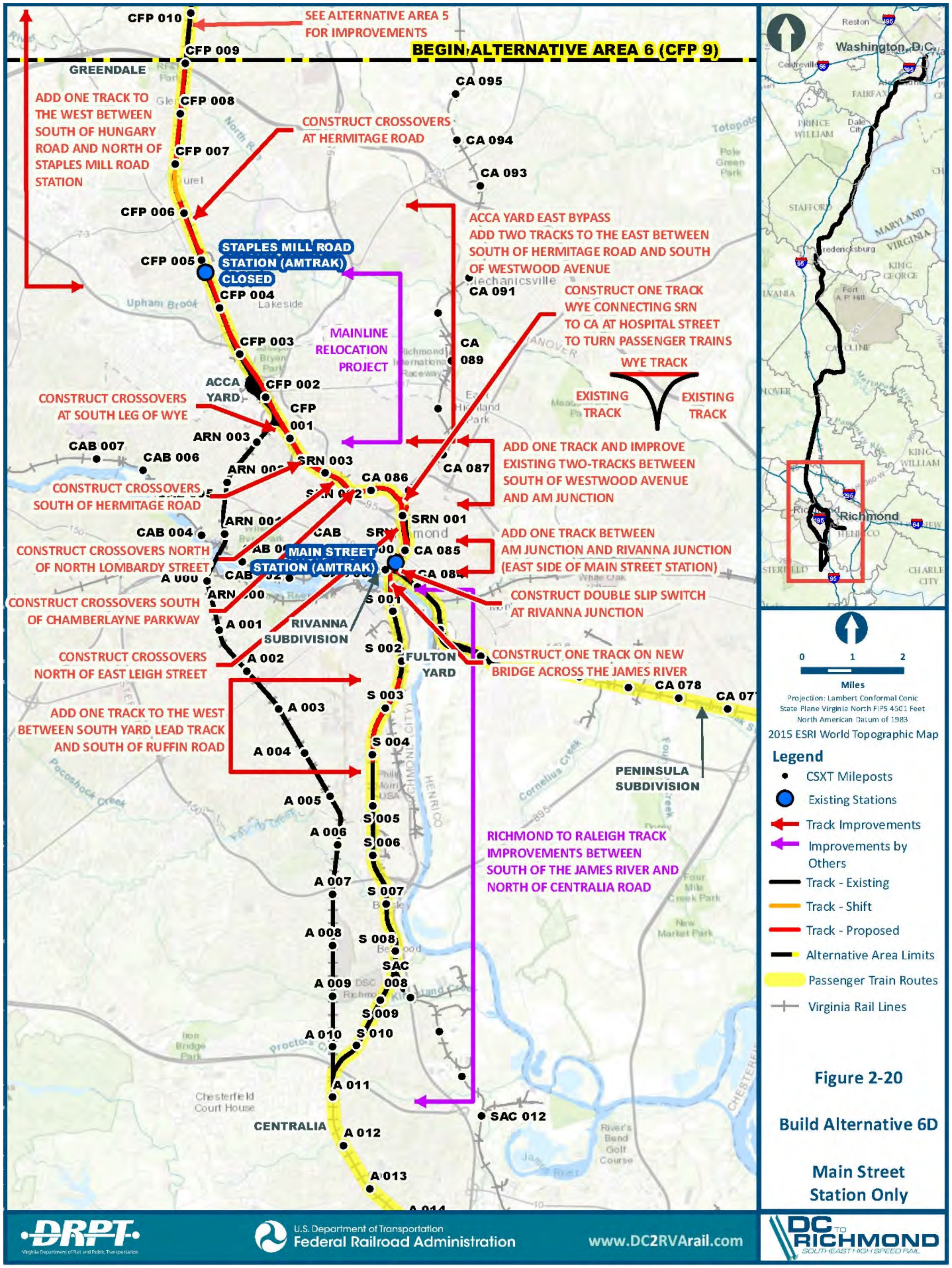


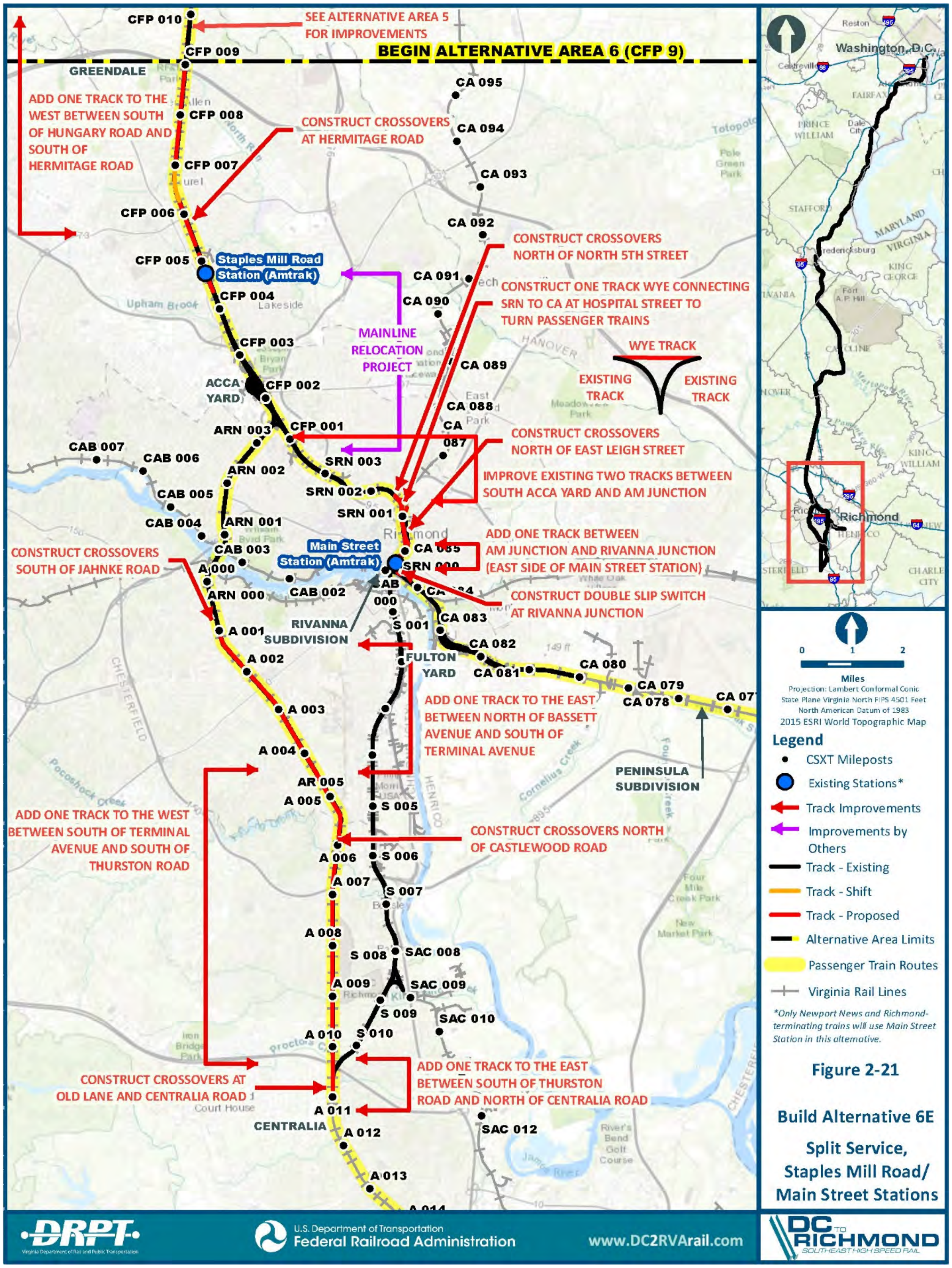
Figure 2-17
Build Alternative 6B–A-Line
Boulevard Station Only, A-Line

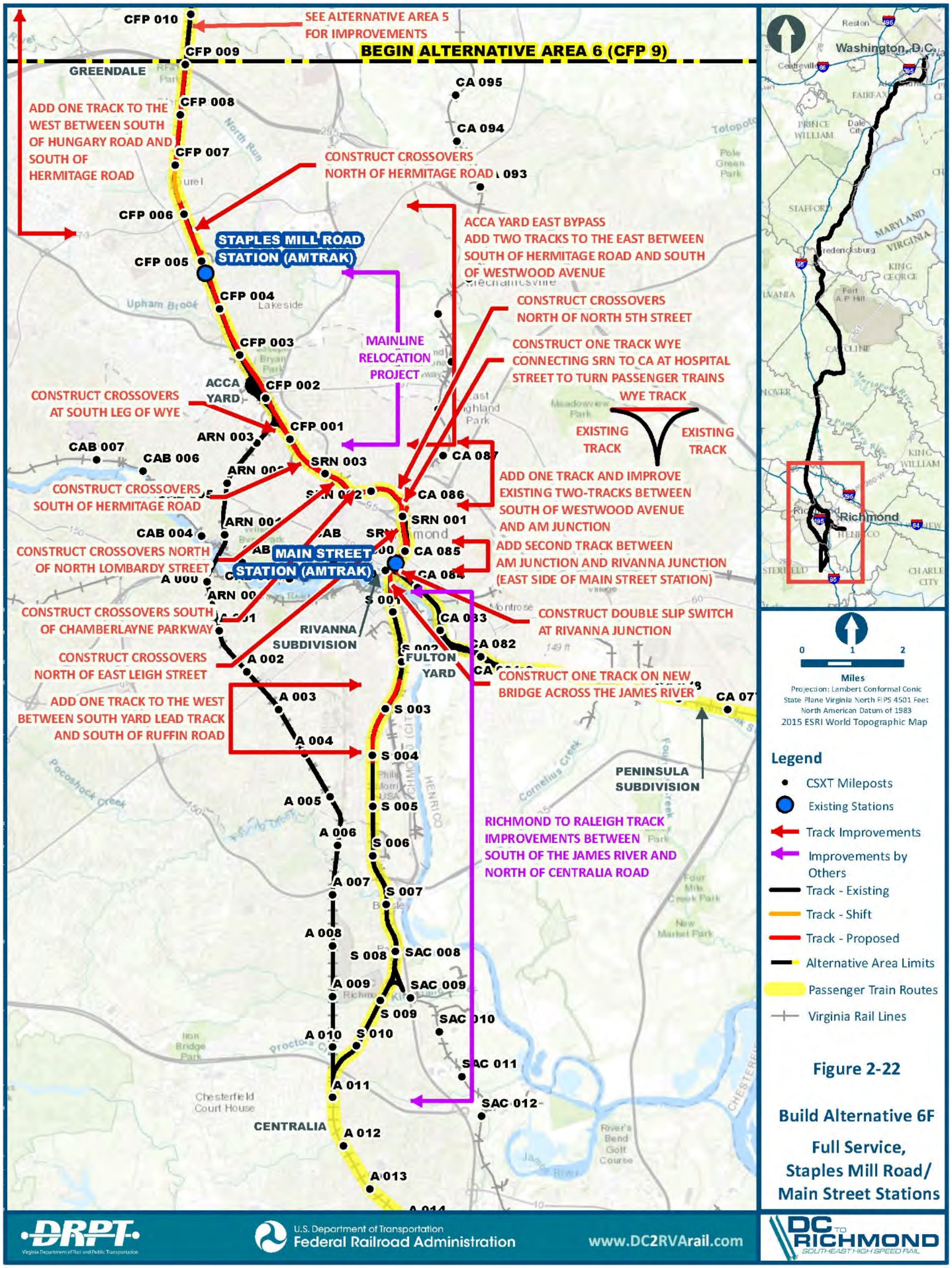


SEE ALTERNATIVE AREA 5 FOR IMPROVEMENTS
BEGIN ALTERNATIVE AREA 6 (CFP 9)
ADD ONE TRACK TO THE WEST BETWEEN SOUTH OF HUNGARY ROAD AND NORTH OF STAPLES MILL ROAD STATION
CONSTRUCT CROSSOVERS AT HERMITAGE ROAD
Staples Mill Road Station (Amtrak) CLOSED
ACCA YARD EAST BYPASS ADD TWO TRACKS TO THE EAST BETWEEN SOUTH OF HERMITAGE ROAD AND SOUTH OF BOULEVARD STATION
MAINLINE RELOCATION PROJECT
CONSTRUCT ONE TRACK WYE CONNECTING SRN TO CA AT HOSPITAL STREET TO TURN PASSENGER TRAINS
EXISTING TRACK
EXISTING TRACK
Boulevard Station (Amtrak)
ACCA YARD
ADD ONE TRACK AND IMPROVE EXISTING TWO-TRACKS BETWEEN SOUTH OF BOULEVARD STATION AND AM JUNCTION
ADD ONE TRACK BETWEEN AM JUNCTION AND RIVANNA JUNCTION (EAST SIDE OF MAIN STREET STATION)
Main Street Station (Amtrak) CLOSED
CONSTRUCT CROSSOVERS SOUTH OF HERMITAGE ROAD
CONSTRUCT DOUBLE SLIP SWITCH AT RIVANNA JUNCTION
CONSTRUCT CROSSOVERS NORTH OF NORTH LOMBARDY STREET
RIVANNA SUBDIVISION
CONSTRUCT CROSSOVERS SOUTH OF CHAMBERLAYNE PARKWAY
CONSTRUCT ONE TRACK ON NEW BRIDGE ACROSS THE JAMES RIVER
FULTON YARD
CONSTRUCT CROSSOVERS NORTH OF NORTH 5TH STREET
ADD ONE TRACK TO THE WEST BETWEEN SOUTH YARD LEAD TRACK AND SOUTH OF RUFFIN ROAD
CONSTRUCT CROSSOVERS NORTH OF EAST LEIGH STREET
PENINSULA SUBDIVISION
RICHMOND TO RALEIGH TRACK IMPROVEMENTS BETWEEN SOUTH OF THE JAMES RIVER AND NORTH OF CENTRALIA ROAD
GREENDALE
CENTRALIA
CFP 010
CFP 009
CFP 008
CFP 007
CFP 006
CFP 005
CFP 004
CFP 003
CFP 002
CA 095
CA 094
CA 093
CA 092
CA 089
CA 088
CA 087
CA 086
CA 085
CA 083
CA 078
SRN 003
SRN 001
CAB 007
CAB 006
CAB 005
CAB 004
CAB 003
ARN 002
A 000
A 002
A 003
A 004
A 005
A 006
A 007
A 008
A 009
A 010
A 011
A 012
A 013
S 002
S 003
S 004
S 005
S 006
S 007
S 008
S 009
S 010
SAC 008
SAC 009
SAC 010
SAC 011
SAC 012
Washington, D.C.
Richmond
0 1 2
Miles
Projection: Lambert Conformal Conic
State Plane Virginia North FIPS 4501 Feet
North American Datum of 1983
2015 ESRI World Topographic Map
Legend
CSXT Mileposts
Existing Stations
Proposed Stations
Track Improvements
Improvements by Others
Track - Existing
Track - Shift
Track - Proposed
Alternative Area Limits
Passenger Train Routes
Virginia Rail Lines
Figure 2-18
Build Alternative 6B–S-Line
Boulevard Station Only, S-Line
U.S. Department of Transportation Federal Railroad Administration
www.DC2RVArail.com
DC TO RICHMOND SOUTHEAST HIGH SPEED RAIL


SEE ALTERNATIVE AREA 5 FOR IMPROVEMENTS
BEGIN ALTERNATIVE AREA 6 (CFP 9)
ADD ONE TRACK TO THE WEST BETWEEN SOUTH OF HUNGARY ROAD AND NORTH OF STAPLES MILL ROAD STATION
CONSTRUCT CROSSOVERS AT HERMITAGE ROAD
Staples Mill Road Station (Amtrak) CLOSED
MAINLINE RELOCATION PROJECT
ACCA YARD EAST BYPASS ADD TWO TRACKS TO THE EAST BETWEEN SOUTH OF HERMITAGE ROAD AND SOUTH OF BROAD STREET STATION
CONSTRUCT TWO-TRACK LOOP TO THE WEST BETWEEN NORTH BOULEVARD AND HERMITAGE ROAD
CONSTRUCT TWO-TRACK CONNECTION ALONG THE SOUTH LEG OF THE WYE
Broad Street Station (Amtrak)
CONSTRUCT CROSSOVERS NORTH OF EAST LEIGH STREET
IMPROVE EXISTING TWO-TRACKS BETWEEN SOUTH ACCA YARD AND AM JUNCTION
Main Street Station (Amtrak) CLOSED
ADD ONE TRACK BETWEEN AM JUNCTION AND RIVANNA JUNCTION (EAST SIDE OF MAIN STREET STATION)
CONSTRUCT DOUBLE SLIP SWITCH AT RIVANNA JUNCTION
CONSTRUCT CROSSOVER SOUTH OF JAHNKE ROAD
RIVANNA SUBDIVISION
FULTON YARD
ADD ONE TRACK TO THE EAST BETWEEN NORTH OF BASSETT AVENUE AND SOUTH OF TERMINAL AVENUE
PENINSULA SUBDIVISION
CONSTRUCT CROSSOVERS NORTH OF CASTLEWOOD ROAD
ADD ONE TRACK TO THE WEST BETWEEN SOUTH OF TERMINAL AVENUE AND SOUTH OF THURSTON ROAD
CONSTRUCT CROSSOVERS AT OLD LANE AND CENTRALIA ROAD
ADD ONE TRACK TO THE EAST BETWEEN SOUTH OF THURSTON ROAD AND NORTH OF CENTRALIA ROAD
GREENDALE
ACCA YARD
CENTRALIA
CFP 010
CFP 009
CFP 008
CFP 007
CFP 006
CFP 005
CFP 004
CFP 003
CFP 002
CA 095
CA 094
CA 093
CA 092
CA 091
CA 090
CA 089
CA 088
CA 087
CA 086
CA 085
CA 084
CA 083
CA 082
CA 081
CA 079
CA 078
SRN 003
SRN 002
SRN 001
SRN 000
CAB 006
CAB 005
CAB 004
CAB 003
CAB 002
CAB 000
ARN 002
ARN 001
ARN 000
A 000
A 001
A 002
A 003
A 004
A 005
A 006
A 007
A 008
A 009
A 010
A 011
A 012
A 013
S 001
S 002
S 003
S 004
S 005
S 006
S 007
S 008
S 009
S 010
SAC 008
SAC 009
SAC 010
SAC 012
Washington, D.C.
Richmond
0 1 2
Miles
Projection: Lambert Conformal Conic
State Plane Virginia North FIPS 4501 Feet
North American Datum of 1983
2015 ESRI World Topographic Map
Legend
CSXT Mileposts
Existing Stations
Proposed Stations
Track Improvements
Improvements by Others
Track - Existing
Track - Shift
Track - Proposed
Alternative Area Limits
Passenger Train Routes
Virginia Rail Lines
Figure 2-19
Build Alternative 6C
Broad Street Station Only
DRPT Virginia Department of Rail and Public Transportation
U.S. Department of Transportation Federal Railroad Administration
www.DC2RVArail.com
DC TO RICHMOND SOUTHEAST HIGH SPEED RAIL


SEE ALTERNATIVE AREA 5 FOR IMPROVEMENTS
BEGIN ALTERNATIVE AREA 6 (CFP 9)
GREENDALE
ADD ONE TRACK TO THE WEST BETWEEN SOUTH OF HUNGARY ROAD AND NORTH OF STAPLES MILL ROAD STATION
CONSTRUCT CROSSOVERS AT HERMITAGE ROAD
ACCA YARD EAST BYPASS ADD TWO TRACKS TO THE EAST BETWEEN SOUTH OF HERMITAGE ROAD AND SOUTH OF WESTWOOD AVENUE
STAPLES MILL ROAD STATION (AMTRAK) CLOSED
CONSTRUCT ONE TRACK WYE CONNECTING SRN TO CA AT HOSPITAL STREET TO TURN PASSENGER TRAINS
MAINLINE RELOCATION PROJECT
WYE TRACK
EXISTING TRACK
EXISTING TRACK
ACCA YARD
CONSTRUCT CROSSOVERS AT SOUTH LEG OF WYE
ADD ONE TRACK AND IMPROVE EXISTING TWO-TRACKS BETWEEN SOUTH OF WESTWOOD AVENUE AND AM JUNCTION
CONSTRUCT CROSSOVERS SOUTH OF HERMITAGE ROAD
ADD ONE TRACK BETWEEN AM JUNCTION AND RIVANNA JUNCTION (EAST SIDE OF MAIN STREET STATION)
CONSTRUCT CROSSOVERS NORTH OF NORTH LOMBARDY STREET
MAIN STREET STATION (AMTRAK)
CONSTRUCT DOUBLE SLIP SWITCH AT RIVANNA JUNCTION
CONSTRUCT CROSSOVERS SOUTH OF CHAMBERLAYNE PARKWAY
RIVANNA SUBDIVISION
CONSTRUCT ONE TRACK ON NEW BRIDGE ACROSS THE JAMES RIVER
CONSTRUCT CROSSOVERS NORTH OF EAST LEIGH STREET
FULTON YARD
ADD ONE TRACK TO THE WEST BETWEEN SOUTH YARD LEAD TRACK AND SOUTH OF RUFFIN ROAD
PENINSULA SUBDIVISION
RICHMOND TO RALEIGH TRACK IMPROVEMENTS BETWEEN SOUTH OF THE JAMES RIVER AND NORTH OF CENTRALIA ROAD
CENTRALIA
CFP 010
CFP 009
CFP 008
CFP 007
CFP 006
CFP 005
CFP 004
CFP 003
CFP 002
CFP 001
CA 095
CA 094
CA 093
CA 091
CA 089
CA 087
CA 086
CA 085
CA 078
SRN 003
SRN 001
ARN 003
CAB 007
CAB 006
CAB 004
A 001
A 002
A 003
A 004
A 005
A 006
A 007
A 008
A 009
A 010
A 011
A 012
A 013
S 001
S 002
S 003
S 004
S 005
S 006
S 007
S 008
SAC 008
S 009
S 010
SAC 012
Washington, D.C.
Richmond
0 1 2
Miles
Projection: Lambert Conformal Conic
State Plane Virginia North FIPS 4501 Feet
North American Datum of 1983
2015 ESRI World Topographic Map
Legend
CSXT Mileposts
Existing Stations
Track Improvements
Improvements by Others
Track - Existing
Track - Shift
Track - Proposed
Alternative Area Limits
Passenger Train Routes
Virginia Rail Lines
Figure 2-20
Build Alternative 6D
Main Street Station Only
DRPT
U.S. Department of Transportation Federal Railroad Administration
www.DC2RVArail.com
DC TO RICHMOND SOUTHEAST HIGH SPEED RAIL


SEE ALTERNATIVE AREA 5 FOR IMPROVEMENTS
BEGIN ALTERNATIVE AREA 6 (CFP 9)
ADD ONE TRACK TO THE WEST BETWEEN SOUTH OF HUNGARY ROAD AND SOUTH OF HERMITAGE ROAD
CONSTRUCT CROSSOVERS AT HERMITAGE ROAD
CONSTRUCT CROSSOVERS NORTH OF NORTH 5TH STREET
CONSTRUCT ONE TRACK WYE CONNECTING SRN TO CA AT HOSPITAL STREET TO TURN PASSENGER TRAINS
MAINLINE RELOCATION PROJECT
WYE TRACK
EXISTING TRACK
EXISTING TRACK
CONSTRUCT CROSSOVERS NORTH OF EAST LEIGH STREET
IMPROVE EXISTING TWO TRACKS BETWEEN SOUTH ACCA YARD AND AM JUNCTION
ADD ONE TRACK BETWEEN AM JUNCTION AND RIVANNA JUNCTION (EAST SIDE OF MAIN STREET STATION)
CONSTRUCT DOUBLE SLIP SWITCH AT RIVANNA JUNCTION
CONSTRUCT CROSSOVERS SOUTH OF JAHNKE ROAD
Staples Mill Road Station (Amtrak)
Main Street Station (Amtrak)
ACCA YARD
RIVANNA SUBDIVISION
FULTON YARD
PENINSULA SUBDIVISION
CENTRALIA
GREENDALE
ADD ONE TRACK TO THE EAST BETWEEN NORTH OF BASSETT AVENUE AND SOUTH OF TERMINAL AVENUE
ADD ONE TRACK TO THE WEST BETWEEN SOUTH OF TERMINAL AVENUE AND SOUTH OF THURSTON ROAD
CONSTRUCT CROSSOVERS NORTH OF CASTLEWOOD ROAD
ADD ONE TRACK TO THE EAST BETWEEN SOUTH OF THURSTON ROAD AND NORTH OF CENTRALIA ROAD
CONSTRUCT CROSSOVERS AT OLD LANE AND CENTRALIA ROAD
CFP 010
CFP 009
CFP 008
CFP 007
CFP 006
CFP 005
CFP 004
CFP 003
CFP 002
CFP 001
CA 095
CA 094
CA 093
CA 092
CA 091
CA 090
CA 089
CA 088
CA 087
CA 083
CA 082
CA 081
CA 080
CA 079
CA 078
ARN 003
ARN 002
ARN 001
ARN 000
SRN 003
SRN 002
SRN 001
CAB 007
CAB 006
CAB 005
CAB 004
CAB 003
CAB 002
A 000
A 001
A 002
A 003
A 004
AR 005
A 005
A 006
A 007
A 008
A 009
A 010
A 011
A 012
A 013
S 001
S 005
S 006
S 007
S 008
S 009
S 010
SAC 008
SAC 009
SAC 010
SAC 012
Washington, D.C.
Richmond
Miles
0 1 2
Projection: Lambert Conformal Conic
State Plane Virginia North FIPS 4501 Feet
North American Datum of 1983
2015 ESRI World Topographic Map
Legend
CSXT Mileposts
Existing Stations*
Track Improvements
Improvements by Others
Track - Existing
Track - Shift
Track - Proposed
Alternative Area Limits
Passenger Train Routes
Virginia Rail Lines
*Only Newport News and Richmond-terminating trains will use Main Street Station in this alternative.
Figure 2-21
Build Alternative 6E
Split Service, Staples Mill Road/ Main Street Stations
DRPT
U.S. Department of Transportation Federal Railroad Administration
www.DC2RVArail.com
DC to RICHMOND SOUTHEAST HIGH SPEED RAIL


BEGIN ALTERNATIVE AREA 6 (CFP 9)
SEE ALTERNATIVE AREA 5 FOR IMPROVEMENTS
ADD ONE TRACK TO THE WEST BETWEEN SOUTH OF HUNGARY ROAD AND SOUTH OF HERMITAGE ROAD
CONSTRUCT CROSSOVERS NORTH OF HERMITAGE ROAD
STAPLES MILL ROAD STATION (AMTRAK)
ACCA YARD EAST BYPASS ADD TWO TRACKS TO THE EAST BETWEEN SOUTH OF HERMITAGE ROAD AND SOUTH OF WESTWOOD AVENUE
CONSTRUCT CROSSOVERS NORTH OF NORTH 5TH STREET
CONSTRUCT ONE TRACK WYE CONNECTING SRN TO CA AT HOSPITAL STREET TO TURN PASSENGER TRAINS
WYE TRACK
EXISTING TRACK
EXISTING TRACK
MAINLINE RELOCATION PROJECT
CONSTRUCT CROSSOVERS AT SOUTH LEG OF WYE
ACCA YARD
CONSTRUCT CROSSOVERS SOUTH OF HERMITAGE ROAD
ADD ONE TRACK AND IMPROVE EXISTING TWO-TRACKS BETWEEN SOUTH OF WESTWOOD AVENUE AND AM JUNCTION
CONSTRUCT CROSSOVERS NORTH OF NORTH LOMBARDY STREET
MAIN STREET STATION (AMTRAK)
ADD SECOND TRACK BETWEEN AM JUNCTION AND RIVANNA JUNCTION (EAST SIDE OF MAIN STREET STATION)
CONSTRUCT CROSSOVERS SOUTH OF CHAMBERLAYNE PARKWAY
RIVANNA SUBDIVISION
CONSTRUCT DOUBLE SLIP SWITCH AT RIVANNA JUNCTION
CONSTRUCT CROSSOVERS NORTH OF EAST LEIGH STREET
FULTON YARD
CONSTRUCT ONE TRACK ON NEW BRIDGE ACROSS THE JAMES RIVER
ADD ONE TRACK TO THE WEST BETWEEN SOUTH YARD LEAD TRACK AND SOUTH OF RUFFIN ROAD
PENINSULA SUBDIVISION
RICHMOND TO RALEIGH TRACK IMPROVEMENTS BETWEEN SOUTH OF THE JAMES RIVER AND NORTH OF CENTRALIA ROAD
GREENDALE
CENTRALIA
CFP 010
CFP 009
CFP 008
CFP 007
CFP 006
CFP 005
CFP 004
CFP 003
CFP 002
CFP 001
CA 095
CA 094
SRN 003
SRN 001
CA 086
CA 085
CA 084
CA 083
CA 082
CAB 007
CAB 006
CAB 004
ARN 003
S 001
S 003
S 004
S 005
S 006
S 007
S 008
S 009
S 010
SAC 008
SAC 009
SAC 010
SAC 011
SAC 012
A 002
A 003
A 004
A 005
A 006
A 007
A 008
A 009
A 010
A 011
A 012
A 013
Washington, D.C.
Richmond
0 1 2
Miles
Projection: Lambert Conformal Conic
State Plane Virginia North FIPS 4501 Feet
North American Datum of 1983
2015 ESRI World Topographic Map
Legend
CSXT Mileposts
Existing Stations
Track Improvements
Improvements by Others
Track - Existing
Track - Shift
Track - Proposed
Alternative Area Limits
Passenger Train Routes
Virginia Rail Lines
Figure 2-22
Build Alternative 6F
Full Service, Staples Mill Road/ Main Street Stations
DRPT
U.S. Department of Transportation Federal Railroad Administration
www.DC2RVArail.com
DC TO RICHMOND SOUTHEAST HIGH SPEED RAIL

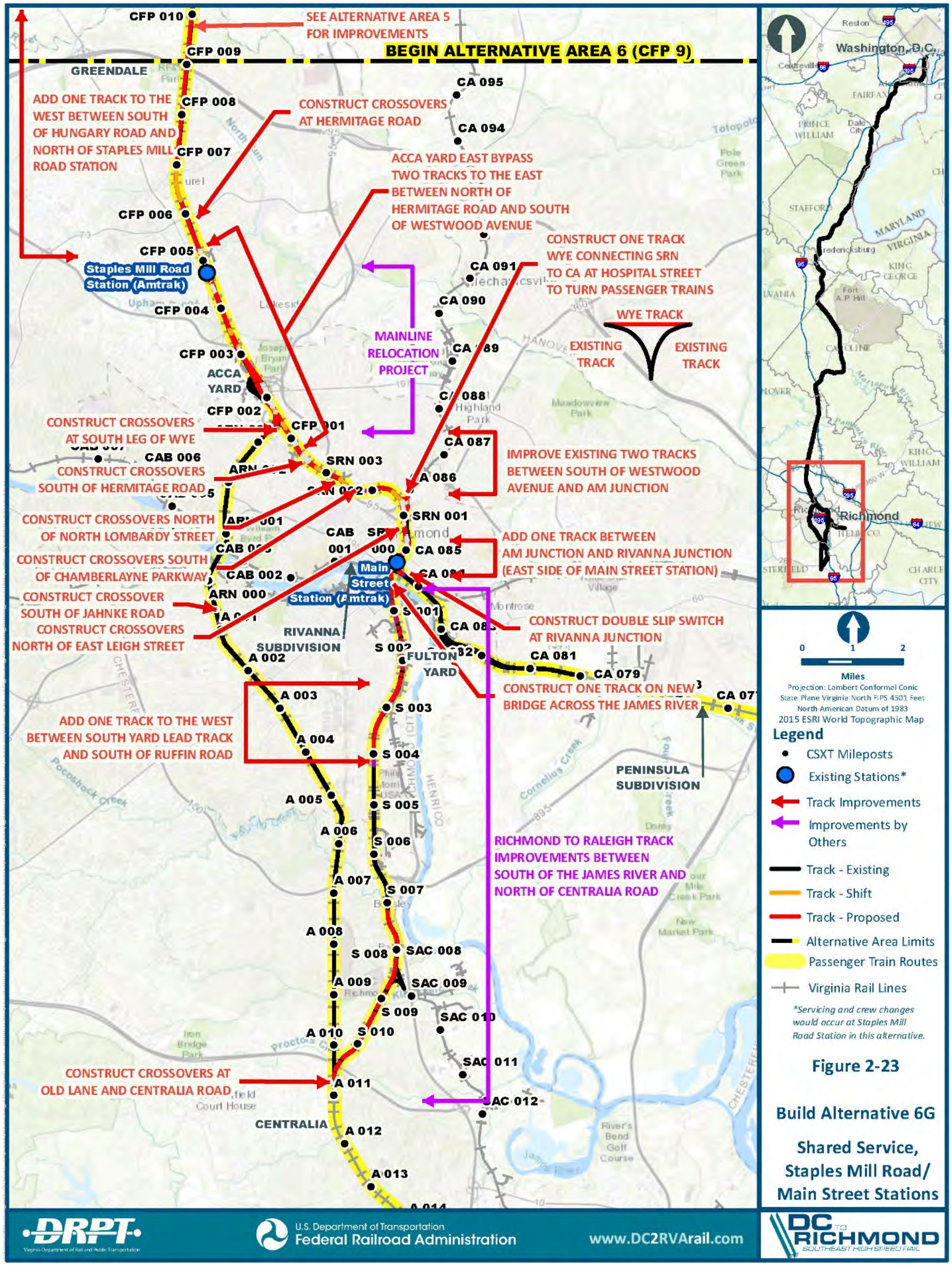


Figure 2-23

Build Alternative 6G

Shared Service, Staples Mill Road/ Main Street Stations

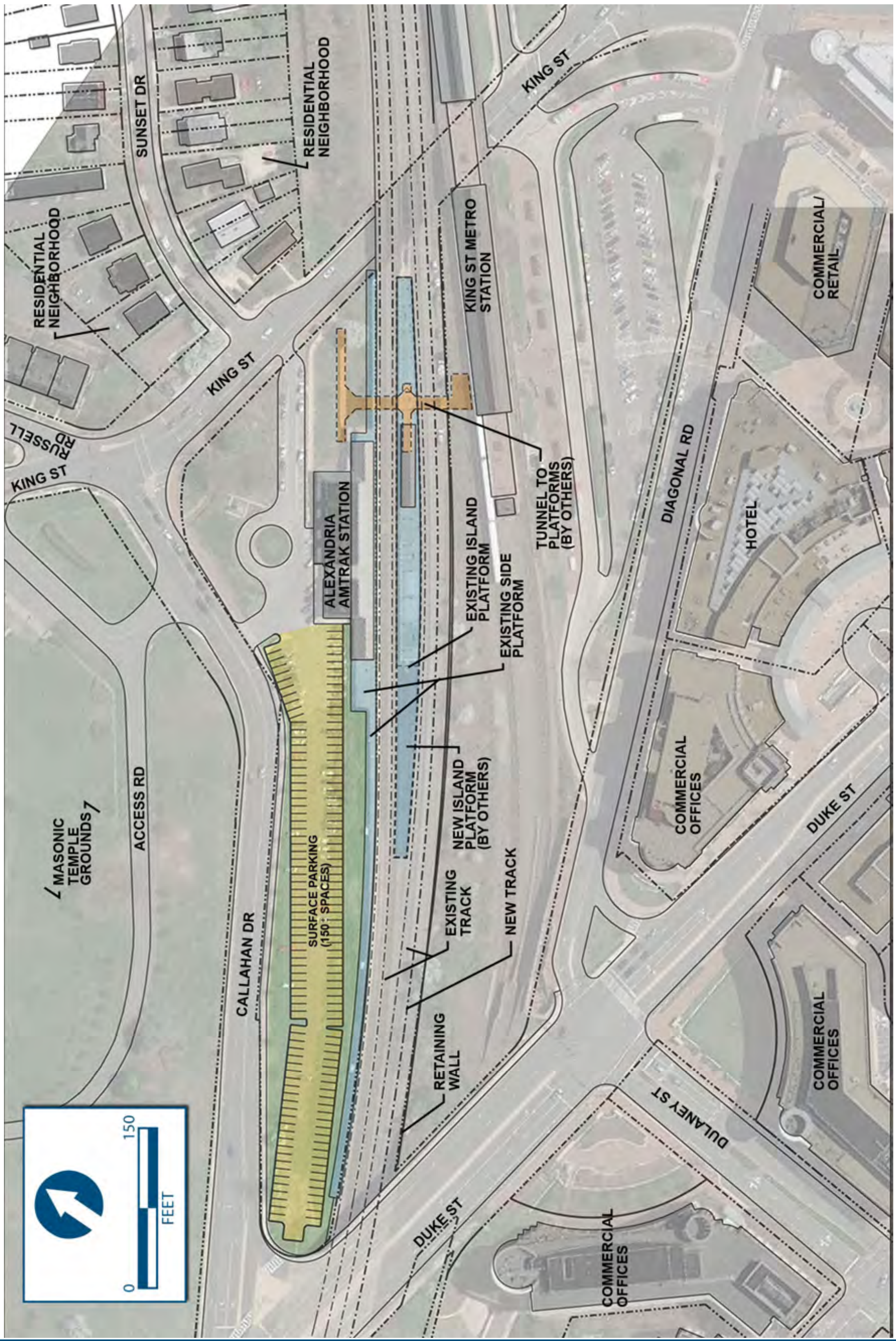


Figure 2-24: Alexandria Station Improvements for Build Alternative 2A

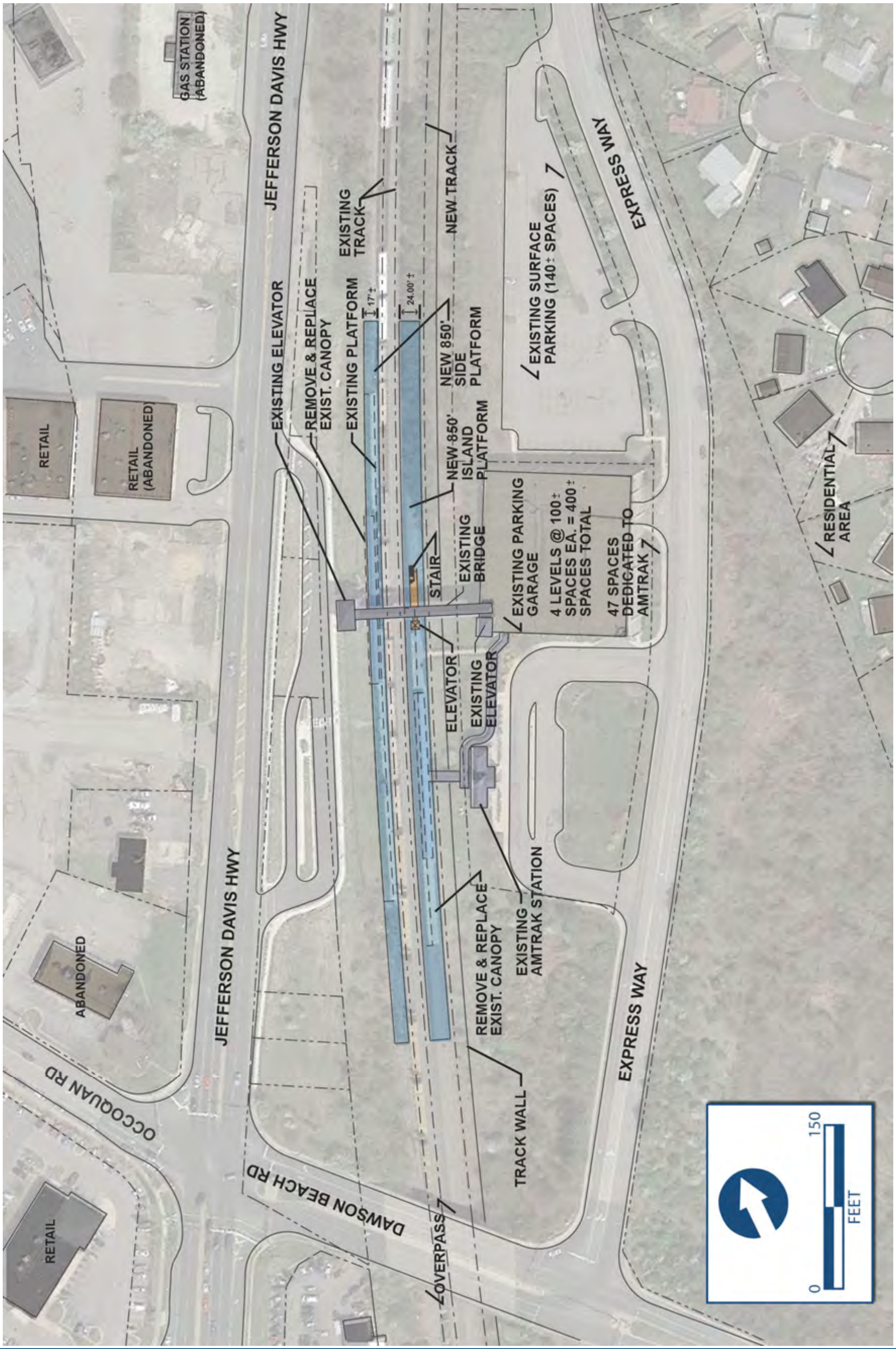


Figure 2-25: Woodbridge Station Improvements for Build Alternative 2A

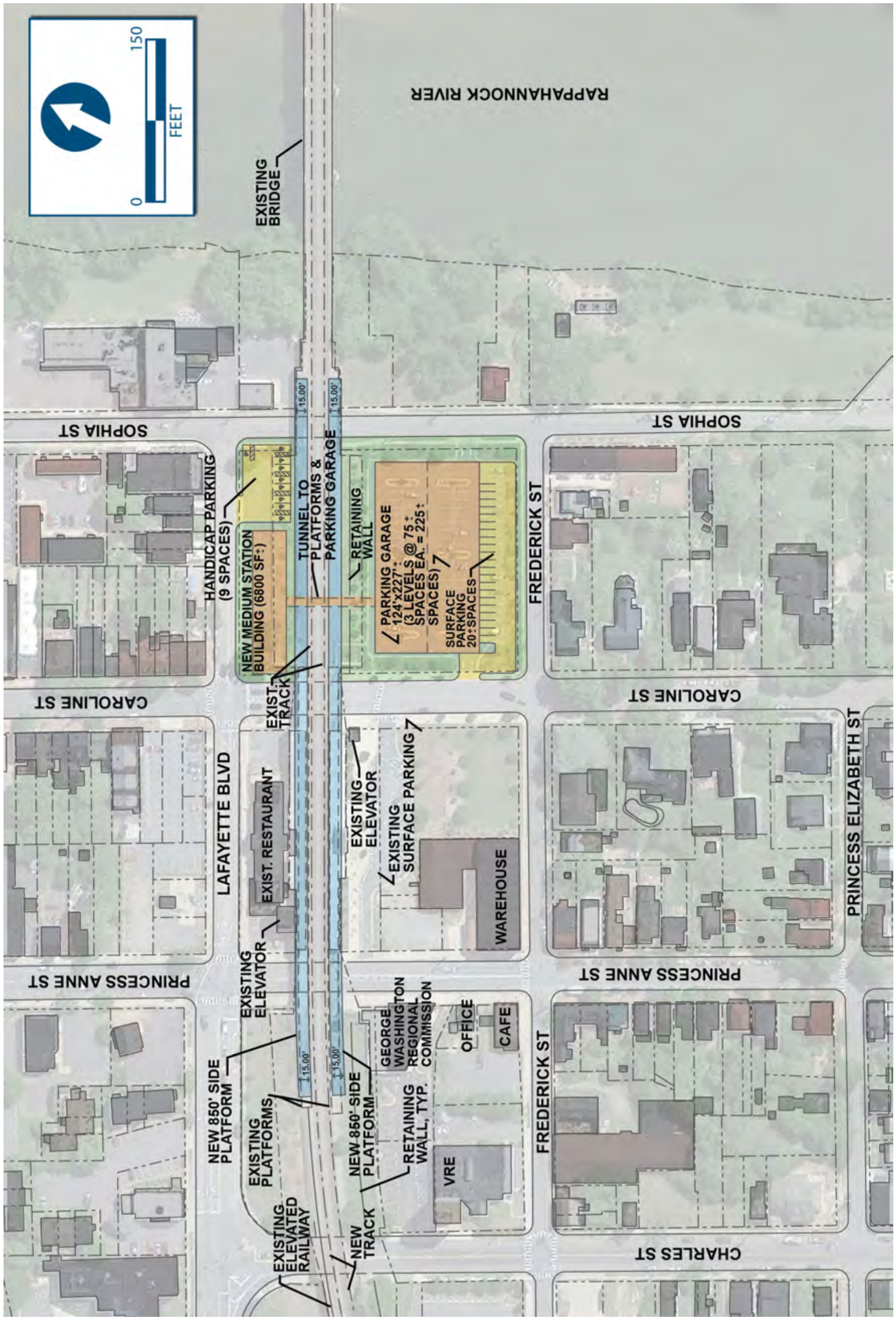


Figure 2-26: Fredericksburg Station Improvements for Build Alternatives 3A and 3C

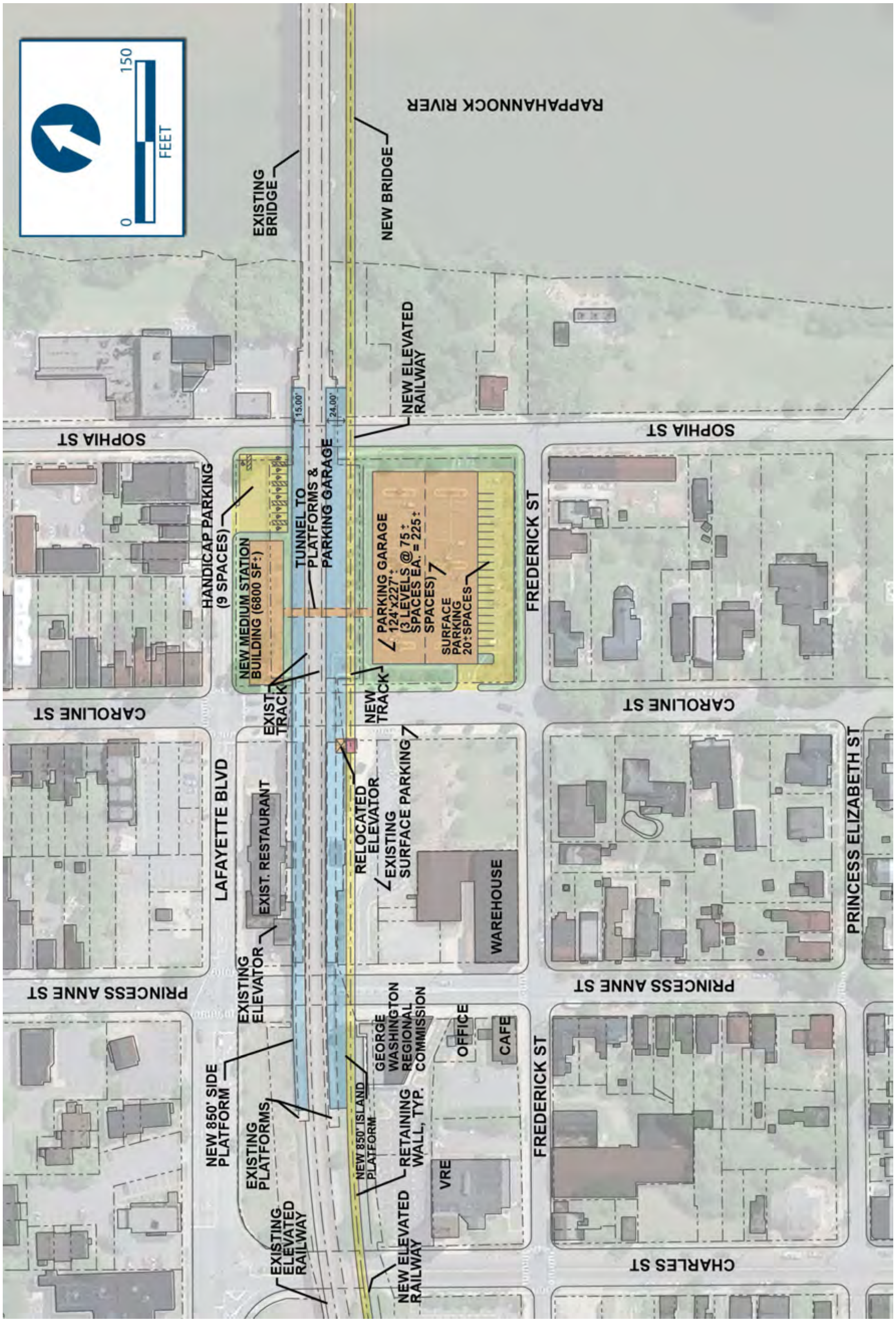


Figure 2-27 Fredericksburg Station Improvements for Build Alternative 3B

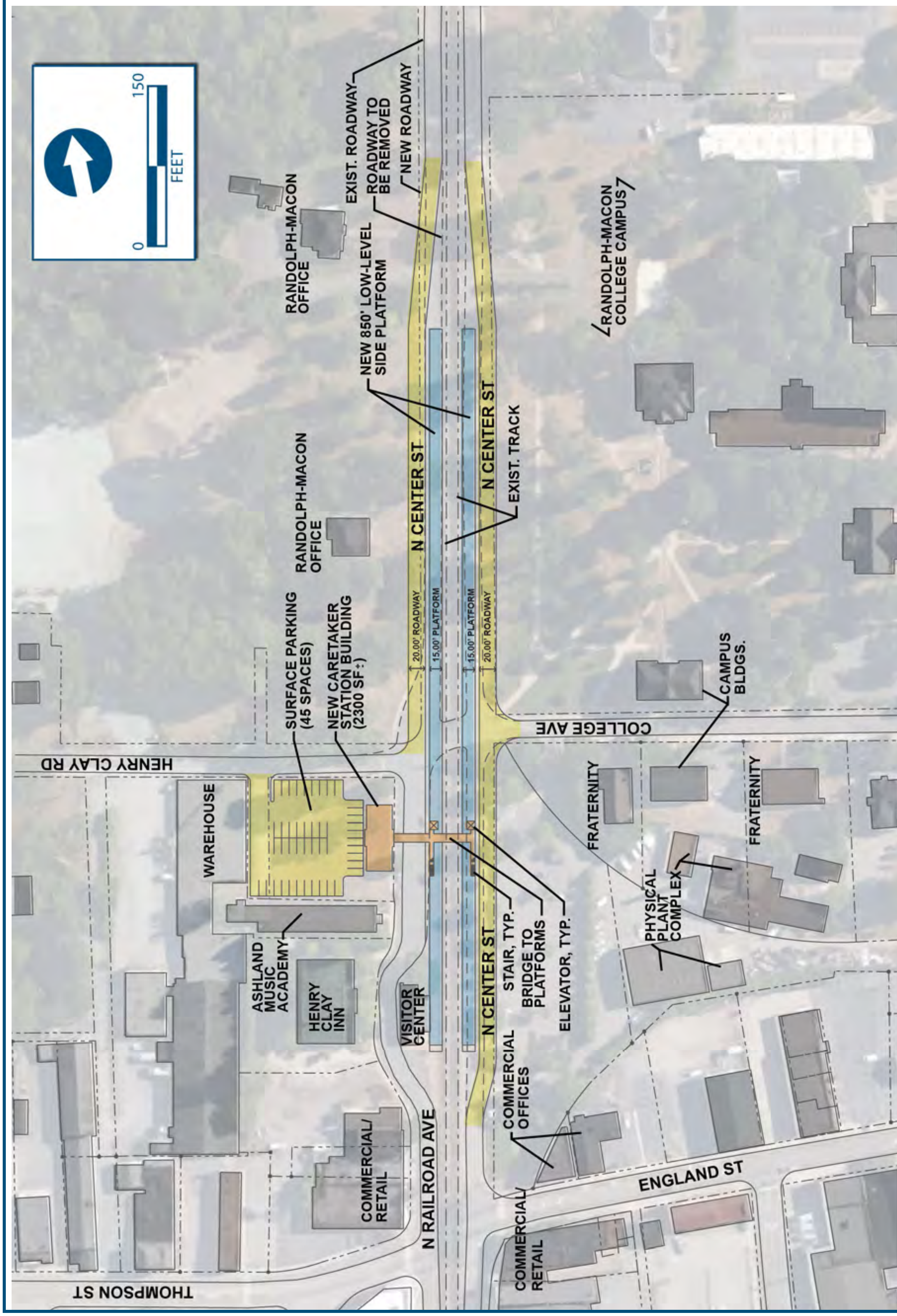


Figure 2-28A: Ashland Station Improvements for Build Alternatives 5A and 5C (Two-Track/850-Foot Platforms)

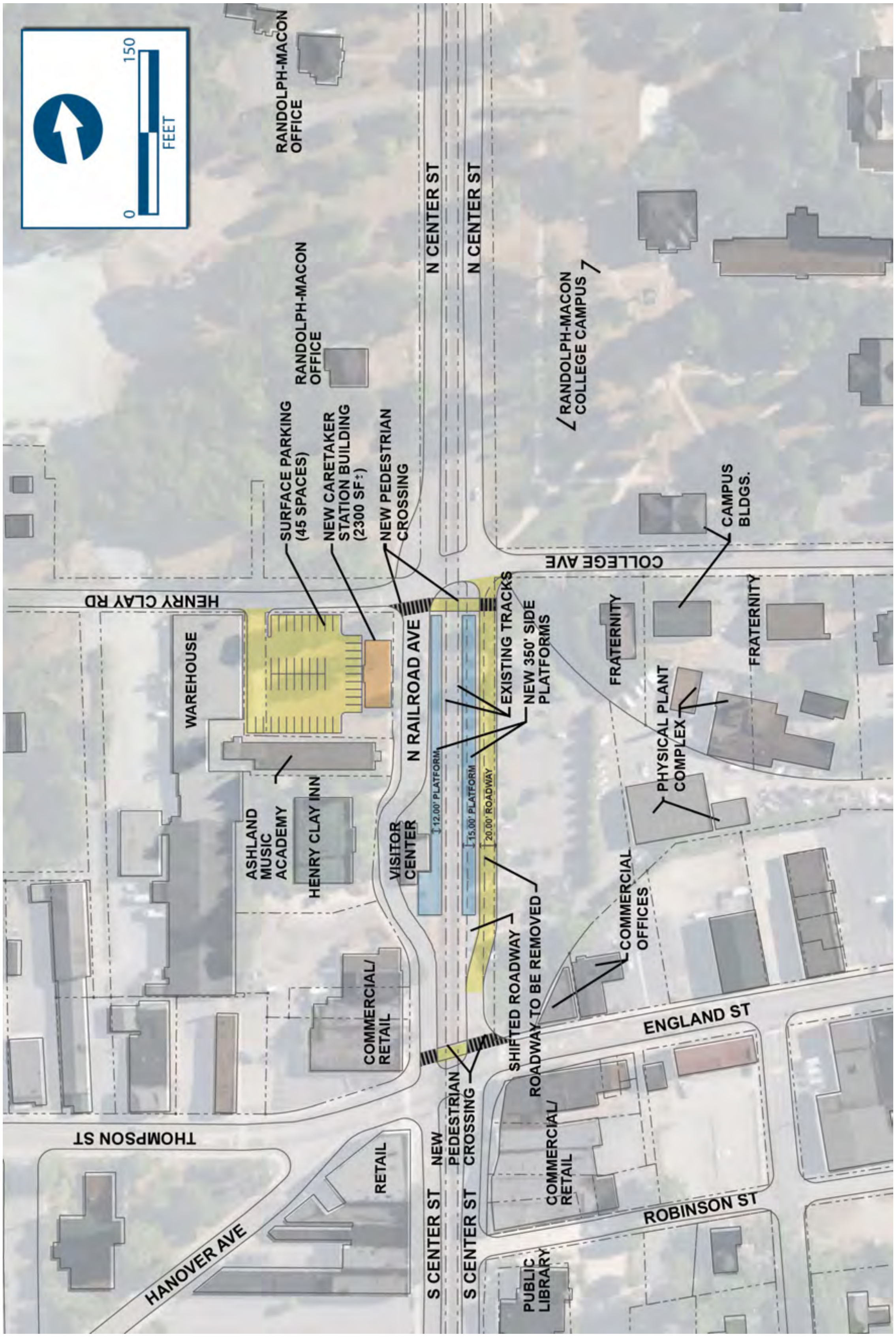


Figure 2-28B: Ashland Station Improvements for Build Alternatives 5A and 5C (Two-Track/350-Foot Platforms)

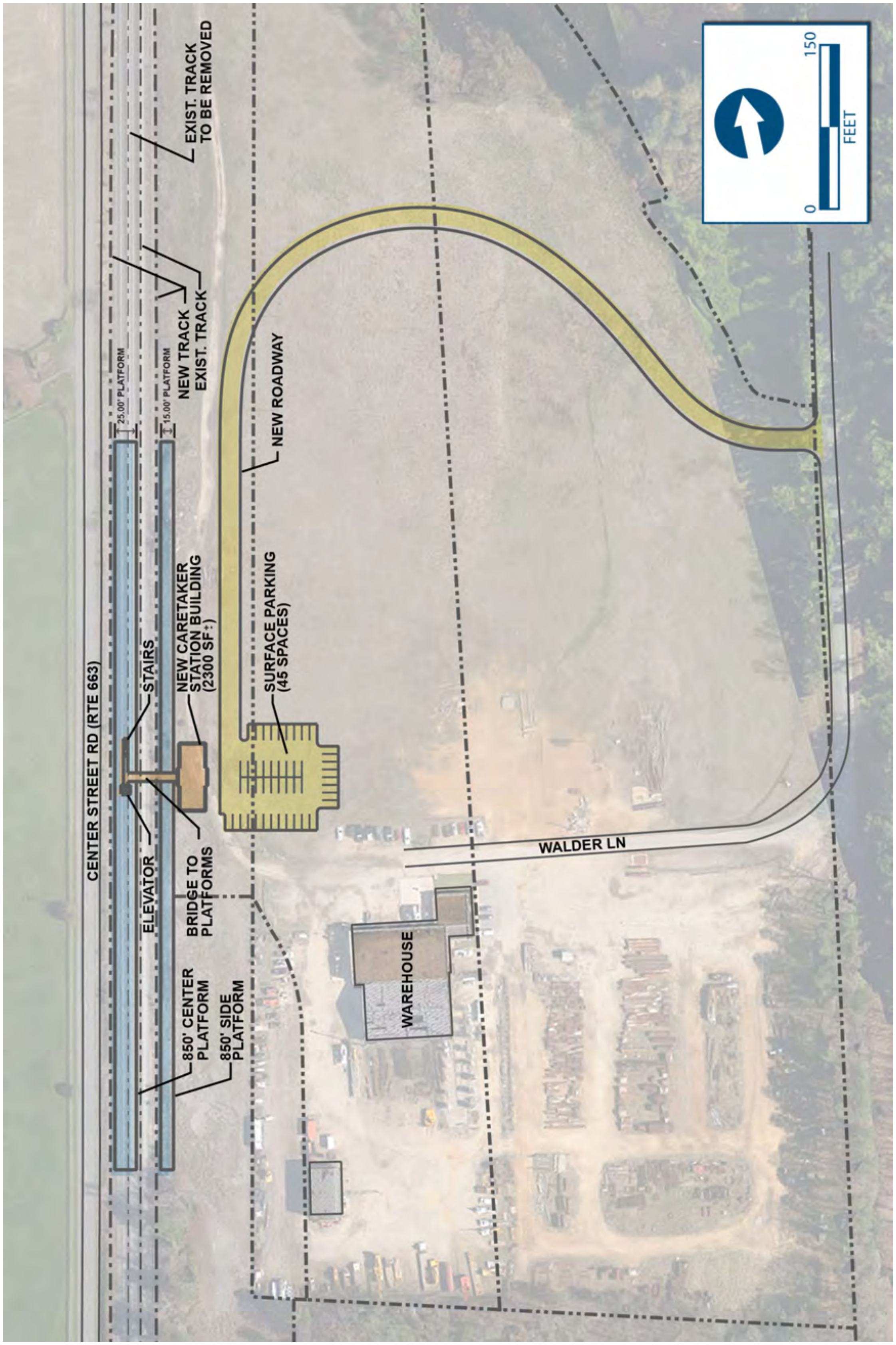


Figure 2-29: Ashcake Station Improvements for Build Alternatives 5A–Ashcake, 5B–Ashcake, 5C–Ashcake, and 5D–Ashcake

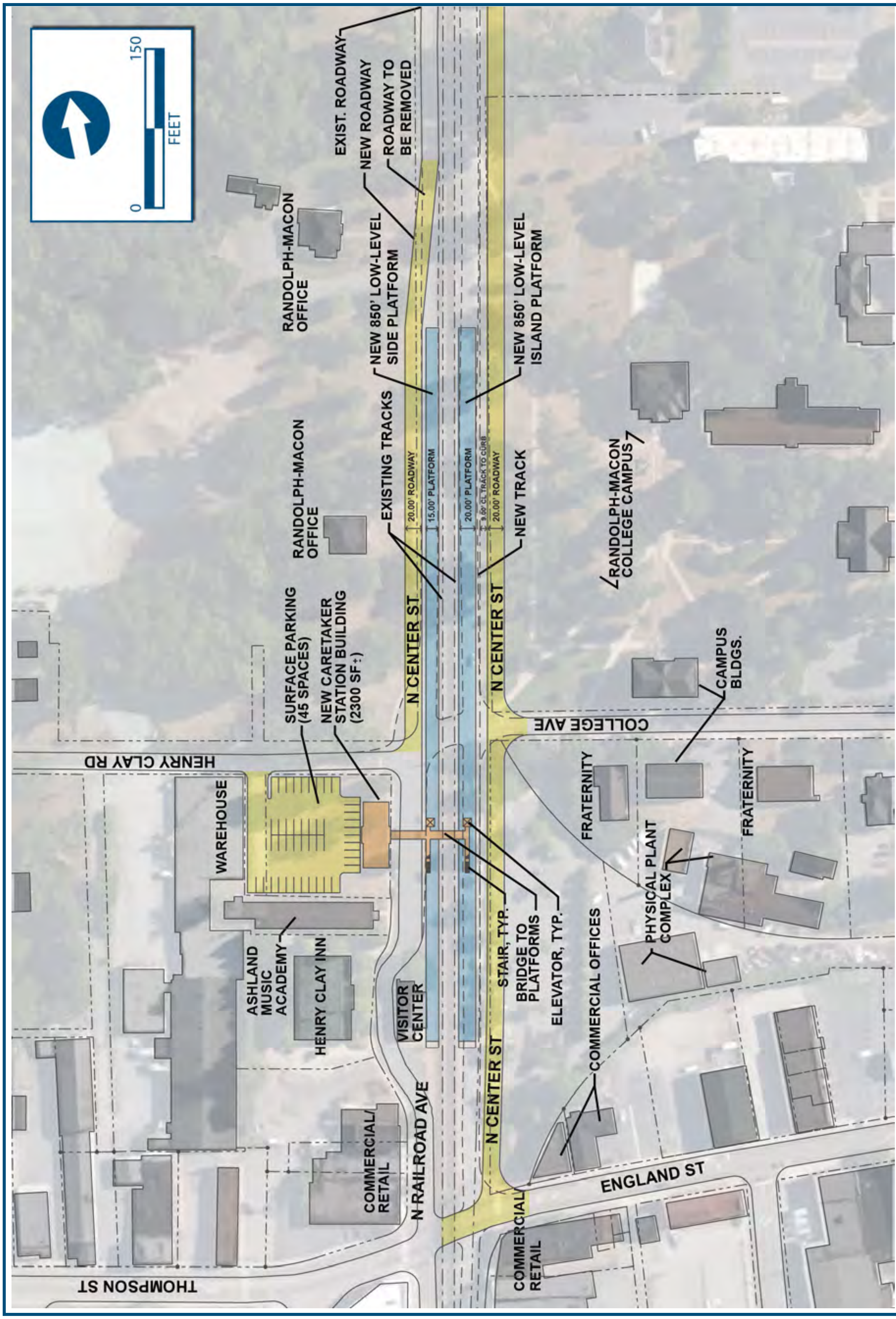


Figure 2-30A: Ashland Station Improvements for Build Alternative 5B (Three-Track/850-Foot Platforms)

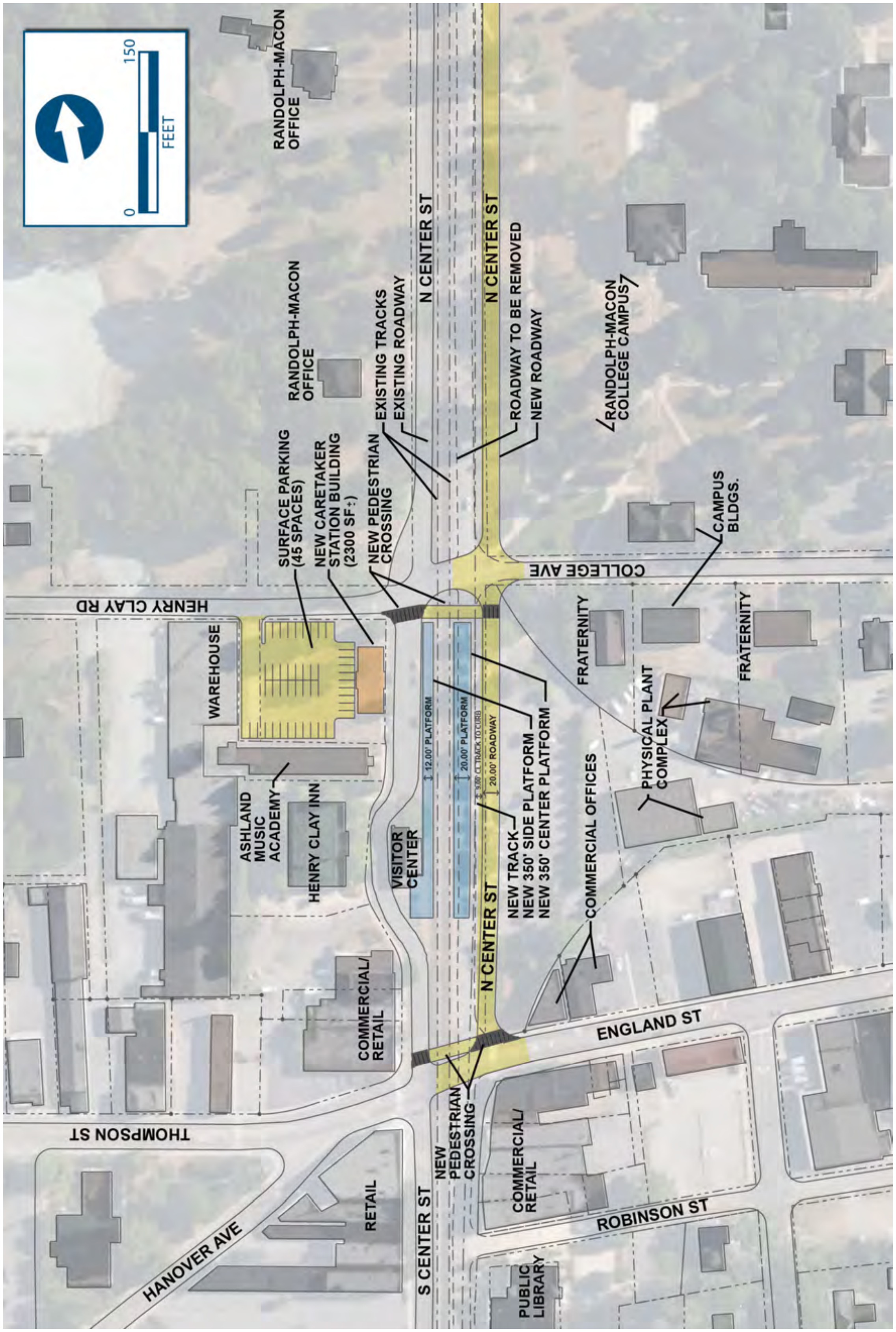


Figure 2-30B: Ashland Station Improvements for Build Alternative 5B (Three-Track/350-Foot Platforms)

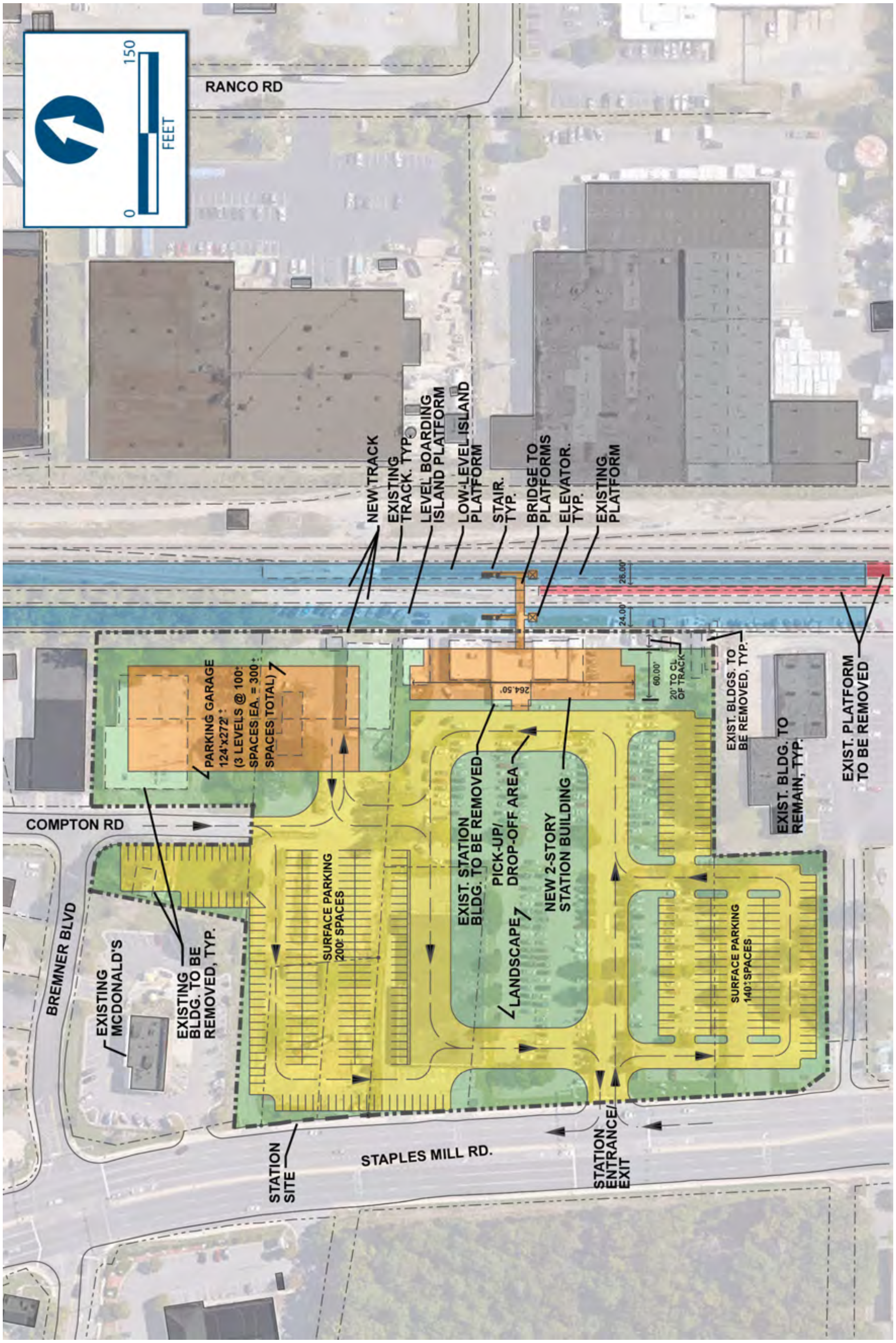


Figure 2-31: Staples Mill Road Station Improvements for Build Alternative 6A

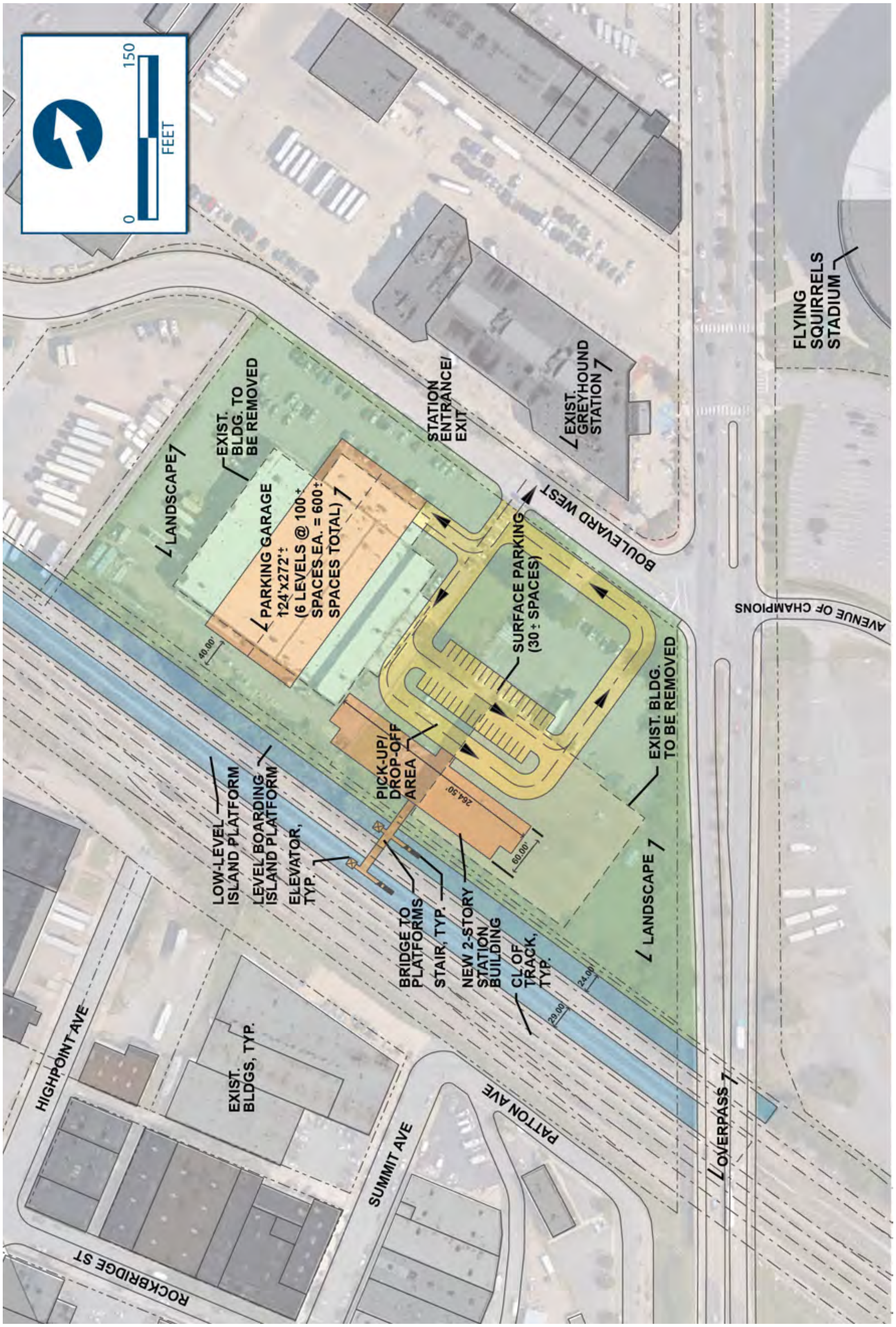


Figure 2-32: Boulevard Station Improvements for Build Alternatives 6B–A-Line and 6B–S-Line

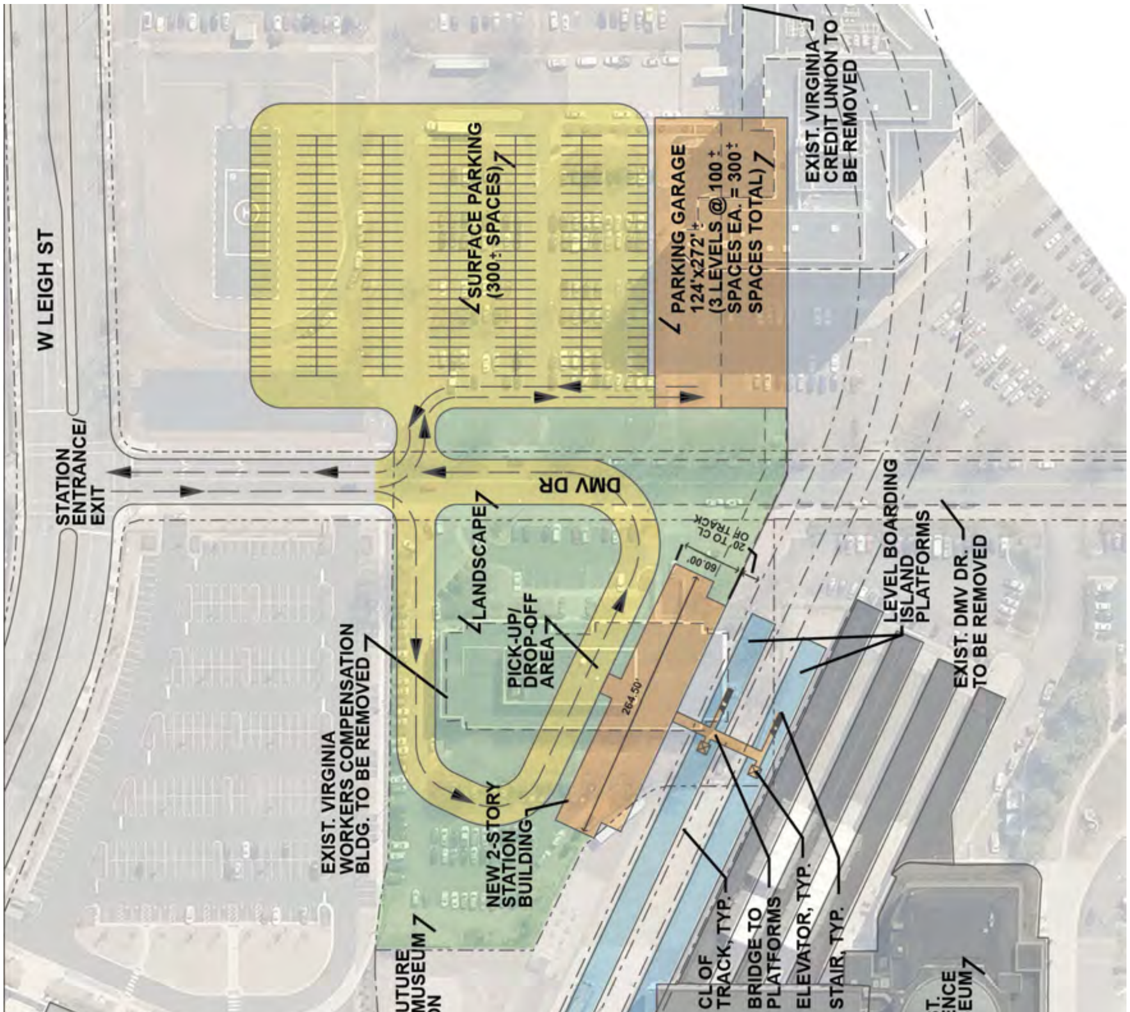


Figure 2-33: Broad Street Station Improvements for Build Alternative 6C

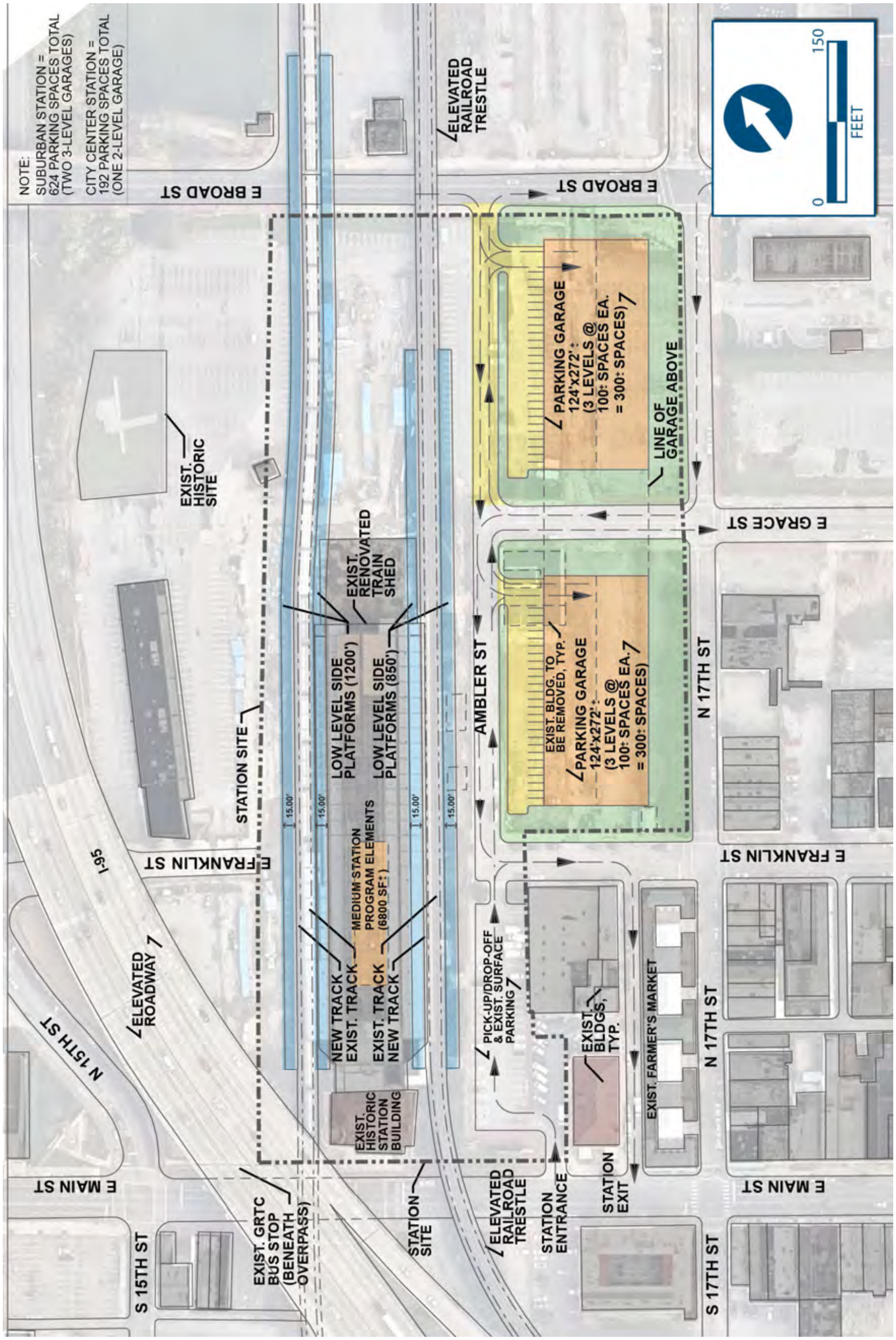


Figure 2-34: Main Street Station Improvements for Build Alternative 6D

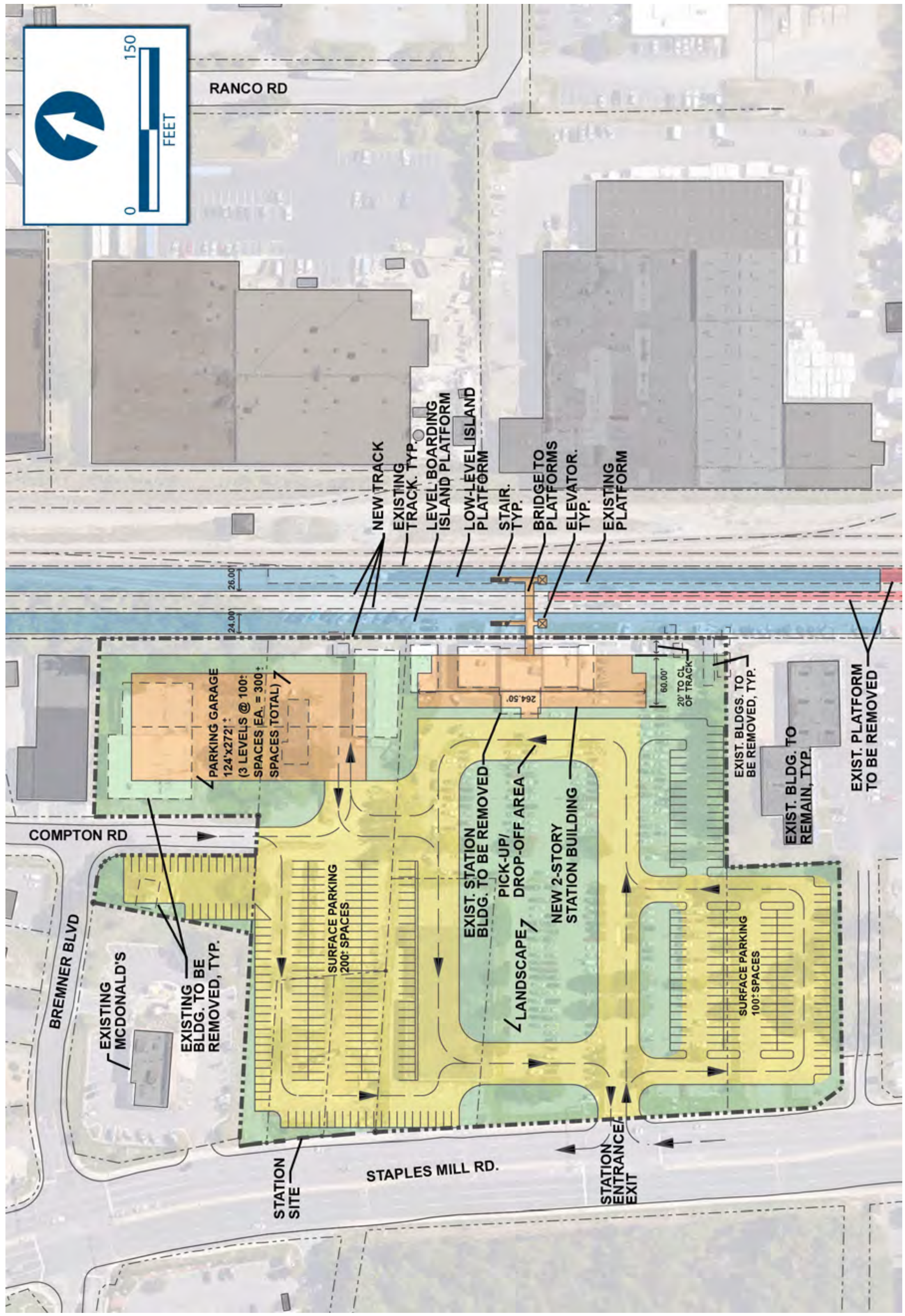


Figure 2-35: Staples Mill Road Station Improvements for Build Alternative 6E

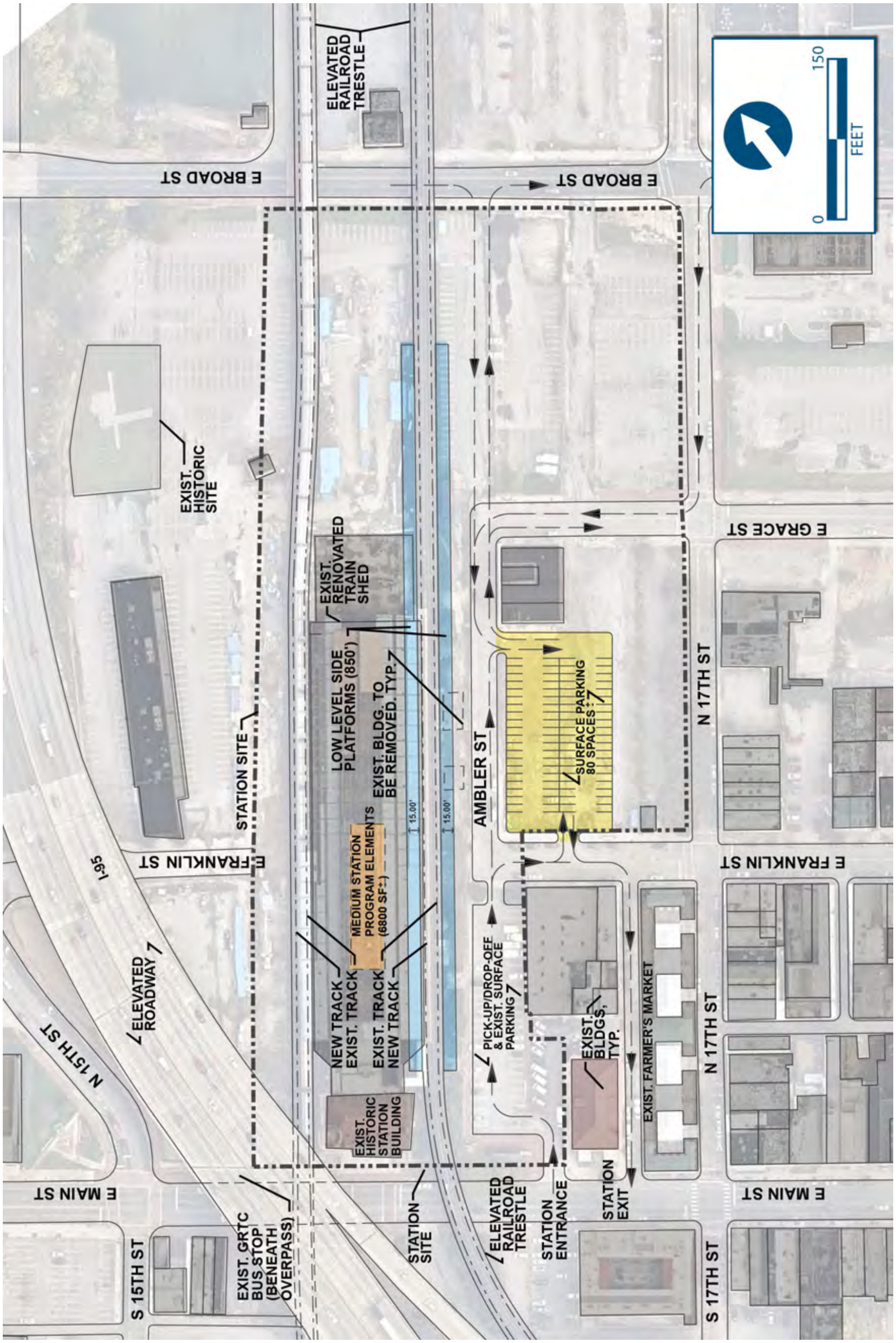


Figure 2-36: Main Street Station Improvements for Build Alternative 6E

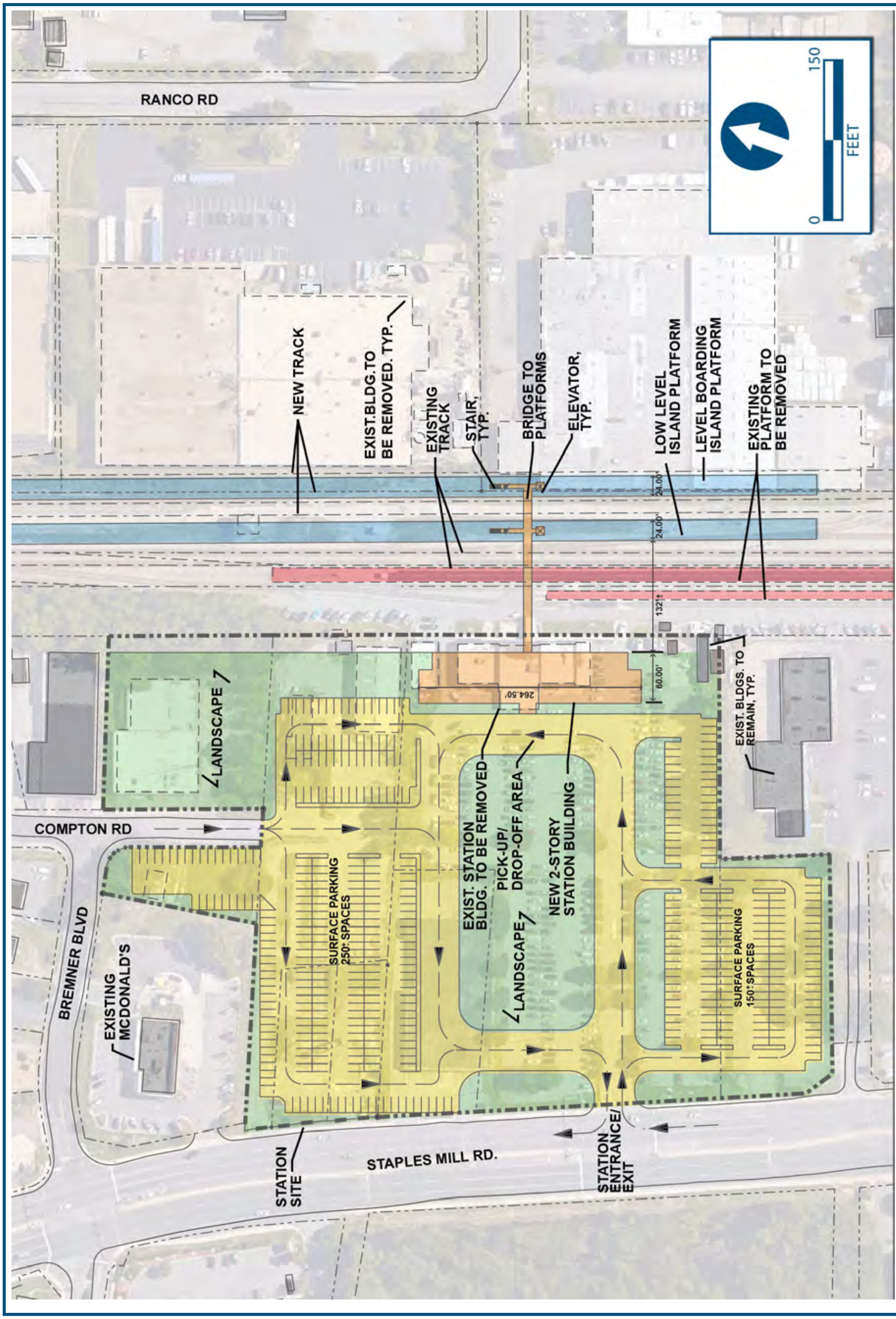


Figure 2-37: Staples Mill Road Station Improvements for Build Alternative 6F

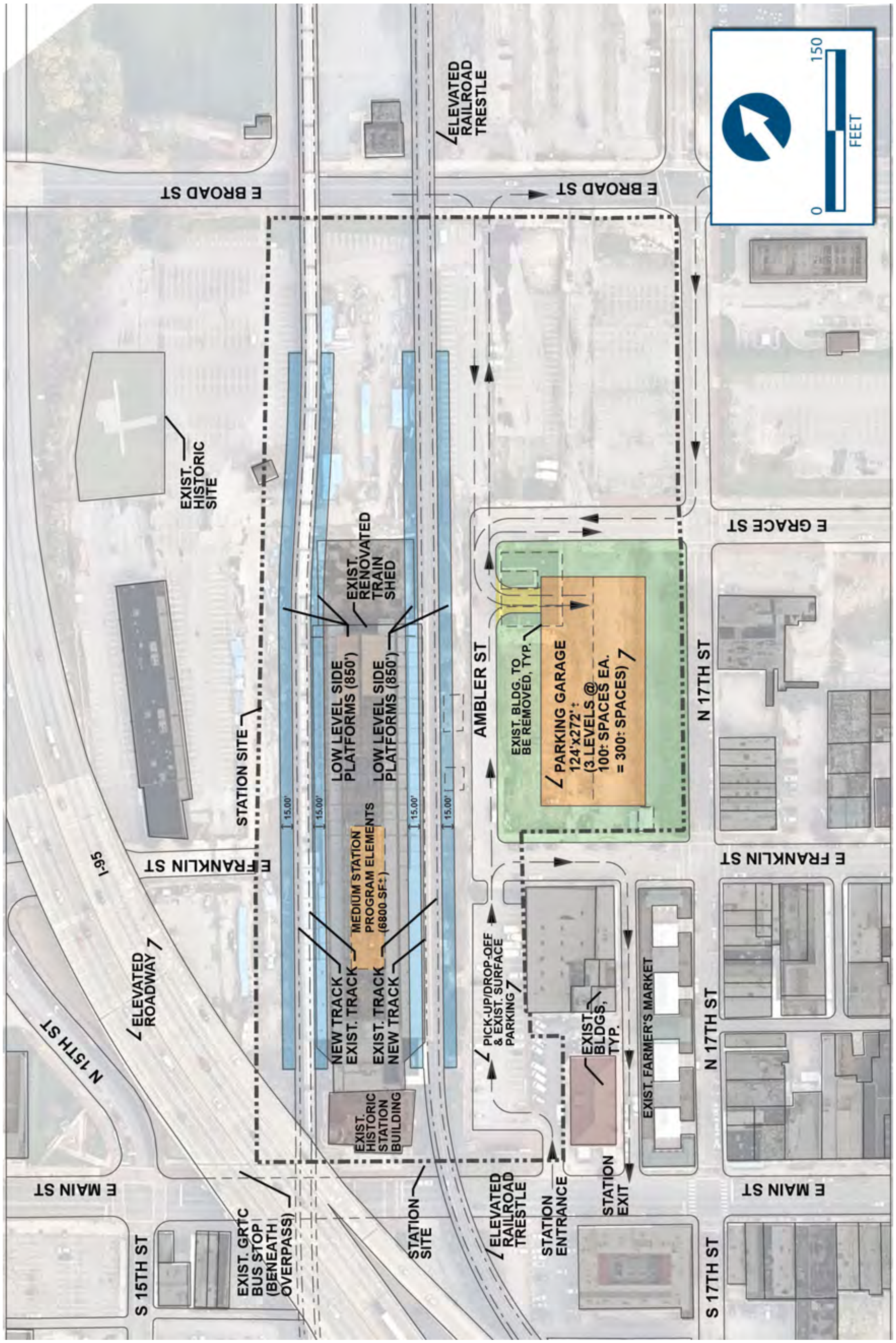


Figure 2-38: Main Street Station Improvements for Build Alternative 6F

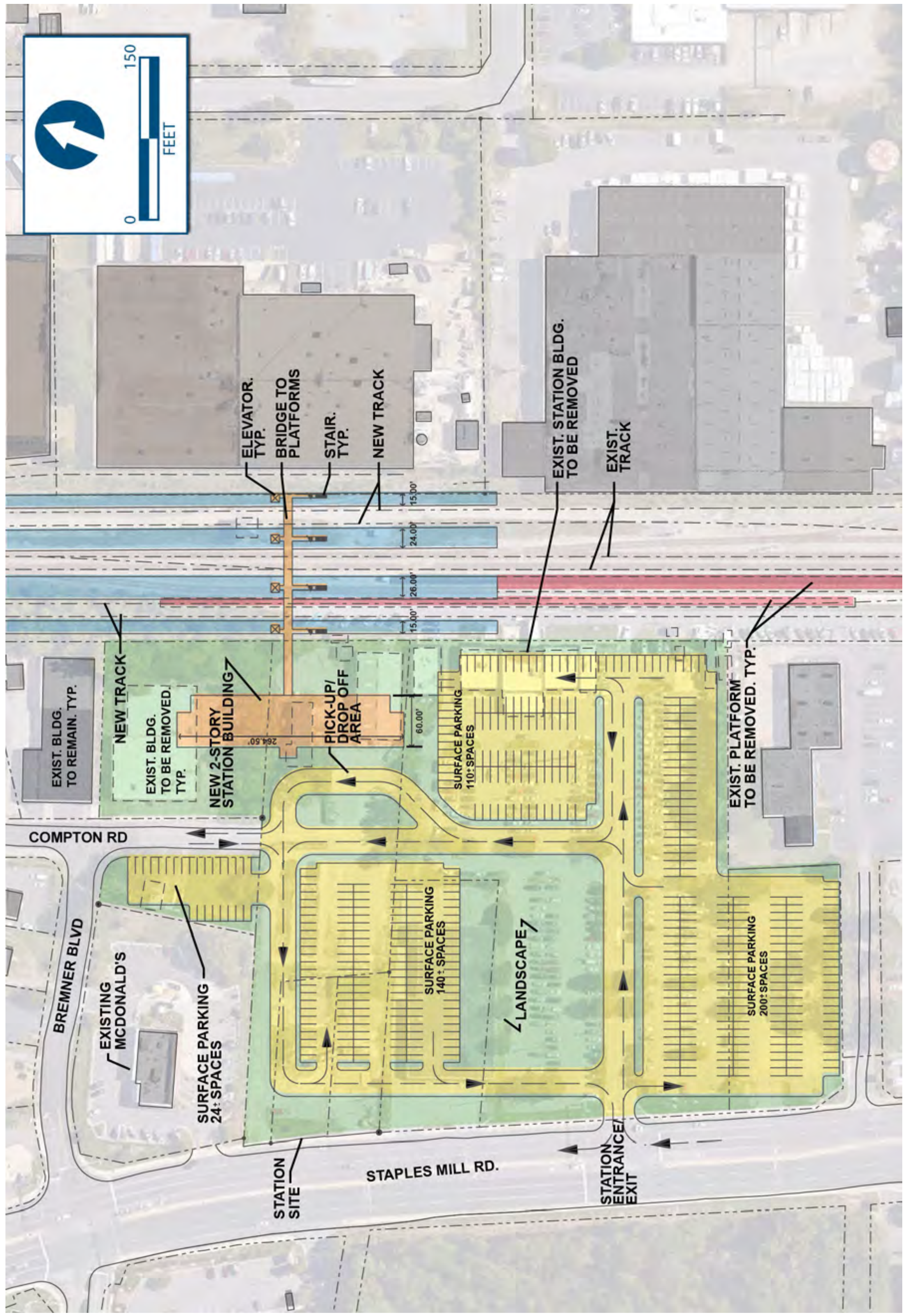


Figure 2-39: Staples Mill Road Station Improvements for Build Alternative 6G

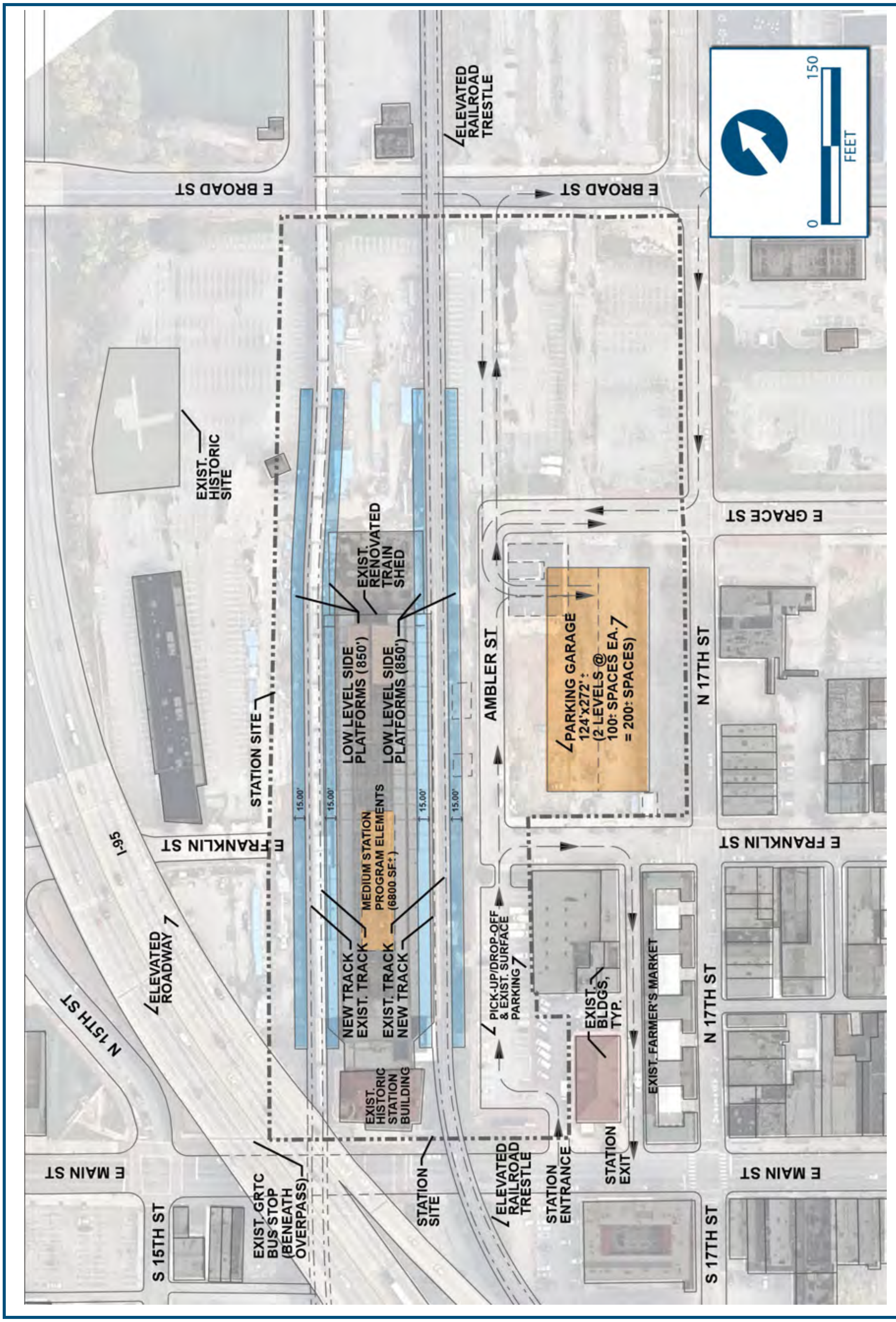


Figure 2-40: Main Street Station Improvements for Build Alternative 6G

3 AFFECTED ENVIRONMENT

The existing transportation facilities in the DC2RVA corridor were evaluated at two geographic scales, as shown in Figure 3-1. The first scale is regional, focusing on the broader transportation network and transportation modes that provide the overall context for the existing railroad service as well as the proposed DC2RVA service. It includes portions of every county and city that the proposed service would traverse, and its extents include I-95 and Route 1, which run roughly parallel to the corridor, as well as their interchanges with other interstates and US routes and primary roadways in the region. The second scale is focused on a 1-mile-wide study area centered on the rail line (0.5 mile on either side of the track). The purpose of the two geographic scales is to enable the evaluation of potential effects of the DC2RVA Project at the appropriate level. For example, the regional scale data reflect larger trends due to regional growth or shifts in travel modes. The DC2RVA corridor scale data, however, reflects more localized influences on individual roadways; analysis at the DC2RVA corridor scale reflects the importance of connections in the transportation network across and on both sides of the DC2RVA corridor. The existing transportation environment is described in the following pages in the context of these two geographic scales.

The terms "grade crossing" and "at-grade crossing" are often used interchangeably, both colloquially and within federal documentation, to refer to the intersection of a roadway and railroad at ground level (i.e., vehicles on the roadway travel across the railroad tracks; trains on the railroad tracks travel across the roadway travel lanes). The Draft EIS documentation, including this technical report, uses the term "at-grade crossing" to ensure a distinct and readily understandable difference from the term "grade-separated crossing."

3.1 REGIONAL SCALE

3.1.1 Regional Roadway Network

The DC2RVA corridor passes through nine counties and three cities from Arlington County, VA at the D.C. jurisdictional line to Chesterfield County, VA. Running roughly parallel to the railroad tracks over nearly the entire 123-mile stretch are I-95 and/or US Route 1. Through Fairfax County, I-95 has eight general purpose lanes, four northbound and four southbound, and three express high-occupancy vehicle (HOV) lanes. From Prince William County to Aquia Harbour in Stafford County, I-95 has six general purpose lanes, three northbound and three southbound, and two express (HOV) lanes. From Aquia Harbour through Chesterfield County, I-95 typically has six general purpose lanes, three northbound and three southbound.

In Arlington County, US Route 1 is mainly a six-lane road, three northbound and three southbound. As it moves down into the city of Alexandria, it remains mostly six lanes and splits into two one-way roads, Henry Street (southbound) and Patrick Street (northbound), and

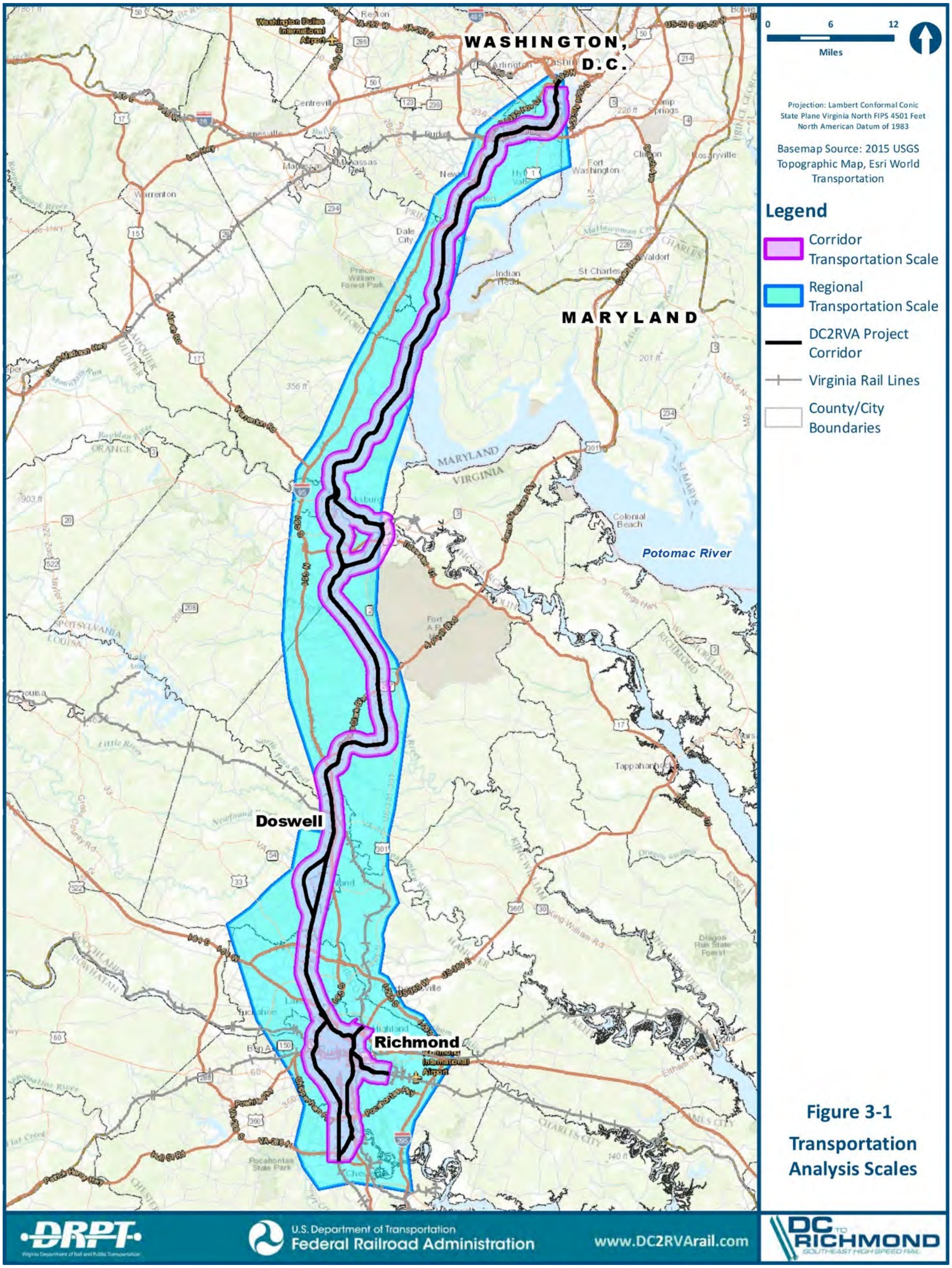


Figure 3-1
Transportation Analysis Scales

merges together again at the Capital Beltway. At Buckman Road in Fairfax County, US Route 1 becomes a four lane road, two northbound and two southbound lanes. It continues as a four lane road until it reaches the city of Richmond. In Richmond, US Route 1 becomes a six-lane road (three northbound and three southbound lanes) as it passes over I-64. It remains six lanes until it passes over Chippenham Parkway in Chesterfield County, where it once again becomes a four-lane road.

Other interstate highways and major US and state routes in each county are summarized below:

- Arlington County: I-395, George Washington Memorial Parkway
- City of Alexandria: I-395, I-495, George Washington Memorial Parkway
- Fairfax County: I-395, I-495, Franconia Springfield Parkway, Telegraph Road
- Prince William County: Dumfries Road, Joplin Road
- Stafford County: US 17, Route 3
- City of Fredericksburg: US 17, Route 3
- Spotsylvania County: US 17, Courthouse Road
- Caroline County: US 301, Route 2, Route 30
- Hanover County: I-295, US 33, US 360, Route 2
- Henrico County: I-64, I-195, I-295, US 33, US 60, US 250, US 360
- City of Richmond: I-64, I-195, US 33, US 60, US 250, US 360
- Chesterfield County: I-295, US 60, US 360

The roadways included in the defined DC2RVA regional area network consist of interstate highways, state primary roads, major secondary roads that connect interstate and state primary roadways, public roads that cross the existing and potential DC2RVA tracks, and the primary and secondary roads that connect these cross roads. Within the regional area as shown in Figure 3-1, approximately 2,000 miles of these regional area network roads carry 79 million vehicle-miles[1] each day in existing conditions. Within this same network, the I-95 facility includes approximately 280 roadway miles (including I-395) between Washington, D.C. and Richmond. In existing conditions, the I-95 facility carried approximately 38 million of the overall network's 79 million vehicle-miles.

Table 3-1 summarizes the roadway system on a county-by-county basis at the regional scale, presenting total length of roadway miles by type of roadway and average daily traffic (ADT) on those facilities, in addition to the calculated vehicle miles that the roadways within each jurisdiction carry. When reviewing Table 3-1, it is important to note that VMT is calculated for individual roadway segments; i.e., the VMT shown for each County is the sum of the individual segments within the county (and not the calculation of county-wide ADT and length).

Table 3-1: Regional Roadway Network: Existing conditions Daily Traffic

City/County	Directional Measure[1]	Interstate and US Routes	State Primary Route	State Secondary Route	Urban Routes	Total
Arlington	ADT	3,484,932	1,471,860	137,323	-	5,094,115
	Length	17.9	29.9	5.5	-	53.3

Table 3-1: Regional Roadway Network: Existing conditions Daily Traffic

City/County	Directional Measure[1]	Interstate and US Routes	State Primary Route	State Secondary Route	Urban Routes	Total
	VMT	2,612,262	1,546,065	50,117	-	4,208,444
Alexandria	ADT	4,429,146	2,184,942	3,264	116,484	6,733,836
	Length	31.8	35.8	0.6	9.6	77.8
	VMT	3,948,393	1,079,649	2,017	92,377	5,122,436
Fairfax	ADT	8,925,306	1,220,430	2,287,758	6,732	12,440,226
	Length	79.9	63.8	51.1	0.3	195.1
	VMT	11,739,358	1,927,020	1,127,223	1,833	14,795,434
Prince William	ADT	4,202,502	1,032,138	998,519	734	6,233,893
	Length	66.8	16.2	39.8	1.5	124.3
	VMT	7,066,087	586,450	602,247	1,131	8,255,915
Stafford	ADT	2,707,488	409,836	262,201	-	3,379,525
	Length	63.7	25.1	70.6	-	159.4
	VMT	5,359,030	447,369	295,487	-	6,101,886
Fredericksburg	ADT	804,576	913,104	-	24,072	1,741,752
	Length	19.3	10.0	-	1.6	30.9
	VMT	911,434	351,615	-	9,644	1,272,693
Spotsylvania	ADT	1,916,682	240,006	100,001	-	2,256,689
	Length	58	11	26	-	95.0
	VMT	3,360,737	486,396	107,256	-	3,954,389
Caroline	ADT	753,372	186,762	51,407	-	991,541
	Length	77.1	45.6	80.5	-	203.2
	VMT	3,172,676	348,945	84,603	-	3,606,224
Hanover	ADT	3,368,917	220,912	151,735	21,349	3,762,913
	Length	100.4	26.5	58.9	5.7	191.5
	VMT	5,746,204	174,503	102,633	12,602	6,035,942
Henrico	ADT	8,698,325	1,297,369	1,542,852	-	11,538,546
	Length	222.5	78.5	74.1	-	375.1

Table 3-1: Regional Roadway Network: Existing conditions Daily Traffic

City/County	Directional Measure[1]	Interstate and US Routes	State Primary Route	State Secondary Route	Urban Routes	Total
	VMT	9,360,405	1,010,272	1,180,790	-	11,551,467
Richmond	ADT	6,857,644	2,734,008	-	860,472	10,452,124
	Length	101	82	-	52	235.0
	VMT	4,504,821	1,939,012	-	501,262	6,945,095
Chesterfield	ADT	1,707,990	2,833,631	213,649	-	4,755,270
	Length	55.9	106.1	14.8	-	176.8
	VMT	3,034,399	4,005,856	106,099	-	7,146,354
Total	ADT	47,856,880	14,744,998	5,748,709	1,029,843	69,380,430
	Length	894.3	530.5	421.9	70.7	1,918.4
	VMT	60,815,806	13,903,152	3,658,472	618,849	78,996,279

Source of ADT and Length Data: VDOT, GIS online database for Annual Average Daily Traffic with Vehicle Classification for 2014. Accessed January 2016.

1. ADT = Average Daily Traffic; VMT = Vehicle Miles Traveled; calculated for individual roadway sections. VMT is calculated for individual roadway sections, which is required due to the range of section ADT and differing section lengths. The VMT shown for each County is the sum of the products of the individual sections within the county (i.e., not the calculation of County-wide ADT and length).

3.1.2 Regional Rail Network

The DC2RVA corridor is a shared use corridor, with freight trains (operated by CSXT and Norfolk Southern railways), intercity passenger trains (operated by Amtrak), and local commuter trains (operated by Virginia Railway Express) commingled on the same tracks. These uses within the DC2RVA corridor and their operations are summarized below; refer to the *Alternatives Technical Report* (Appendix A of the Draft EIS) for full details.

CSX Transportation. CSXT, the principal operating subsidiary of CSX Corporation, is the track owner and operator of the DC2RVA corridor. CSXT owns 761 miles of railroad in Virginia (roughly 25 percent of Virginia's total rail network) and has operating rights via lease or trackage rights over an additional 293 miles in the state. CSXT's Richmond, Fredericksburg, and Potomac (RF&P) Subdivision between Washington, D.C. and Richmond makes up most of the DC2RVA corridor.

The DC2RVA Project limits include components of three critical rail corridors in the larger CSXT freight rail network:

- *I-95 Freight Rail Corridor*. The I-95 Freight Rail Corridor is a 1,400-mile-long rail line running the length of the eastern seaboard between New York and Miami, FL, that roughly parallels I-95 and serves many urban, port, industrial, and rural areas along the eastern seaboard, and includes the RF&P Subdivision.
- *National Gateway*. The National Gateway is a public-private partnership to improve the transportation of shipping containers to population centers in the Midwestern United

States. Projects to upgrade three rail corridors are part of the initiative, including the Virginia Avenue Tunnel clearance improvement project in Washington, D.C.

- *Coal Network*. In Richmond, the DC2RVA Project area includes a small component of the CSXT Peninsula Subdivision east to Beulah, which is part of CSXT's Coal Network that connects coal mines in the Appalachian Mountains to electric power generating stations and export coal docks.

Norfolk Southern (NS) Railway. NS operates approximately 20,000 route-miles in 22 states and Washington, D.C., serves every major container port in the eastern United States, and provides connections to other rail carriers. NS owns 1,897 route-miles in Virginia (approximately 60 percent of Virginia's total rail network), including a rail line from Manassas that connects to the DC2RVA corridor in Alexandria. Additionally, NS has trackage rights from Alexandria north to Washington, D.C. on the DC2RVA corridor.

Amtrak. Amtrak operates intercity passenger rail service throughout the United States and generally operates over the tracks of the private freight railroads. Amtrak operates 24 daily trains and two tri-weekly trains in Virginia. Operations are more frequent north of Alexandria, where Amtrak passenger trains, using an NS rail line from Lynchburg and Manassas, VA, join the DC2RVA corridor for trips north to Washington Union Station.

The four types of passenger train serve that Amtrak operates in the DC2RVA corridor are summarized below (see Chapter 2 for full details):

- Northeast Regional (Virginia) Amtrak service provides regional passenger rail service along the length of the Northeast Corridor from Boston and New York and continues south to serve routes in Virginia. Trains make local station stops.
- Interstate Corridor (Carolinian) Amtrak operates between New York and North Carolina (one single daily round trip) through Virginia, making fewer stops in the DC2RVA corridor than the Northeast Regional service.
- Long Distance Amtrak service operates from New York and continues through Washington, D.C. and Virginia to other out-of-state locations. Long distance trains serve the fewest of Amtrak station stops within the DC2RVA corridor.
- Auto Train Amtrak service operates as a daily nonstop, overnight train between dedicated station facilities in Lorton, VA and Florida, and carries passengers and their automobiles.

In existing conditions (2015), Amtrak operates an average of 20 passenger trains per day between Washington and Richmond (10 round trips), including 8 long distance trains (4 round trips), 10 Northeast Regional (Virginia) state supported regional trains (5 round trip trains supported by Virginia), 2 Interstate Corridor (Carolinian) state supported trains (1 round trip train supported by North Carolina), and Amtrak's Auto Train (1 round trip) which operates between Lorton, VA and Sanford, FL.

Virginia Railway Express. VRE is a transportation partnership of the Northern Virginia Transportation Commission (NVTC) and the Potomac & Rappahannock Transportation Commission (PRTC) and has been providing commuter rail service to the residents of Northern Virginia since 1992. VRE commuter trains operate on two lines, the Fredericksburg Line and the Manassas Line, that join at Alexandria and continue into Washington Union Station.

VRE trains operate Monday-Friday only, with most trips timed to bring passengers to Washington, D.C. for work in the morning and from Washington, D.C. back home in the evening. As of 2015, operations on each line are as follows:

- *Fredericksburg Line*: Eight weekday-only revenue[2] round trips between Washington, D.C. and Spotsylvania (60 miles).
- *Manassas Line*: Eight weekday-only revenue round trips and one weekday-only non-revenue round trip between Washington, D.C. and Broad Run/Airport Station (36 miles), operating in the DC2RVA corridor between Washington, D.C. and AF interlocking in Alexandria (9 miles). VRE operates one of its Manassas Line daily round trips as a mid-day train, and a second daily round trip as reverse-peak southbound in the morning and northbound in the evening.

3.1.3 Stations within the DC2RVA Corridor

3.1.3.1 Station Location, Service, and Connections

Amtrak and VRE stations that currently serve the DC2RVA corridor are summarized in Table 3-2 below and are included in Figure 3-2. Full details of these stations are provided in the *Alternatives Technical Report* (Appendix A of the Draft EIS).

Table 3-2: Amtrak and VRE Stations in the DC2RVA Corridor

City/County	Station Name	Amtrak Service	VRE Service	Nearest Major Highway	Transit Connections
Arlington	Crystal City		X	0.35 mile to US Route 1 0.5 mile to I-395 1 mile to George Washington Memorial Parkway	VRE Fredericksburg and Manassas Lines Metrorail Blue and Yellow Lines (nearby) Metrobus, ART, Fairfax Connector, PRTC OmniRide buses
Alexandria	Alexandria	X	X	Less than 2 miles to I-95/I-495	VRE Fredericksburg and Manassas Lines Metrorail Blue and Yellow Lines (nearby) Metrobus, Dash, King St. Trolley, Richmond Highway Express Buses
Fairfax	Franconia-Springfield		X	0.75 mile to I-95 2 miles to US Route 1 On Franconia Springfield Parkway	VRE Fredericksburg Line Metrorail Blue Line Metrobus, Fairfax Connector, PRTC OmniRide buses Greyhound intercity bus
	Lorton (VRE)		X	1 mile to US Route 1 1.5 miles to I-95	VRE Fredericksburg Line Fairfax Connector bus Vamoose intercity bus
	Lorton Auto Train	X		0.13 mile to I-95 1 mile to US Route 1	None

Table 3-2: Amtrak and VRE Stations in the DC2RVA Corridor

City/County	Station Name	Amtrak Service	VRE Service	Nearest Major Highway	Transit Connections
Prince William	Woodbridge	X	X	Adjacent to US Route 1 Less than 3 miles to I-95	VRE Fredericksburg Line PRTC OmniRide, OmniLink and Prince William Metro Direct buses Greyhound intercity bus
	Rippon		X	2 miles to US Route 1 4 miles to I-95	VRE Fredericksburg Line
	Potomac Shores		X	3 miles to US Route 1 4.5 miles to I-95	VRE Fredericksburg Line *(station planned to open in 2018; not shown in Figure 3-2)*
	Quantico	X	X	5 miles to I-95 3 miles to US Route 1	VRE Fredericksburg Line PRTC OmniLink bus
Stafford	Brooke		X	4 miles to US Route 1 4.5 miles to I-95	VRE Fredericksburg Line
	Leeland Road		X	Less than 2 miles to US Route 1 4 miles to I-95	VRE Fredericksburg Line
Fredericksburg	Fredericksburg	X	X	1 mile to VA Route 3 Less than 2 miles to US Route 1 3 miles from I-95	VRE Fredericksburg Line Fredericksburg Transit (FRED) bus
Spotsylvania	Spotsylvania		X	3.6 miles to US Route 1 4.3 miles to I-95	VRE Fredericksburg Line
Hanover	Ashland	X		2 miles to I-95	None
Henrico	Staples Mill Road	X		2 miles to I-64 2.6 miles to US Route 1 5 miles to I-95	GRTC bus
Richmond	Main Street Station	X		0.6 mile to I-95	GRTC bus, Megabus intercity bus

Note: While rail service extends to Union Station and L'Enfant Plaza Station in Washington, D.C., the data in this table are for current (existing and under construction) stations that are located within the DC2RVA corridor in Virginia.

3.1.3.2 Parking at Stations Served by Amtrak in the DC2RVA Corridor

Parking that is currently provided at each station in the DC2RVA corridor served by Amtrak is summarized in Table 3-3 below. Typically, long-term parking spaces are daily and/or overnight spaces, and short-term spaces have hourly limits. Most of the parking spaces provided in the corridor are free for riders, unless otherwise noted; the exceptions are the long-term parking provided at the Main Street and Staples Mill Road stations in Richmond.

Table 3-3: Existing Parking Inventory by Amtrak Station

Amtrak Station Name	Number of Spaces[1]	Facilities Notes
Alexandria	25 Short-Term 25 Long-Term	Surface parking lot. General parking available in city of Alexandria (public parking garages, street parking, etc.).
Lorton Auto Train	20 Short-Term	Surface parking lot.

Table 3-3: Existing Parking Inventory by Amtrak Station

Amtrak Station Name	Number of Spaces[1]	Facilities Notes
	0 Long-Term	Additional ADA-accessible dedicated spaces available.
Woodbridge	150 Ground Level Lot 738 Parking Garage	Short- and Long-Term spaces are combined. Parking facilities estimated at 65% capacity.
Quantico	210 Short-Term 60 Long-Term	Surface parking lot. Additional ADA-accessible dedicated spaces available. Parking facilities estimated at 70% capacity. Bicycle racks are provided.
Fredericksburg	810 Total *684 VRE Only* *124 City Resident Only*	Surface parking lots located near the station. Additional ADA-accessible dedicated spaces and motorcycle parking available. Parking facilities estimated at 47% capacity.
Ashland	0	No dedicated parking lot. General parking available throughout the Town (parallel parking on streets, etc.).
Staples Mill Road	20 Short-Term (1-3 hours free) 288 Long-Term (Paid)	Pre-paid parking via third party vendor required. Parking provided in surface parking lots. Additional ADA-accessible dedicated spaces available. DRPT has acquired 4.95 acres for development as additional parking accommodations; the project is still in the planning stage, and a timeframe for availability of the increased parking is unknown.
Main Street	30 Long-Term (Paid) *First 30 minutes Free*	Parking provided in surface parking lots.

1. Inventory as of July 2016

3.1.4 Other Regional Transportation Facilities

In addition to the stations that specifically serve the DC2RVA corridor, various other transportation facilities that connect to and through the DC2RVA corridor as summarized below.

Existing Public Transit.

- The following public transit systems serve the DC2RVA corridor (more detail on these transit systems is included in the County-by-County discussion):
- WMATA Metrorail and Metrobus serving Washington, D.C. and Northern Virginia
- Arlington Transit (ART) serving Arlington County, VA
- Alexandria Transit Company (ATC) DASH system serving connection to Metrobus, Metrorail, VRE, and other local bus routes in Alexandria, VA
- Fairfax Connector Bus serving routes connecting to Fairfax County, VA
- OmniRide and OmniLink (Potomac and Rappahannock Transportation Commission (PRTC)) serving Prince William, Stafford, and Spotsylvania Counties and the city of Fredericksburg
- Fredericksburg Regional Transit (FRED) serving the city of Fredericksburg and connecting to Stafford, Spotsylvania, and Caroline Counties
- GRTC (Greater Richmond Transit Company) Transit System serving the city of Richmond and Henrico County and connecting to Chesterfield County

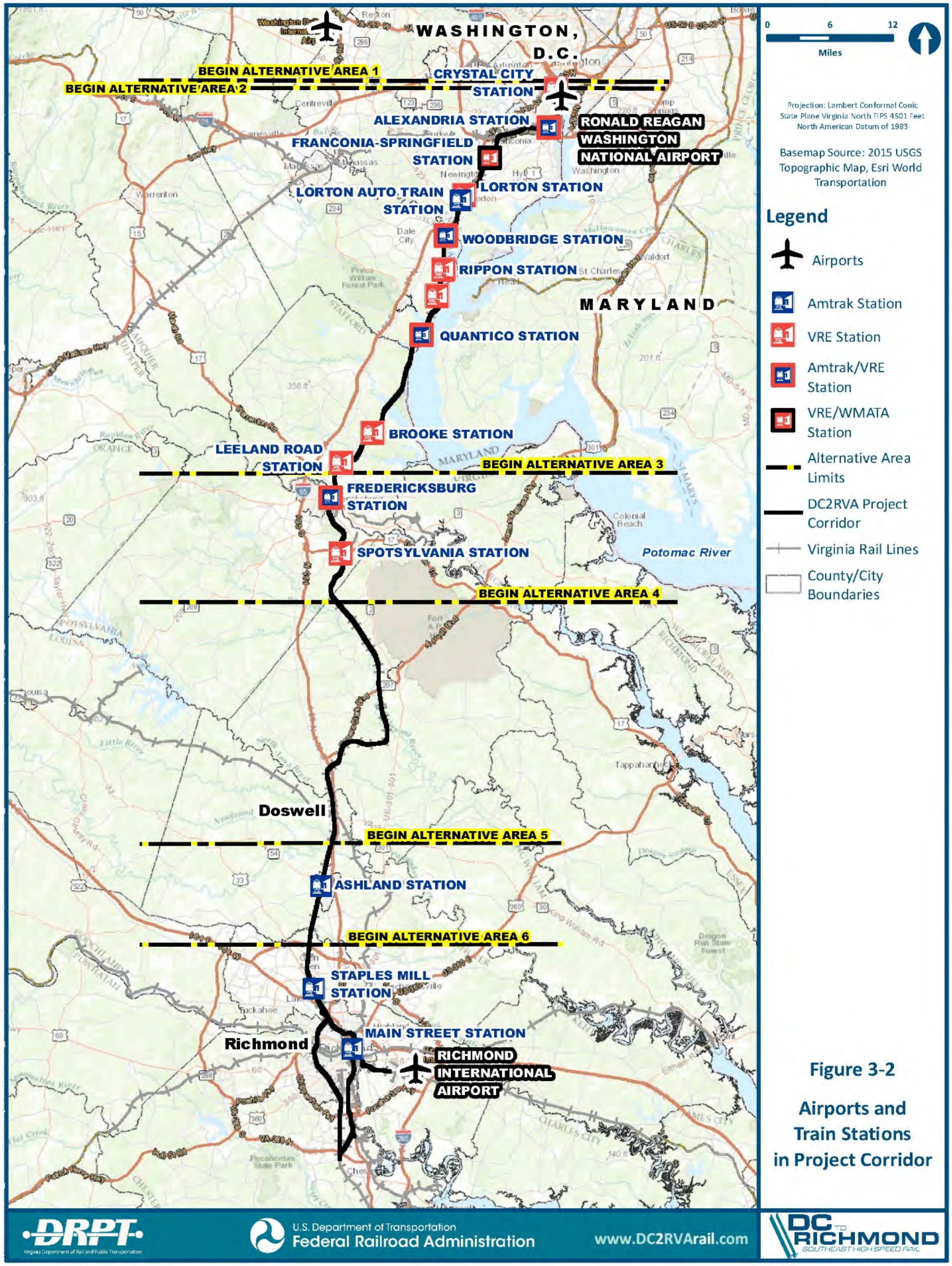


Figure 3-2

Airports and Train Stations in Project Corridor

Washington D.C. and Northern Virginia:

WMATA: Metrobus is the Washington D.C. regional bus system, operated by the Washington Metropolitan Area Transit Authority (WMATA). Metrobus operates 325 routes and provides more than 400,000 weekday trips to 11,500 bus stops in the District of Columbia, Maryland, and Virginia. Metrorail is the Washington D.C. regional rail system, operated by WMATA. Metrorail serves 91 stations connecting Virginia, Maryland, and the District of Columbia and has 117 miles of track. The daily ridership is 700,000. Metrobus and Metrorail serve a population of approximately 4 million within a 1,500-square mile jurisdiction. Metro's paratransit service, MetroAccess, provides about 2.3 million trips per year.

Virginia Railway Express: Virginia Railway Express (VRE) provides commuter rail service on two railroad lines in Fredericksburg and Manassas, Virginia, terminating at Union Station, Washington, DC. VRE is jointly owned and operated by the Northern Virginia Transportation Commission (NVTC) and the Potomac and Rappahannock Transportation Commission (PRTC), collectively referred to as "the Commissions." During fiscal year 2015, VRE operated 32 trains and served an average daily ridership of 18,547, based on 249 service days.

Arlington County: Arlington Transit (ART), operated by Arlington County, provides local bus service to supplement Metrobus with cross-county routes and neighborhood connections to Metrorail stations. ART operates 16 local bus fixed routes with 15 to 30 minute headways. The average weekday ridership was 10,074 between April and June 2015. ART also provides Specialized Transit for Arlington Residents (STAR), a regional paratransit service that provides curb-to-curb shared-ride alternative to MetroAccess. STAR's ridership for fiscal year 2015 was 85,429.

City of Alexandria: The Alexandria Transit Company's (ATC) DASH system provides connections to Metrobus, Metrorail, VRE and local bus systems. DASH operates 13 local fixed routes during morning and evening peak periods. Ridership for December 2015 was 319,646. DOT is Alexandria's on-demand paratransit service.

Fairfax County: The Fairfax Connector Bus, operated by MV Transit, provides bus service throughout Fairfax County. The Fairfax Connector operates 85 routes in Alexandria, Annandale, Burke, Centreville, Chantilly, Fairfax, Falls Church, Fort Belvoir, Herndon, Lorton, McLean, Mount Vernon, Pentagon, Reston, Springfield, Tysons, and Vienna. Headways during the a.m. and p.m. peak are approximately 10 to 30 minutes. FASTRAN is the paratransit service for Fairfax County.

Prince William County: PRTC is a multi-jurisdictional agency representing Prince William, Stafford and Spotsylvania Counties and the Cities of Manassas Park and Fredericksburg. PRTC provides the OmniRide and Metro Direct commuter bus services along the I-95 and I-66 corridors to points north, and the OmniLink and Cross County Connector local bus services in Prince William County and the cities of Manassas and Manassas Park. OmniRide provides weekday service to destinations that include the Pentagon, Crystal City, Rosslyn / Ballston, downtown Washington, D.C., Capitol Hill, the Washington Navy Yard, and Tysons Corner. Metro Direct buses provide weekday connecting service to Franconia Springfield and Tysons Corner Metrorail stations. OmniLink provides demand responsive bus service in eastern Prince William County and the Manassas area. OmniLink can be rerouted to serve locations up to ¾ mile off the route. The Cross County Connector busses connect eastern Prince William and Manassas area, via the

Prince William Parkway. In fiscal year 2013, PRTC had more than 135 buses with a ridership of 3.2 million. PRTC also offers OmniMatch, a free ridesharing service.

City of Fredericksburg, Stafford County, Spotsylvania County, and Caroline County: Fredericksburg Regional Transit (FRED) provides bus service in the city of Fredericksburg, Stafford, Spotsylvania, and Caroline Counties. FRED operates 20 routes, on weekdays and offers special limited late night service on Thursday, Friday, and all day Saturday and Sunday during the University of Mary Washington school year (late August through mid-May). The VRE feeder bus service provides service in the city and Spotsylvania County, and VDOT commuter shuttle in north Stafford County to the Fredericksburg and Spotsylvania VRE stations. Route C1/C2 provides service to Caroline County.

Hanover County: No public local transit service is provided in Hanover County.

Henrico County, City of Richmond, and Chesterfield County: The GRTC Transit System, operated by the city of Richmond and Chesterfield County, provides fixed route bus service and curb-to-curb paratransit service in the Greater Richmond area. GRTC operates over 40 local bus routes within the city of Richmond and Henrico County. Five routes are provided between Downtown Richmond and Henrico County and eight routes provide access between Richmond and Chesterfield County. GRTC also operates express routes on weekdays, with an annual ridership of 230,000.

Planned Transit Improvements. The below are known improvements that are occurring or would occur within the DC2RVA Project timeline, and are included in the regional rail modeling that was developed as part of the Project.

DDOT D.C. Streetcar—In February 2016, DDOT opened the 2.4-mile H Street/Benning Road Streetcar Line. The streetcar line connects Union Station with neighborhoods in Northeast Washington, D.C. Plans exist to extend the current line toward downtown Washington, and construct a larger system of streetcar lines to serve areas without access to the Washington Metro.

WMATA Silver Line Phase II—The Washington region's Metrorail system expanded to include the first phase of the Silver Line in 2014, connecting Tysons, VA to the wider Metro system serving the Greater Washington area. The Washington Metropolitan Area Transit Authority (WMATA), in partnership with Metropolitan Washington Airports Authority (MWAA), is presently constructing an additional 11.5-mile extension with six stations, including one planned to serve Washington Dulles International Airport. Phase II of the Silver Line is expected to be complete by 2020.

Crystal City BRT/Streetcar Corridor (Metroway)—In August 2014, WMATA launched Metroway, a bus rapid transit line connecting Crystal City in Arlington, with Potomac Yards and Braddock Road in Alexandria, VA. The line parallels US Route 1, and consists of separated busways to speed bus travel and reduce congestion. The separated busways were designed with provisions for conversion to a light rail or streetcar right-of-way in the future.

GRTC Broad Street BRT (The Pulse) —The GRTC Transit System (GRTC) is implementing a bus rapid transit (BRT) system along Broad Street in Richmond and western Henrico County. The BRT line, branded "The Pulse," completed an Environmental Assessment in 2014. GRTC received a US Department of Transportation TIGER (Transportation Investment Generating Economic Recovery) grant award of $24.9 million for the construction of The Pulse, and has received additional funding from VDOT and DRPT to implement the project. The Pulse would connect major employment centers in Henrico and downtown Richmond Main Street Station. GRTC is presently completing the final design and beginning construction for the facilities to support the BRT line.

Aviation. (Airport locations are shown in Figure 3-2.)

- Ronald Reagan Washington National Airport (Arlington, VA)
- Richmond International Airport (Richmond, VA)

Bicycle and Pedestrian Facilities On and/or Adjacent To Public Roadways

- Potomac Yard Trail (Alexandria, VA)
- Mount Vernon Trail (Northern Virginia)
- Richmond Capital Trail (from Williamsburg, VA to Richmond, VA)
- Cannon Creek Greenway (Richmond Henrico Turnpike in Richmond, VA)
- Bike lanes (various streets in Richmond, VA and Alexandria, VA)
- US Bike Routes 1 and 76
- Ashland Trolley Line Trail

3.1.5 Regional Highway-Rail Crossing Accident Data

FRA data show that 96 percent of rail-related fatalities, most of which are considered preventable, are the result of accidents at highway-rail crossings and by vehicles trespassing onto the tracks[3]. Highway-rail accident data for public crossings was obtained from the FRA Office of Safety Analysis (OSA) online reporting databases (accessed July 2016 for the most recently available data for each report type). The data was reviewed for types of highway-rail crossing accidents[4] as well as overall incident trends. The tables below present the data for total number of accidents for highway-rail incidents (Table 3-4 and Table 3-5).

In the tables below, the highway-rail crossing accident data for specific counties within the DC2RVA corridor are reported and compared to all other counties within the state. If a DC2RVA county is not listed, no documented collisions in that county were reported during the reporting dates. All counties that have experienced highway-rail-related accidents but are not located in the DC2RVA corridor are grouped together as "Other Counties."

Throughout the Commonwealth of Virginia for the four-year period through the end of 2016, there were a total of 21 highway-rail accidents. Highway-rail accidents consist of an accident between a train and any type of motor vehicle at a public highway-rail crossing. Table 3-4 provides the county-by-county breakdown of these accidents.

In the DC2RVA corridor, seven public at-grade crossings had at least one accident in the four-year period through the end of 2016, as reported in Table 3-5. All accidents involved a train striking a highway user, six of which were automobile vehicles and one of which was a motorcycle; one accident involved pedestrians and resulted in two fatalities. Seven of the eight total accidents occurred at crossings that have non-four-quadrant gates. Any discrepancies between the data in Table 3-4 and Table 3-5 are due to the use of different FRA Office of Safety Analysis data systems and their source data reporting time periods that were available.

Table 3-4: Highway-Rail Accidents at Public Crossings in Virginia

County/ City	Total		Total Calendar Year (CY) Accidents				% Change over Time		
	Accidents	Percent of Total	CY 2013	CY 2014	CY 2015	CY 2016*	CY 2013 to CY 2015	CY 2014 to CY 2015	CY 2015 to CY 2016
Caroline	1	4.8	-	-	1	-	-	-	-
Henrico	1	4.8	-	1	-	-	-	-	-
Richmond	3	14.3	-	1	1	1	-	-	-
Chesterfield	3	14.3	-	-	3	-	-	-	-
Other Counties	13	61.8	1	6	3	3	-	-	-
State Total	21	100	1	8	8	4	700	-	-50.0

Source: FRA OSA, Query Accident / Incident Trends—Highway-Rail Crossings. CY = Calendar Year
*2016 accident data reported from FRA month-to-month for the CY.

Table 3-5: Highway-Rail Accidents in DC2RVA Corridor, by Public Crossing

Crossing	City/County	Total	Year	Warning Device	Circumstance (User)	User Injuries (Fatalities)
Featherstone Road	Prince William	1	2015	Four Quadrant Gates	Train Struck Highway User (Auto)	1 (0)
Myrtle Street	Hanover	1	2012	Gates	Train Struck Highway User (Auto)	1 (0)
Hungary Road	Henrico	1	2014	Gates	Train Struck Highway User (Auto)	0 (0)
Broad Rock Boulevard	Richmond	2	2015	Gates	Train Struck Highway User (Pedestrian)	0 (2)
			2011	Gates	Train Struck Highway User (Motorcycle)	1 (0)
Terminal Avenue	Richmond	1	2011	Gates	Train Struck Highway User (Auto)	0 (0)
Hospital Street / N 7th Street	Richmond	1	2015	Gates	Train Struck Highway User (Auto)	0 (0)
Bells Road	Richmond	1	2014	Gates	Train Struck Highway User (Auto)	0 (0)

While a Corridor-Scale element, it is important to note that "Expected Accident Frequency" at existing at-grade highway-rail corridor crossings is one of the eleven thresholds for at-grade crossing elimination per FHWA's *Railroad-Highway Grade Crossing Handbook*[5] that was used while developing proposed crossing improvements as part of the Build Alternatives for the DC2RVA Project. Therefore, potential reductions for at-grade accidents are inherent in the Build Alternatives for the Project.

3.1.6 Regional Plans (SYIP / TIP / County Planning Documents)

The most recent version of the VDOT SYIP / TIP and the County plans were reviewed to identify planned transportation projects. In addition, safety improvements projects that are identified in the VDOT Highway Safety Improvement Program (HSIP) are included.

SYIP / TIP: The VDOT Six-Year Improvement Program (SYIP) is a document that outlines planned spending for transportation projects proposed for construction development or study for the next six fiscal years. Also, the Statewide Transportation Improvement Program (STIP) is Virginia's federally required four-year program that identifies the transportation projects that will utilize federal transportation funding or require approval from the FHWA or FTA. The STIP includes projects within each of the Metropolitan Planning Organizations (MPOs). The MPOs that are in the DC2RVA Project area are the National Capital Region, Fredericksburg, and Richmond. Both documents, the SYIP and the STIP, were reviewed in order to ensure that any funded projects that could affect the DC2RVA Project area are documented[6]. The SYIP also includes safety projects that are identified as part of the Highway Safety Improvement Program[7] projects

After reviewing the plans for each public crossing, there were 36 crossings that had a project listed in the SYIP and 11 of the projects at these crossings were also listed in the STIP. The county-by-county and MPO-by-MPO distribution of these crossings for each program are as follows:

<u>SYIP (Counties)</u>

Arlington County – 1 crossing

City of Alexandria – 4 crossings

Fairfax County – 2 crossings

Stafford County – 4 crossings

City of Fredericksburg – 1 crossing

Spotsylvania County – 1 crossing

Hanover County – 3 crossings

Henrico County – 1 crossing

City of Richmond – 16 crossings

Chesterfield County – 3 crossings

<u>STIP (MPOs)</u>

National Capital Region – 5 crossings

Richmond – 6 crossings

The main types of projects located at these crossings are bridge rehabilitation, roadway reconstruction, intersection/interchange improvements, roadway widening, improvements to pedestrian/bicycle/bus facilities, and at-grade crossing enhancements. Of these 36 crossings, 28 are located at grade separated crossings while 8 are located at at-grade crossings. The grade separated crossings have a mix of projects, but mostly consist of bridge rehabilitation, roadway reconstruction, intersection/interchange improvements and roadway widening. All at-grade crossings have projects involving roadway widening or reconstruction, crossing enhancements, or intersection improvements.

COUNTY PLANS. Comprehensive plans were reviewed for all counties in the DC2RVA Project area in order to ensure that any potential improvement that could affect the project area is documented. After reviewing the plans for improvements at the public crossings, there are 31 crossings with recommended improvements. The county-by-county distribution of these crossings are as follows:

- Fairfax County – 7 crossings
- Stafford County – 1 crossing
- Spotsylvania County – 2 crossings
- Caroline County – 4 crossings
- Henrico County – 1 crossing
- City of Richmond – 16 crossings

Most of the recommended improvements are roadway widening, intersection/interchange improvements, roadway construction, or at-grade crossing enhancements/elimination. Of these 31 crossings with recommended improvements, 19 are located at grade separated crossings while 12 are located at at-grade crossings. All grade separated crossings are recommended to be widened or to include intersection, interchange, or roadway reconstruction. The at-grade crossings are mainly recommended to have crossing enhancements or elimination, as well as some roadway widening and reconstruction.

3.2 CORRIDOR SCALE

The following section describes the transportation network for a one-mile wide corridor that is centered on the existing CSXT rail line within the EIS Alternative Areas[8]; the DC2RVA corridor scale is shown in Figure 3-1. The transportation network is presented both as a county-by-county overview of general characteristics of land use and facilities, and as a more focused description of the roadway network focused on the highway-rail crossings and their operations.

3.2.1 Transportation Corridor Network (by City/County)

The following paragraphs describe the general transportation characteristics of the DC2RVA corridor, including a summary of total highway-rail crossings (both public and private, at-grade and grade-separated) within each county and/or city. Refer to Section 3.2.2 for more detailed descriptions and data of the DC2RVA corridor crossings.

For reference, the DC2RVA areas are located within the following Counties and/or Cities:

- The Arlington Area (Long Bridge approach) is located within Arlington County.
- The Northern Virginia Area is located within the city of Alexandria, Fairfax County, Prince William County, and Stafford County.

- The Fredericksburg Area is mainly located within Stafford County, the city of Fredericksburg, and Spotsylvania County (with part of the bypass alignment in Caroline County).
- The Central Virginia Area is located within Caroline County and Hanover County.
- The Ashland Area is mainly located within Hanover County (including the town of Ashland).
- The Richmond Area is located within Henrico County, the city of Richmond, and Chesterfield County.

Arlington County / City of Alexandria. Starting from the northern extent of the DC2RVA corridor at the Long Bridge connecting into Washington, D.C., the Project corridor parallels US Route 1 and the George Washington Memorial Parkway and the southern edge of the Capital Beltway through Arlington County and the city of Alexandria, a section of just over 7 rail miles. The rail infrastructure in this area consists of three main line tracks. The Northern Virginia area is one of the most urban in the DC2RVA corridor, with dense development surrounding the DC2RVA corridor. All highway-rail crossings (a total of 11 within this section, 10 public and 1 private) are grade-separated with typically less than 1 mile between adjacent crossings. In downtown Alexandria, for example, adjacent roadway crossings can be within a few hundred feet of each other. Daily vehicle volumes on the crossing roadways range from less than 10,000 vehicles in downtown Alexandria to over 60,000 vehicles on the George Washington Parkway and on Telegraph Road near where it interchanges with I-95. Also adjacent to the DC2RVA corridor is Ronald Reagan Washington National Airport, which is served by Metrorail to the Crystal City Station (VRE only) in Arlington County and the Alexandria Station (Amtrak and VRE, adjacent to Metrorail Station) in the city of Alexandria.

Fairfax County. The DC2RVA corridor in Fairfax County generally parallels the eastern side of I-95, with US Route 1 running further to the east. The 13 miles of this section include either two or three main line tracks. Land use transitions dense urban just south of Alexandria into more suburban, residential development in the southern part of the county; many of the commercial land uses are directly adjacent to I-95 and its interchanges with the crossing roadways of the DC2RVA corridor. All 12 highway-rail crossings within the County are grade-separated within the county and, outside of the city of Alexandria, adjacent crossings are typically 1 to 2 miles apart. The highway-rail crossing with the highest daily vehicle volume in the entire DC2RVA corridor is the crossing of I-95 in the northern part of Fairfax County, just south of the city of Alexandria, with a daily volume of more than 184,000 vehicles. Other crossing roadway volumes range from almost 50,000 daily vehicles on those principal arterial roadways that connect and interchange with I-95 (Franconia Road and Franconia Springfield Parkway) to less than 5,000 daily vehicles on the smaller two-lane local roadways in the suburban southern parts of the county. The Franconia Springfield and Lorton stations (VRE) as well as the Lorton Auto Train Station (Amtrak) are located within the DC2RVA corridor in Fairfax County.

Prince William County. The 12 miles of DC2RVA corridor in Prince William County generally run parallel to I-95, and consist of either two or three main line tracks. For the southern half of the county, the DC2RVA corridor is located within 0.5 mile or less of the west bank of the Potomac River. Much of the land use throughout the DC2RVA corridor is suburban housing development. Crossing roadways typically provide access to these developments, extending from the Potomac River to I-95 and areas to the west. There are a total of 11 crossings in Prince William County. Most of the public crossings are grade-separated, with most of the at-grade crossings located in the southern part of the county; all private crossings are at-grade. The only public at-grade crossing with at least 10,000 daily vehicles is Featherstone Road. The smaller local roadway crossings, such as Daniel K. Ludwig Drive and Possum Point Road, carry less than 500 vehicles per day. The DC2RVA corridor passes through two denser urban areas within the county: Woodbridge and the Marines Corps Base Quantico (MCBQ). Crossings that are located within military installations were categorized by DRPT as private crossings for analysis in the DC2RVA Project; Potomac Avenue, which is located in the Town of Quantico (and not within the MCBQ installation), is a public crossing within Prince William County. Adjacent crossings are within a few hundred feet of each other within these urban areas. As the DC2RVA corridor progresses south, adjacent crossings are farther apart (up to 3 miles apart). Woodbridge and Quantico Stations (Amtrak and VRE) and Rippon Station (VRE) are located within the DC2RVA corridor in Prince William County. Additionally, Potomac Shores Station (VRE) is currently under construction.

Stafford County. In the Stafford County section of the DC2RVA corridor on the RF&P Line, which is approximately 18 miles of either two or three main line tracks, the rail alignment runs along the coast of the Potomac River until it reaches Arkendale/Widewater State Park where it then shifts to the west towards US Route 1 and I-95 which run parallel to each other in close proximity. Within most of this section, land use is generally rural, with large areas of undeveloped, forested land interspersed with relatively small residential communities. The public crossing roadways in the rural areas generally connect these communities together and to US Route 1 and/or I-95. There are a total of 18 roadway crossings of the DC2RVA corridor; 11 are public crossings (most of which are grade-separated) and seven private crossings. Each private crossing typically provides access to one or two residential properties. Land uses transition to suburban as the DC2RVA corridor approaches the city of Fredericksburg. Volumes on the crossing roadways are representative of the adjacent land use densities, with the highest volumes crossing at Kings Highway (grade-separated) located just north of the city; this road is a four-lane median-separated minor arterial roadway carrying more than 25,000 daily vehicles. The lowest volume roadways typically carry several hundred daily vehicles, often providing sole access into small residential communities. In these rural areas, adjacent crossings tend to be located 1 to 3 miles apart. The Brooke and Leeland Road VRE Stations are located in Stafford County.

The portion of the DC2RVA corridor that bypasses the city of Fredericksburg on the bypass alignment splits from the main line track just north of Fredericksburg at Butler Road in Stafford County, along a CSXT single track rail line called the Dahlgren Branch. It continues to the east of the city along Kings Highway then crosses over the Rappahannock River. From there it heads west to meet the main DC2RVA corridor just south of the Spotsylvania VRE Station. This bypass is approximately 13 rail miles long, with six miles of existing rail alignment along the CSXT Dahlgren Branch and seven miles of new track alignment. At the beginning of the split north of Fredericksburg, the area is mostly suburban, but as the DC2RVA corridor moves further away from the city, it becomes more rural. Along the existing Dahlgren Branch track, there are five existing at-grade highway-rail crossings. The roadways in this area carry daily traffic volumes ranging from 150 vehicles on local roadways to 21,000 vehicles on principal arterial roadways. Additionally, the Fredericksburg bypass alignment crosses five public and four private roadways that are not existing rail crossing on the portion of the alignment that would be new track.

City of Fredericksburg. The DC2RVA corridor runs through the eastern part of the city of Fredericksburg for approximately 2 rail miles; the line in the city typically consists of either two or three main line tracks (with sections of three to four tracks that provide yard access in the southern portion of the city) and includes a two-track crossing of the Rappahannock River. This section has dense urban development, typical of a city, on both sides of the DC2RVA corridor. In the most downtown portion of the DC2RVA corridor, adjacent crossings are located within a few hundred feet of each other. There are a total of six public roadway crossings of the DC2RVA corridor, all but one of which are grade-separated (Landsdowne Road, with almost 9,000 vehicles per day, is at-grade). The Fredericksburg Station (Amtrak and VRE) is located between Lafayette Boulevard (to the northwest) and Frederick Street (to the south-east); these two streets generally parallel the DC2RVA corridor through downtown. The Blue and Gray Parkway (US Route 3), a principal arterial roadway that crosses the DC2RVA corridor, carries more than 40,000 vehicles per day. Other crossing roadways in the city limits generally carry between 2,000 and 10,000 vehicles per day.

Spotsylvania County. The RF&P Line portion of the DC2RVA corridor traverses 8 miles of either two or three main line tracks through the eastern corner of Spotsylvania County, with sections of three to four tracks through the area near the US-17 (Mills Drive) crossing to provide yard access. This part of the county is generally rural, with large areas of the DC2RVA corridor crossing through undeveloped, forested land and farms. There are four roadway crossings of the DC2RVA corridor in the county; two are at-grade crossings of local roads and two are grade-separated crossings. The Spotsylvania Station (VRE) is located within Spotsylvania County. The Fredericksburg bypass alignment crosses through a portion of the county as it connects back to the RF&P line; there are no existing highway-rail crossings on this portion of the bypass alignment as it would be new track.

Caroline County. The RF&P Line portion of the DC2RVA corridor, consisting of 25 rail miles consisting of two main line tracks, travels through the central part of Caroline County. The DC2RVA corridor begins veering to the east towards Bowling Green and the Richmond Turnpike before making its way back toward US Route 1 and I-95 in Ruther Glen and continues to run south between these two roadways. Most of the land use in this long section of DC2RVA corridor is rural, with large areas of the DC2RVA corridor crossing through undeveloped, forested land and farms. There are a total of 22 roadways crossings in the county: 12 public roadway crossings, and 10 private crossings that typically provide access to residences and farm lands. Most of the public crossings are at-grade, which is typical of a more rural area, with adjacent crossings 1.5 to 5 miles apart. In the southern part of the county, the DC2RVA corridor crosses I-95; this grade-separated crossing is one of the highest volume crossings in the DC2RVA corridor, with almost 100,000 daily vehicles. Additionally, the Fredericksburg bypass alignment crosses through a portion of the north-western corner of the county as it connects back to the RF&P line; there are no existing highway-rail crossings on this portion of the bypass alignment.

Hanover County. The RF&P Line of the DC2RVA corridor traverses central Hanover County as just over 13 miles of two main line tracks. The DC2RVA corridor runs between US Route 1 and I-95 until just north of the town of Ashland where it crosses over US Route 1 and continues on the west side of both of these roadways. Outside the town of Ashland, land use in the DC2RVA corridor is generally rural or suburban. There are 17 roadway crossings of the DC2RVA corridor in the county, 11 of which are at-grade public crossings and 5 of which are public grade-separated crossings (there is also one private grade-separated crossing in the county). Seven of the public at-grade crossings are within the limits of the town of Ashland. Through Ashland, which includes development typical of a small town business district that extends approximately two blocks in either direction, the rail line runs down the median of Center Street through the downtown commercial area, as well as the campus of Randolph-Macon College and residential areas north and south of the commercial district. Adjacent roadway crossings within the town are less than 0.5 mile apart, with some located within a few hundred feet of each other. Center Street operates as two one-way roadways (one on each side of the rail line). The main roadway in the town is England Street/Thompson Street (Route 54), which crosses the DC2RVA corridor adjacent to the Ashland Station at a five-way roadway intersection that includes both sides of Center Street and Hanover Avenue. This roadway crossing is one of the highest volume (14,000 daily vehicles) at-grade crossings in the DC2RVA corridor. There are also 11 at-grade pedestrian crossings of the DC2RVA corridor within the town of Ashland. The 11 pedestrian crossings consist of approximately three feet wide wood or composite platforms placed between the tracks and rails. The pedestrian crossings do not have active warning devices (flashing lights, bells, and crossing gates activated by approaching trains), although many of the pedestrian crossings are located near or adjacent to at-grade roadway crossings with approach-activated flashing lights, bells, and gates. Outside of the town of Ashland, the roadway crossings generally carry a few hundred to several thousand vehicles per day, depending on the type of roadway served, and are typically located within 1 to 2 miles of each other.

The Ashland Bypass alignment splits from the RF&P Line after the Old Ridge Road crossing just north of the town of Ashland. It runs west of the town towards the intersection of West Patrick Henry Road and Independence Road. After passing between Kings Pond and Lucks Pond, the alignment begins to veer back to the east towards the main DC2RVA corridor where it merges just before the Elmont Road crossing. This section consists of just over 7 miles of new construction. Most of the roads in this area are either minor collector or local roads with daily volumes ranging from 500 to 900 vehicles, or major collector or minor arterial roads with daily volumes ranging from 2,000 to 8,000 vehicles. There are no existing highway-rail crossings on the Ashland Bypass alignment as the entire alignment would be new track.

Henrico County. The DC2RVA corridor in Henrico County quickly transitions from more rural and light suburban land use patterns into denser suburban residential and commercial development as it moves towards the city of Richmond. This section, which consists of just over 8 miles of either two or three main line tracks, is typified by residential areas and collector-type crossing roadways that connect neighborhoods to the major roadway arteries of Staples Mill Road (Route 33), US Route 1, and I-95. The DC2RVA corridor generally parallels Route 33 for the southern portion of the county, and crosses both I-295 and I-64. There are a total of 10 public roadway crossings in the county, six of which are grade-separated. Roadway crossings in the county are typically located within a mile or less of an adjacent crossing. In general, the at-grade crossings are located within the more suburban northern areas of the county, transitioning to mostly grade-separated crossings closer to the city of Richmond. Henrico County has one of the highest volume at-grade crossings in the DC2RVA corridor (Hungary Road with 16,000 daily vehicles) as well as one of the highest volume grade-separated crossings (I-64 with 140,000 daily vehicles). The Staples Mill Road Amtrak Station serves Henrico County and is located just north of I-64 along Staples Mill Road. The Richmond International Airport is located approximately 8 miles east of the DC2RVA corridor.

City of Richmond. The DC2RVA corridor splits north of Richmond into two lines, one to the east and one to the west of the city. The A-Line runs west of the city along I-195 and Route 76 until it crosses over the James River where it runs parallel to Westover Hills Boulevard and Belt Boulevard. This line is approximately 9.5 miles long and consists of two main line tracks with 23 public highway-rail crossings (five at-grade and 18 grade-separated). The S-Line runs east of the city along I-64 and continues south through downtown Richmond along I-95. The Main Street Amtrak Station is located along this line. The S-Line is just over 10 miles long and consists of either one or two main line tracks with 34 highway-rail crossings (30 public and four private). In the city, adjacent crossings are generally within 0.3 miles of each other and are mostly grade-separated; as the two rail lines move away from the city to the more suburban areas, adjacent crossings are typically between 0.3 miles and 1 mile. Of the at-grade crossings in the DC2RVA corridor, Broad Rock Boulevard on the A-Line has the highest daily volume of 19,000 vehicles. There are two main interstates in Richmond—I-95 and I-64—with multiple crossings that have some of the highest daily vehicle volumes for grade-separated crossings in the DC2RVA corridor: I-95 carries volumes over 130,000 vehicles per day and I-64 carries over 95,000 vehicles per day.

Chesterfield County. There are two different lines of the DC2RVA corridor in Chesterfield County: the A-Line to the west, and the S-Line to the east. The A-Line runs west of and parallel to US Route 301. This line is approximately 5 rail miles of two main line tracks with nine public crossings (three at-grade and six grade-separated). The northern portion of this line is more suburban with mostly grade-separated crossings that are generally within 0.3 miles of each other, whereas the southern portion is rural and consists of at-grade crossings about 0.5 miles from each other. The S-Line runs parallel between US Route 301 and I-95. This line is about 5.5 rail miles of either one or two main line tracks with 11 highway-rail crossings (7 public crossings and 4 private crossings). The northern portion of this line is more suburban or industrial with private crossings or public grade-separated crossings while the southern portion is rural with at-grade crossings. The crossings in Chesterfield County consist of either major freeways / expressways or principal arterial roads with daily volumes of over 20,000 vehicles, or local roads or major collectors with volumes under 5,000 vehicles per day. The A-Line and S-Line meet between Route 288 and Old Lane, which is the southern terminus of the DC2RVA Project.

3.2.2 Roadway Network–Corridor Crossings

This section summarizes the roadway network by highway-rail corridor crossings of all public and private facilities, presented in the following order:

- Summary of existing crossings
- Summary of public
- Public at-grade crossings
- Summary of private crossings
- Private at-grade crossings

Following the summary of the existing crossings, additional details of the at-grade crossings are provided. While the proposed DC2RVA Project may affect crossings in the corridor that are currently grade-separated (by increasing or decreasing roadway traffic on these crossings, for example), potential effects are likely to be greater at locations that are currently at-grade since some of these locations could become candidates for crossing elimination (i.e., constructing a roadway (or rail) bridge to separate the rail traffic from the roadway traffic or crossing closure, which could affect existing traffic conditions and/or operations. Accordingly, the discussion in this section, therefore, focuses on the at-grade crossings because of the higher potential effects compared to grade-separated crossings.

3.2.2.1 Summary of Existing Crossings

The highway-rail crossings in the DC2RVA corridor include both at-grade crossings and grade-separated crossings, with public and private crossings of both types. There are 200 existing highway-rail crossings in the DC2RVA corridor, as summarized in Table 3-6 below. A summary of the locations of all existing roadway crossings are shown in Figure 3-3.

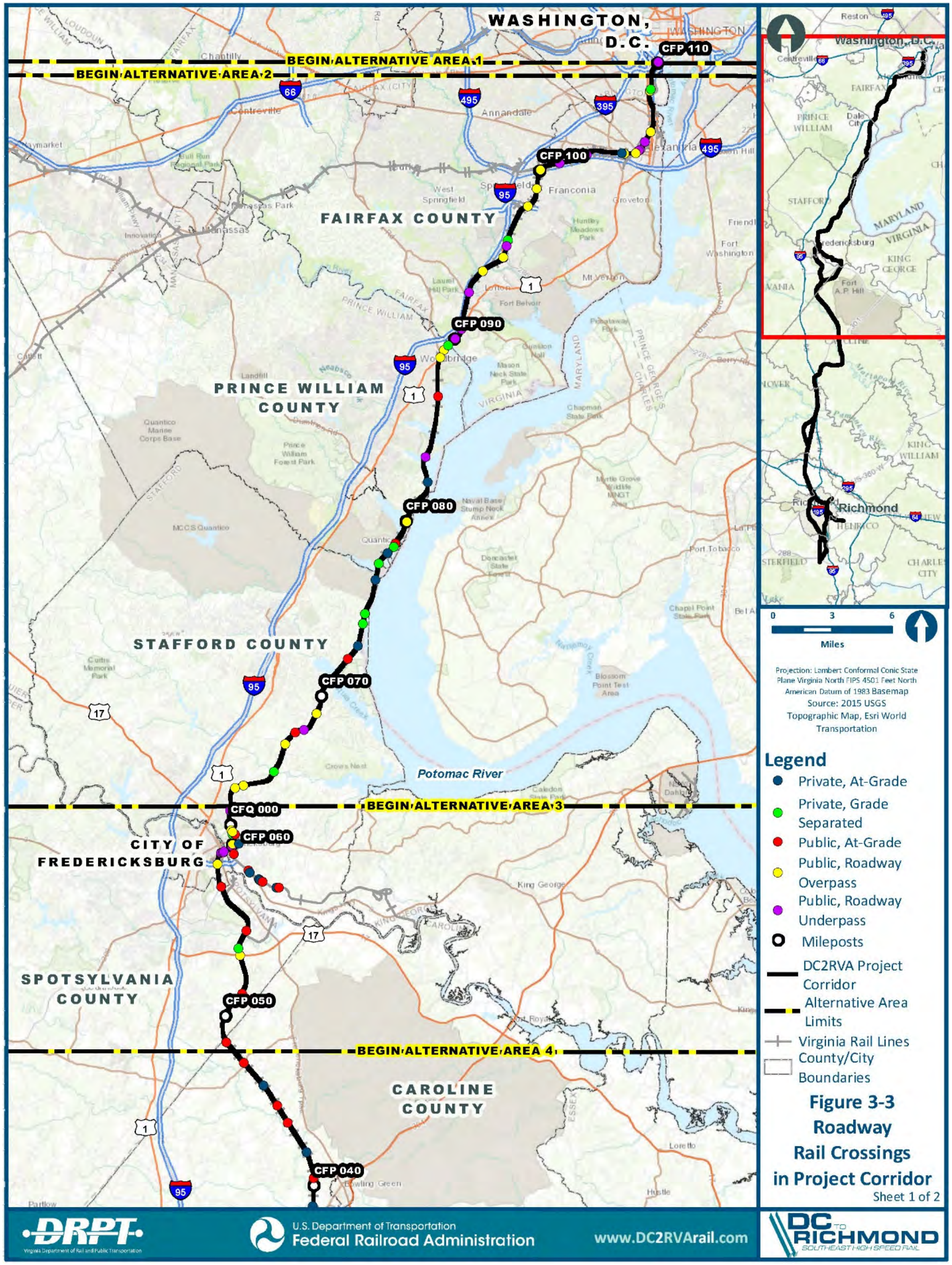


Figure 3-3 Roadway Rail Crossings in Project Corridor
Sheet 1 of 2

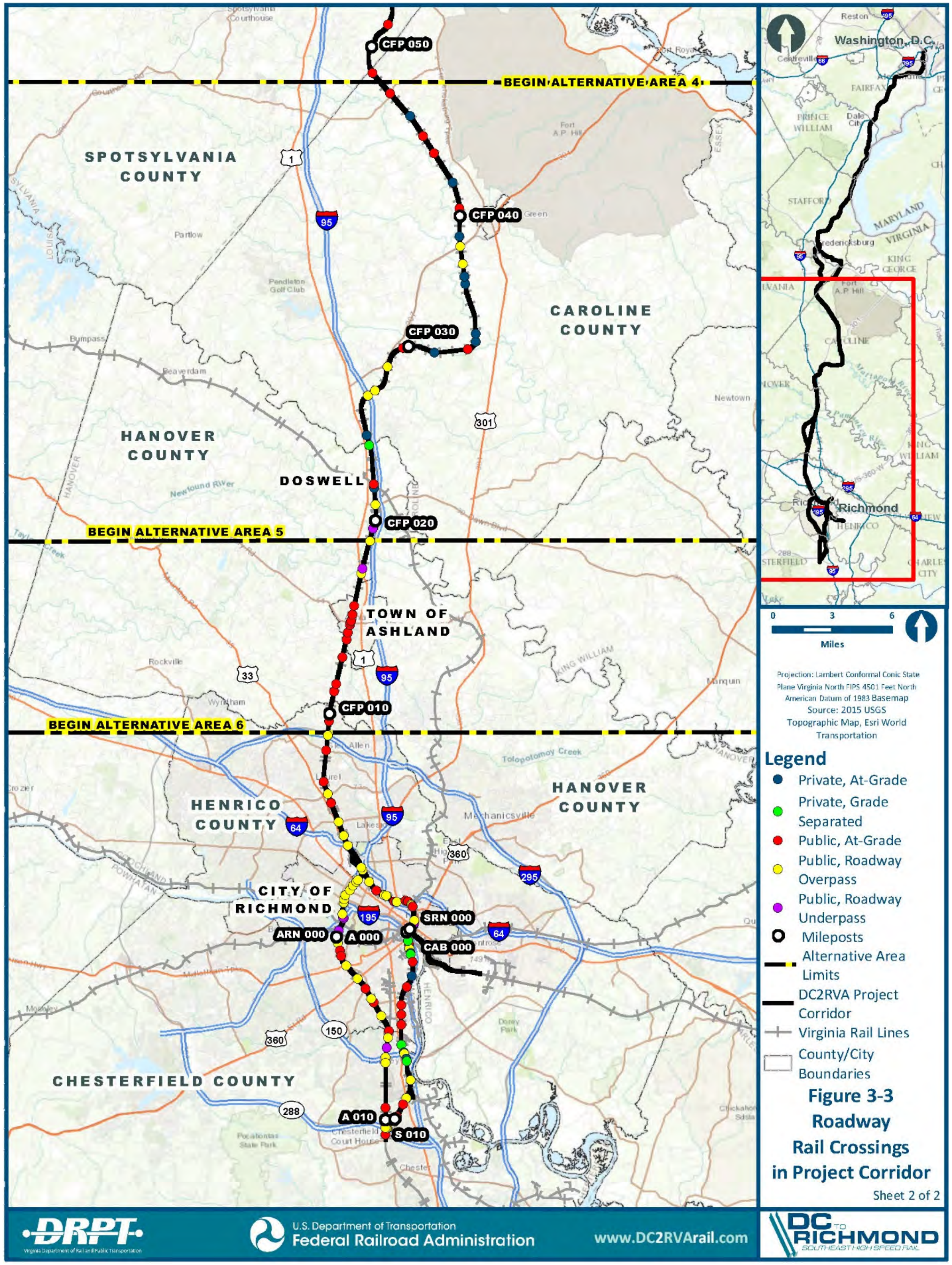


Figure 3-3
Roadway Rail Crossings in Project Corridor
Sheet 2 of 2

Table 3-6: Existing Highway-Rail Crossings in the DC2RVA Corridor

Alternative Area	Public		Private		Totals (By Area)
	At-Grade	Grade-Separated	At-Grade	Grade-Separated	
Area 1: Arlington	0	1	0	0	1
Area 2: Northern Virginia	4	29	5	9	47
Area 3: Fredericksburg	9	11	5	2	27
Area 4: Central Virginia	7	7	10	1	25
Area 5: Ashland	11	4	0	0	15
Area 6: Richmond	24	53	4	4	85
Totals (by Crossing Type):	55	105	24	16	200

Note that the I-295 crossing is located at the boundary between the Ashland area and the Richmond area; it is included in the total for the Richmond area only in this table. This table includes the existing public crossing(s) in the Franconia to Occoquan Project (which is the subject of a separate Categorical Exclusion) as well as in the Powell's Creek to Arkendale section for reference.

In addition to the existing crossings of the DC2RVA corridor, the new track sections of the two bypass alignments would cross roadways that are not currently railroad crossings. Note that Virginia state code[9] restricts the creation of new at-grade crossings, so all new crossings would be grade-separated, with potential roadway realignment and/or closure. The Fredericksburg bypass alignment would cross five public roadways, and the Ashland bypass alignment would cross eight public roadways that are not currently highway-rail crossings; both bypass alignments would additionally cross numerous private roadways that currently mainly act as driveways and access to private property. The existing roadway crossings along the Dahlgren Spur (i.e., Fredericksburg bypass) are include in the figures within this section.

3.2.2.2 Summary of Public Crossings

The 160 public at-grade and grade-separated crossings are summarized in Table 3-7; data includes rail line, crossing type, roadway functional classification per VDOT, and daily traffic. This table include any new crossings that could be created as part of the DC2RVA Project. The exact location (CFP milepost) and name of each of these crossings are presented by alternative area in Figure 3-4 through Figure 3-9.

Table 3-7: Summary of Public Crossings (By Alternative Area)

Jurisdiction (County / City)	Crossing Name	Rail Line[1]	Mile-post	Crossing Type	Functional Classification[2]	AADT[3] (2015)
Arlington (Long Bridge Approach) (Alternative Area 1)						
Arlington	George Washington Parkway	RF&P	CFP 110.07	Roadway Underpass	Other Freeway /Expressway	63,240
Northern Virginia (Alternative Area 2)						
Arlington	VA 233 / Airport Access	RF&P	CFP 108.48	Roadway Overpass	Minor Arterial	23,460

Table 3-7: Summary of Public Crossings (By Alternative Area)

Jurisdiction (County / City)	Crossing Name	Rail Line[1]	Mile-post	Crossing Type	Functional Classification[2]	AADT[3] (2015)
Alexandria	US Route 1 / N Henry Street	RF&P	CFP 106.44	Roadway Overpass	Other Principal Arterial	47,940
	E Braddock Road	RF&P	CFP 105.84	Roadway Underpass	Minor Arterial	7,344
	Commonwealth Avenue / Daingerfield Road	RF&P	CFP 105.38	Roadway Underpass	Major Collector	6,222
	King Street	RF&P	CFP 105.33	Roadway Underpass	Other Principal Arterial	16,320
	Duke Street	RF&P	CFP 105.10	Roadway Overpass	Other Principal Arterial	22,440
	Telegraph Road	RF&P	CFP 104.54	Roadway Overpass	Minor Arterial	61,200
	Eisenhower Avenue	RF&P	CFP 102.55	Roadway Underpass	Minor Arterial	12,240
	Eisenhower Avenue Connector	RF&P	CFP 102.37	Roadway Underpass	Major Collector	14,280
Fairfax	S Van Dorn Street	RF&P	CFP 101.14	Roadway Underpass	Minor Arterial	48,960
	I-95/ I-495	RF&P	CFP 100.04	Roadway Overpass	Interstate	185,640
	Franconia Road	RF&P	CFP 99.10	Roadway Overpass	Minor Arterial	32,640
	Franconia - Springfield Parkway	RF&P	CFP 98.06	Roadway Overpass	Other Principal Arterial	48,960
	Newington Road	RF&P	CFP 95.75	Roadway Underpass	Major Collector	9,588
	Backlick Road	RF&P	CFP 95.15	Roadway Overpass	Local	2,142
	Fairfax County Parkway	RF&P	CFP 95.10	Roadway Overpass	Other Principal Arterial	37,740
	Pohick Road	RF&P	CFP 93.85	Roadway Overpass	Minor Arterial	12,240
	Lorton Road	RF&P	CFP 92.56	Roadway Underpass	Minor Arterial	21,420
	Jefferson Davis Highway	RF&P	CFP 90.66	Roadway Underpass	Other Principal Arterial	37,740
	Furnace Road	RF&P	CFP 90.04	Roadway Underpass	Minor Collector	1,326
Prince William	Railroad Avenue	RF&P	CFP 89.23	Roadway Overpass	Local	510
	Dawson Beach Road	RF&P	CFP 88.79	Roadway Overpass	Major Collector	7,344
	Featherstone Road	RF&P	CFP 86.85	At-Grade	Major Collector	10,200
	Daniel K Ludwig Drive / Powells Creek	RF&P	CFP 83.66	Roadway Underpass	Local	194

Table 3-7: Summary of Public Crossings (By Alternative Area)

Jurisdiction (County / City)	Crossing Name	Rail Line[1]	Mile-post	Crossing Type	Functional Classification[2]	AADT[3] (2015)
	Possum Point Road	RF&P	CFP 80.02	Roadway Overpass	Local	326
	Potomac Avenue	RF&P	CFP 78.79	At-Grade	Local	7,140
Stafford	Brent Point Road	RF&P	CFP 72.35	At-Grade	Local	541
	Courthouse Road	RF&P	CFP 69.09	Roadway Overpass	Major Collector	561
	Andrew Chapel Road	RF&P	CFP 68.01	Roadway Underpass	Major Collector	5,406
	Mount Hope Church Road	RF&P	CFP 67.54	At-Grade	Local	214
	Eskimo Hill Road	RF&P	CFP 66.77	Roadway Overpass	Major Collector	1,632
	Leeland Road	RF&P	CFP 63.47	Roadway Overpass	Major Collector	11,220
	Primmer House Road	RF&P	CFP 63.02	Roadway Overpass	Major Collector	10,200
Fredericksburg (Alternative Area 3)						
Stafford	Harrell Road	RF&P	CFP 61.79	Roadway Underpass	Minor Collector	3,876
	Butler Road / White Oak Road	RF&P	CFP 60.81	Roadway Overpass	Minor Arterial	15,300
	Kings Highway	RF&P	CFP 60.04	Roadway Overpass	Minor Arterial	26,520
	Naomi Road	RF&P	CFP 59.97	Roadway Underpass	Local	663
Fredericksburg	Sophia Street	RF&P	CFP 59.46	Roadway Underpass	Major Collector	5,712
	Caroline Street	RF&P	CFP 59.40	Roadway Underpass	Minor Arterial	2,346
	Princess Anne Street	RF&P	CFP 59.33	Roadway Underpass	Minor Arterial	2,754
	Charles Street	RF&P	CFP 59.27	Roadway Underpass	Major Collector	5,916
	Blue and Gray Parkway	RF&P	CFP 58.68	Roadway Overpass	Other Principal Arterial	40,800
	Landsdowne Road	RF&P	CFP 57.51	At-Grade	Major Collector	8,772
Spotsylvania	Mine Road	RF&P	CFP 54.77	At-Grade	Major Collector	5,202
	Mills Drive	RF&P	CFP 53.45	Roadway Overpass	Other Principal Arterial	14,280
	Summit Crossing Road	RF&P	CFP 51.45	At-Grade	Local	408
Caroline	Claiborne Crossing Road	RF&P	CFP 48.63	At-Grade	Local	479
Stafford	Cool Spring Road	FBP	CFQ 0.37	Roadway Overpass	Major Collector	13,260
	Debruen Lane	FBP	CFQ 0.53	At-Grade	Local	510
	Ferry Road	FBP	CFQ 1.70	At-Grade	Major Collector	9,180
	Federal Drive	FBP	CFQ 2.89	At-Grade	Local	1,326

Table 3-7: Summary of Public Crossings (By Alternative Area)

Jurisdiction (County / City)	Crossing Name	Rail Line[1]	Mile-post	Crossing Type	Functional Classification[2]	AADT[3] (2015)
	Little Falls Road	FBP	CFQ 3.80	At-Grade	Local	153
	Forest Lane Road	FBP	CFQ 4.68	At-Grade	Local	1,428
	Kings Highway – Route 3	FBP	*(new)*	*No Existing Crossing*	Other Principal Arterial	21,420
Spotsylvania	Mills Drive – Route 17	FBP	*(new)*	*No Existing Crossing*	Other Principal Arterial	6,324
	Fredericksburg Turnpike – Route 2	FBP	*(new)*	*No Existing Crossing*	Minor Arterial	5,100
	Thorton Rolling Road – Route 609	FBP	*(new)*	*No Existing Crossing*	Minor Collector	2,652
	Patriot Lane	FBP	*(new)*	*No Existing Crossing*	Local	510
Central Virginia (Alternative Area 4)						
Caroline	Stonewall Jackson Road	RF&P	CFP 47.27	At-Grade	Major Collector	1,938
	Woodford Road	RF&P	CFP 44.54	At-Grade	Local	388
	Woodslane Road	RF&P	CFP 43.51	At-Grade	Local	102
	Paige Road	RF&P	CFP 40.40	At-Grade	Minor Collector	479
	Route 207	RF&P	CFP 38.49	Roadway Overpass	Other Principal Arterial	11,220
	Nelson Hill Road	RF&P	CFP 37.60	Roadway Overpass	Major Collector	1,836
	Penola Road	RF&P	CFP 33.00	At-Grade	Local	428
	Colemans Mill Road	RF&P	CFP 29.70	At-Grade	Local	449
	Dry Bridge Road	RF&P	CFP 28.38	Roadway Overpass	Local	949
	Ruther Glen Road	RF&P	CFP 26.93	Roadway Overpass	Major Collector	2,142
	I-95	RF&P	CFP 26.51	Roadway Overpass	Interstate	99,960
Hanover	Doswell Road	RF&P	CFP 21.88	At-Grade	Local	316
	Kings Dominion Boulevard	RF&P	CFP 20.81	Roadway Overpass	Minor Arterial	5,100
	Taylorsville Road	RF&P	CFP 19.59	Roadway Underpass	Local	184
Ashland (Alternative Area 5)						
Hanover	Old Ridge Road	RF&P	CFP 18.96	Roadway Overpass	Major Collector	1,122
	Elletts Crossing Road	RF&P	CFP 17.51	Roadway Underpass	Minor Collector	133
	US Route 1	RF&P	CFP 17.23	Roadway Overpass	Minor Arterial	8,160
	W Vaughan Road / Henry Street	RF&P	CFP 15.64	At-Grade	Local	1,326
	W Patrick Street	RF&P	CFP 15.21	At-Grade	Minor Collector	304

Table 3-7: Summary of Public Crossings (By Alternative Area)

Jurisdiction (County / City)	Crossing Name	Rail Line[1]	Mile-post	Crossing Type	Functional Classification[2]	AADT[3] (2015)
	College Avenue / Henry Clay Street	RF&P	CFP 14.90	At-Grade	Major Collector	1,326
	England Street / Thompson Street	RF&P	CFP 14.77	At-Grade	Minor Arterial	14,280
	Myrtle Street	RF&P	CFP 14.66	At-Grade	Major Collector	1,836
	E Francis Street	RF&P	CFP 14.22	At-Grade	Local	1,428
	Ashcake Road	RF&P	CFP 13.85	At-Grade	Minor Arterial	7,752
	Gwathmey Church Road	RF&P	CFP 12.94	At-Grade	Minor Collector	163
	Elmont Road	RF&P	CFP 11.54	At-Grade	Major Collector	2,142
	Cedar Lane	RF&P	CFP 11.15	At-Grade	Major Collector	1,938
Henrico	Greenwood Road	RF&P	CFP 9.94	Roadway Overpass	Major Collector	1,530
	Mill Road	RF&P	CFP 9.65	At-Grade	Major Collector	2,754
	I-295 (Northbound only)	RF&P	CFP 8.94	Roadway Overpass	Interstate	62,220
Hanover	Washington Highway – Route 1	ABP	(new)	*No Existing Crossing*	Minor Arterial	8,160
	Cross Corner Road – Route 641	ABP	(new)	*No Existing Crossing*	Minor Collector	530
	Blunts Bridge Road	ABP	(new)	*No Existing Crossing*	Minor Collector	551
	Independence Road	ABP	(new)	*No Existing Crossing*	Minor Collector	949
	W Patrick Henry Road	ABP	(new)	*No Existing Crossing*	Minor Arterial	6,834
	Yowell Road	ABP	(new)	*No Existing Crossing*	Local	775
	Ashcake Road – Route 657	ABP	(new)	*No Existing Crossing*	Minor Arterial	5,406
	Elmont Road – Route 626	ABP	(new)	*No Existing Crossing*	Major Collector	2,346
Richmond (Alternative Area 6)						
Henrico	I-295 (Southbound only)	RF&P	CFP 8.94	Roadway Overpass	Interstate	62,220
	Mountain Road	RF&P	CFP 8.15	At-Grade	Minor Arterial	5,304
	Hungary Road	RF&P	CFP 6.59	At-Grade	Minor Arterial	16,320
	E Parham Road	RF&P	CFP 5.94	Roadway Overpass	Other Principal Arterial	26,520
	Hermitage Road	RF&P	CFP 5.43	At-Grade	Major Collector	4,284
	Hilliard Road	RF&P	CFP 4.44	Roadway Overpass	Minor Arterial	16,320
	Dumbarton Road	RF&P	CFP 3.70	Roadway Overpass	Minor Arterial	15,300
	I-64	RF&P	CFP 3.15	Roadway Overpass	Interstate	140,760

Table 3-7: Summary of Public Crossings (By Alternative Area)

Jurisdiction (County / City)	Crossing Name	Rail Line[1]	Mile-post	Crossing Type	Functional Classification[2]	AADT[3] (2015)
Richmond	I-195	RF&P	CFP 1.84	Roadway Overpass	Interstate	77,520
	Westwood Avenue / Saunders Avenue	RF&P	CFPD 1.73	Roadway Overpass	Minor Arterial	12,240
	I-195 Northbound	A-LINE	ARN 3.17	Roadway Overpass	Interstate	74,460
	W Broad Street	A-LINE	ARN 3.02	Roadway Overpass	Other Principal Arterial	9,690
	Monument Avenue	A-LINE	ARN 2.77	Roadway Overpass	Minor Arterial	24,480
	Patterson Avenue	A-LINE	ARN 2.49	Roadway Overpass	Other Principal Arterial	8,772
	Grove Avenue	A-LINE	ARN 2.18	Roadway Overpass	Minor Arterial	11,220
	W Cary Street	A-LINE	ARN 1.92	Roadway Overpass	Other Principal Arterial	15,300
	I-195 Southbound	A-LINE	ARN 1.79	Roadway Overpass	Interstate	9,078
	Douglasdale Road	A-LINE	ARN 1.21	Roadway Overpass	Major Collector	510
	Powhite Parkway Southbound	A-LINE	ARN 1.07	Roadway Underpass	Other Freeway /Expressway	26,520
	Powhite Parkway Northbound	A-LINE	ARN 1.01	Roadway Underpass	Other Freeway /Expressway	94,860
	Riverside Drive	A-LINE	ARN 0.32	Roadway Underpass	Local	510
	Forest Hill Avenue	A-LINE	A 0.31	Roadway Overpass	Minor Arterial	20,400
	Jahnke Road	A-LINE	A 0.68	At-Grade	Minor Arterial	12,240
	Bassett Avenue	A-LINE	A 1.01	At-Grade	Local	1,399
	Midlothian Turnpike	A-LINE	A 1.54	Roadway Overpass	Other Principal Arterial	22,440
	Hull Street Road	A-LINE	A 2.43	Roadway Overpass	Other Principal Arterial	24,480
	Broad Rock Boulevard	A-LINE	A 3.08	At-Grade	Other Principal Arterial	19,380
	Hopkins Road	A-LINE	A 3.67	Roadway Overpass	Minor Arterial	8,772
	Terminal Avenue	A-LINE	A 3.88	At-Grade	Major Collector	683
	Warwick Road	A-LINE	A 4.66	Roadway Overpass	Minor Arterial	11,220
	Walmsley Boulevard	A-LINE	A 5.54	At-Grade	Minor Arterial	4,998
Chesterfield	Castlewood Road / Cardwell Road	A-LINE	A 5.85	Roadway Overpass	Local	1,122
	Cogbill Road	A-LINE	A 6.37	Roadway Underpass	Major Collector	3,876

Table 3-7: Summary of Public Crossings (By Alternative Area)

Jurisdiction (County / City)	Crossing Name	Rail Line[1]	Mile-post	Crossing Type	Functional Classification[2]	AADT[3] (2015)
	Chippenham Parkway	A-LINE	A 6.84	Roadway Overpass	Other Freeway /Expressway	60,180
	S Beulah Road / Dundas Road	A-LINE	A 7.13	Roadway Overpass	Major Collector	5,100
	Kingsland Road	A-LINE	A 9.37	At-Grade	Major Collector	2,142
	Thurston Road	A-LINE	A 10.00	At-Grade	Local	459
	Route 288 Northbound	A-LINE	A 10.36	Roadway Overpass	Other Freeway /Expressway	19,890
	Route 288 Southbound	A-LINE	A 10.38	Roadway Overpass	Other Freeway /Expressway	19,890
	Old Lane	A-LINE and S-LINE	A 10.74	At-Grade	Major Collector	4,896
Richmond	North Boulevard	S-LINE	SRNX 3.94	Roadway Overpass	Other Principal Arterial	21,420
	Hermitage Road	S-LINE	SRN 3.37	At-Grade	Minor Arterial	10,200
	I-64 / I-95	S-LINE	SRN 2.93	Roadway Overpass	Interstate	138,720
	N Lombardy Street	S-LINE	SRN 2.83	Roadway Overpass	Major Collector	7,752
	Brook Road	S-LINE	SRN 2.34	At-Grade	Minor Arterial	8,262
	N Belvidere Street	S-LINE	SRN 2.24	Roadway Overpass	Other Principal Arterial	22,440
	Chamberlayne Parkway	S-LINE	SRN 2.20	Roadway Overpass	Major Collector	7,548
	St James Street	S-LINE	SRN 1.75	At-Grade	Local	1,000
	N 1st Street	S-LINE	SRN 1.64	Roadway Overpass	Major Collector	3,774
	N 2nd Street / Valley Road	S-LINE	SRN 1.60	At-Grade	Local	2,142
	N 5th Street	S-LINE	SRN 1.36	Roadway Overpass	Major Collector	3,978
	I-64	S-LINE	SRN 1.30	Roadway Overpass	Interstate	95,880
	Hospital Street / N 7th Street	S-LINE	SRN 1.24	At-Grade	Minor Arterial	5,814
	Leigh Street	S-LINE	CA S 85.7	Roadway Overpass	Minor Arterial	11,220
	I-95 Off Ramp to 17th Street	S-LINE	SRN 0.43	Roadway Overpass	Interstate Ramp	6,018
	E Marshall Street	S-LINE	SRN 0.30	Roadway Underpass	Local	510
	E Broad Street	S-LINE	SRN 0.23	Roadway Underpass	Other Principal Arterial	26,520
	E Main Street	S-LINE	SRN 0.00	Roadway Underpass	Other Principal Arterial	21,420
	I-95	S-LINE	S 0.15	Roadway Overpass	Interstate Ramp	130,560

Table 3-7: Summary of Public Crossings (By Alternative Area)

Jurisdiction (County / City)	Crossing Name	Rail Line[1]	Mile-post	Crossing Type	Functional Classification[2]	AADT[3] (2015)
	E Cary Street	S-LINE	S 0.08	Roadway Underpass	Local	510
	Dock Street	S-LINE	S 0.16	Roadway Underpass	Major Collector	510
	Ramps between I-195 and I-95	S-LINE	S 0.17	Roadway Overpass	Interstate Ramp	24,480
	Byrd Street	S-LINE	S 0.19	Roadway Underpass	Local	510
	Maury Street	S-LINE	S 0.78	At-Grade	Local	2,589
	I-95 / Maury Street Ramp	S-LINE	S 0.97	Roadway Overpass	Interstate Ramp	19,951
	Goodes Street	S-LINE	S 1.66	At-Grade	Local	204
	E Commerce Road	S-LINE	S 2.98	At-Grade	Minor Arterial	4,284
	Ruffin Road	S-LINE	S 3.98	At-Grade	Major Collector	1,836
	Bells Road	S-LINE	S 4.46	At-Grade	Minor Arterial	8,976
	Dale Avenue / Trenton Avenue	S-LINE	S 4.98	At-Grade	Local	0
Chesterfield	Chippenham Parkway	S-LINE	S 6.47	Roadway Overpass	Other Freeway /Expressway	58,140
	Elliham Avenue	S-LINE	S 7.85	Roadway Overpass	Local	520
	Jefferson Davis Highway	S-LINE	S 8.80	Roadway Overpass	Other Principal Arterial	20,400
	Kingsland Road	S-LINE	S 9.14	At-Grade	Major Collector	2,040
	Brinkley Road	S-LINE	S 9.83	At-Grade	Local	1,836
	Route 288 Northbound	S-LINE	SC 10.60	Roadway Overpass	Other Freeway /Expressway	19,890
	Route 288 Southbound	S-LINE	SC 10.62	Roadway Overpass	Other Freeway /Expressway	19,890

1: The Rail Line includes the following terminology for the purposes of the transportation analyses:

- "FBP" is the Fredericksburg Bypass alignment and includes both the existing crossings on the Dahlgren spur as well as new crossings along the proposed new track alignment.
- "ABP" is the Ashland Bypass and includes the new crossings along the proposed new track alignment (there are no existing crossings of the proposed Ashland Bypass."

2: Source of Functional Classification: VDOT 2014 Approved Functional Classification, http://www.arcgis.com/home/webmap/viewer.html?webmap=3eca6c9adb6649c988d98734f85baddb (accessed January 2016).

3: Source of ADT: VDOT, GIS online database for Annual Average Daily Traffic with Vehicle Classification for 2014 (accessed January 2016), Grown to 2015 (Refer to Section 4 of the DEIS details on growth rates).

Note that this table includes the existing public crossing(s) in the Franconia to Occoquan Project (which is the subject of a separate Categorical Exclusion) as well as in the Powell's Creek to Arkendale section for reference. The Dale Avenue / Trenton Avenue at-grade crossing is not open to public vehicles in existing conditions.

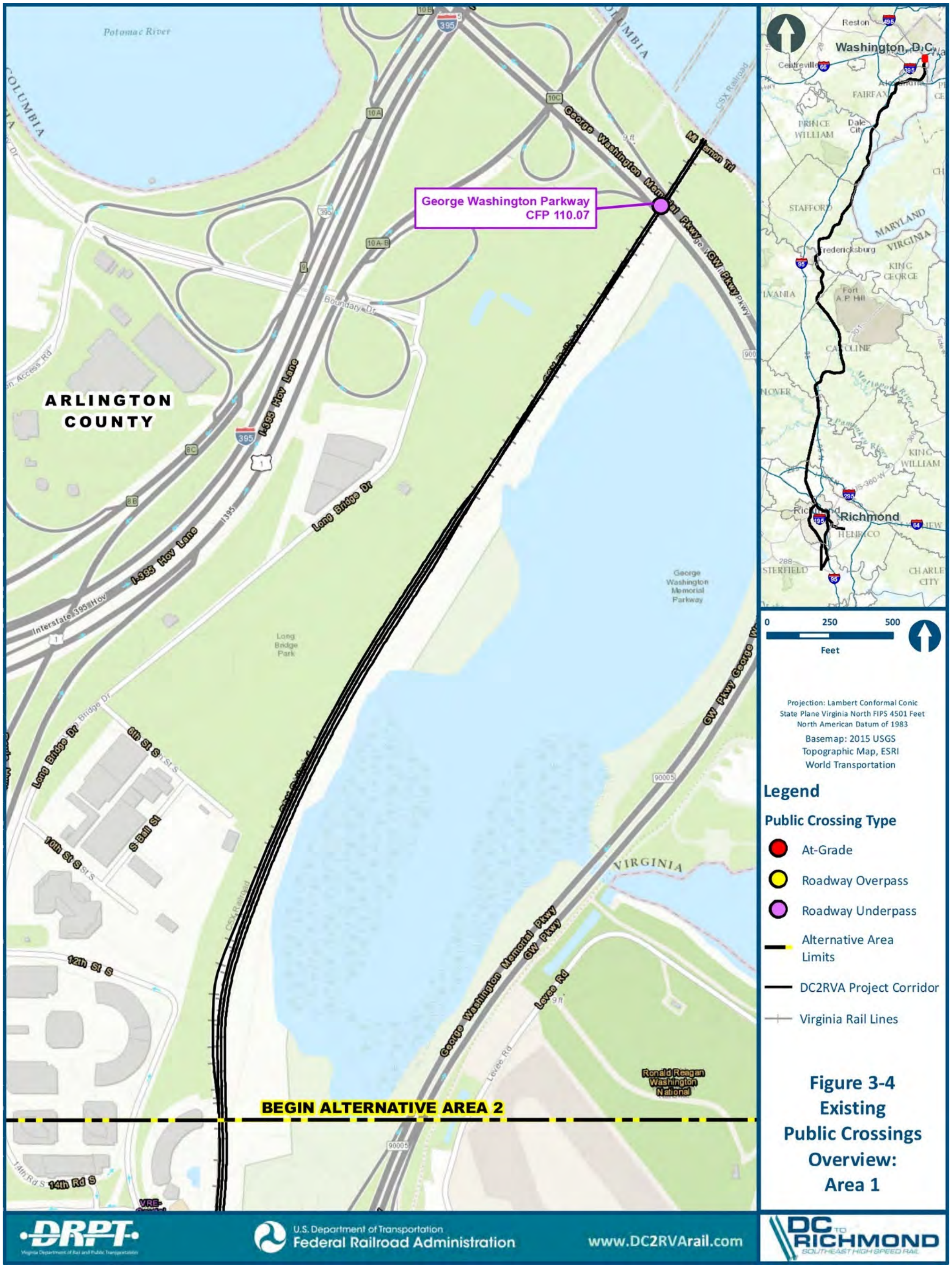


Figure 3-4
Existing Public Crossings Overview: Area 1

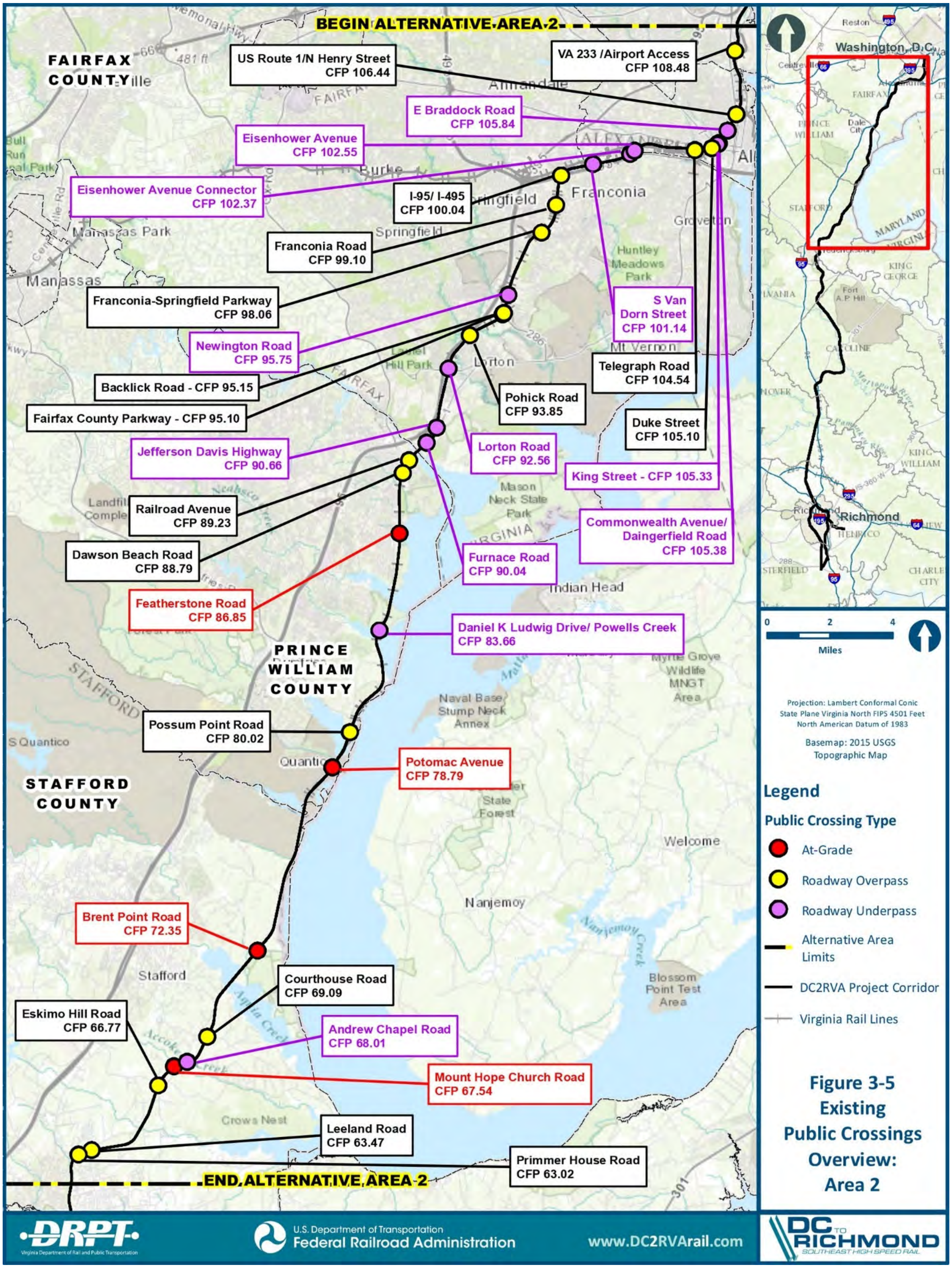
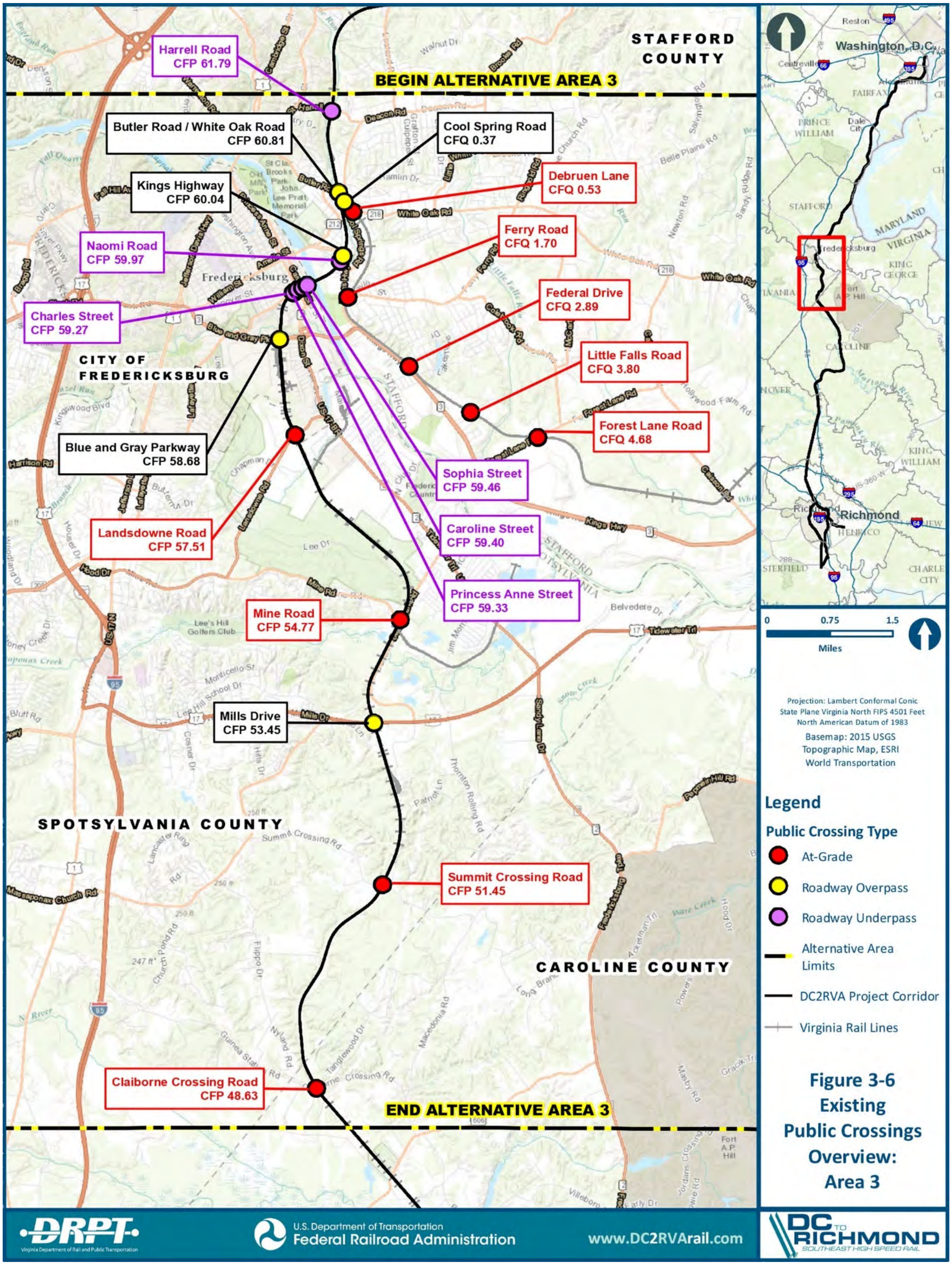
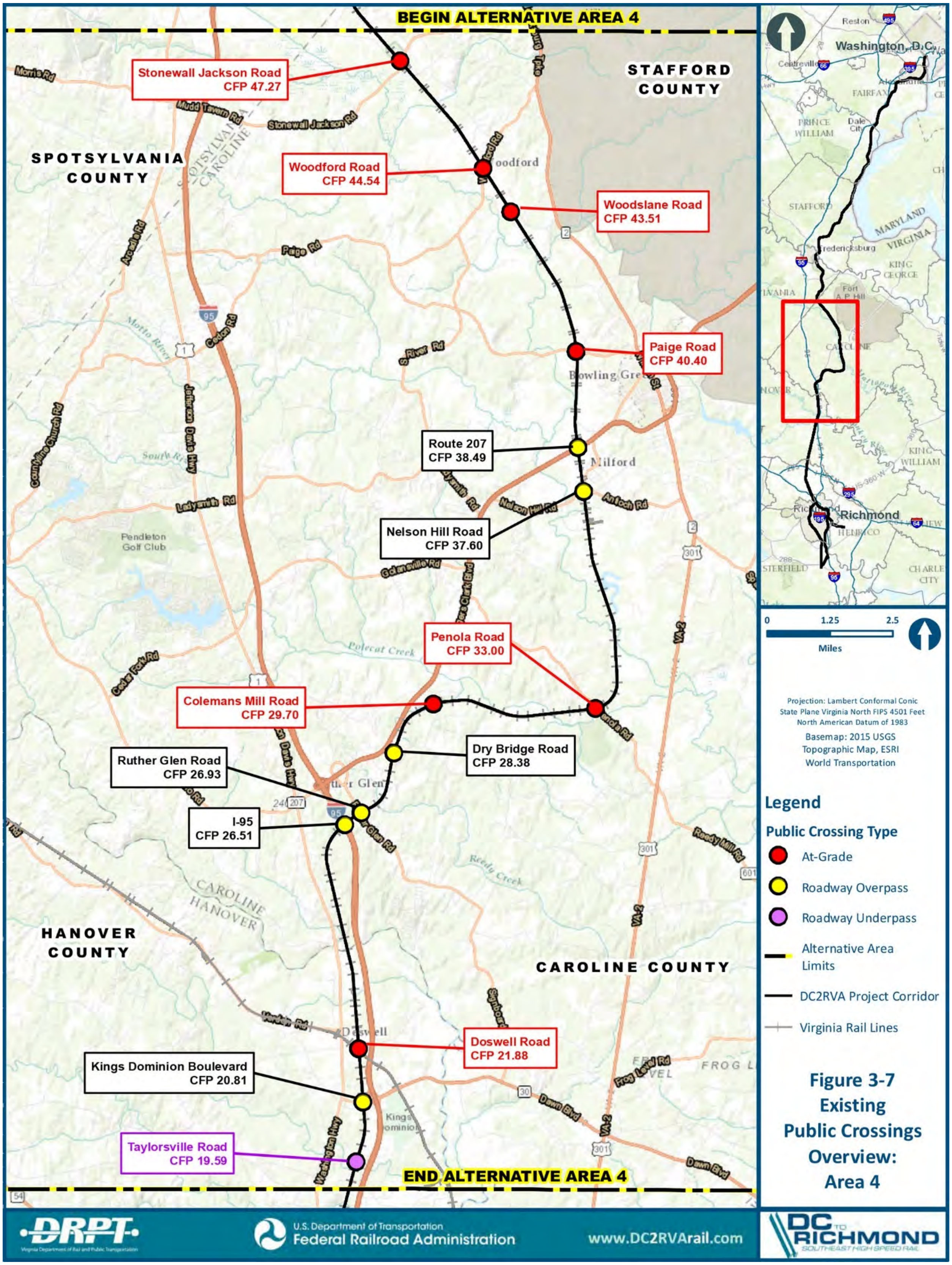
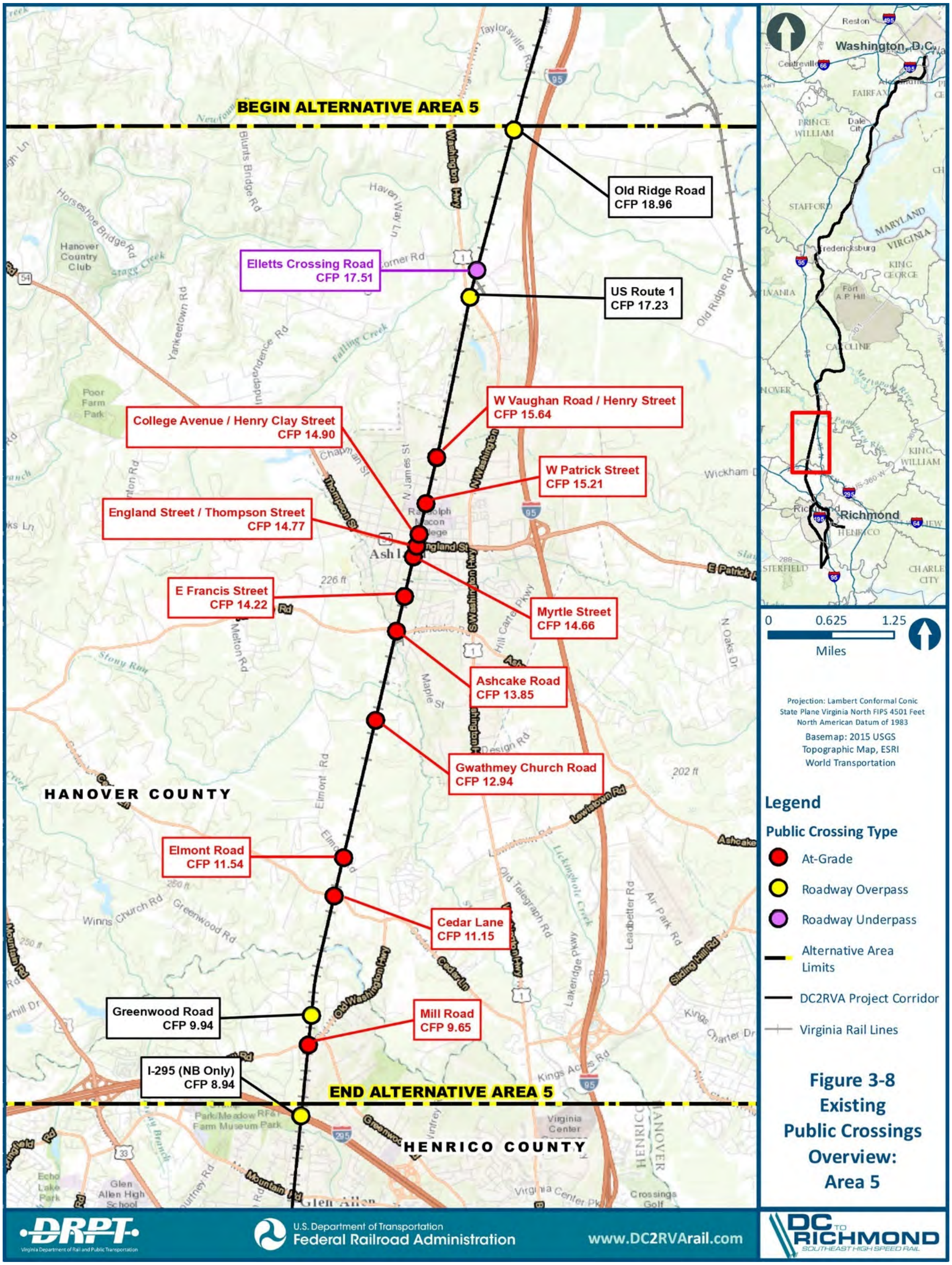


Figure 3-5 Existing Public Crossings Overview: Area 2



STAFFORD COUNTY
BEGIN ALTERNATIVE AREA 3
Harrell Road CFP 61.79
Butler Road / White Oak Road CFP 60.81
Cool Spring Road CFQ 0.37
Debruen Lane CFQ 0.53
Kings Highway CFP 60.04
Naomi Road CFP 59.97
Ferry Road CFQ 1.70
Federal Drive CFQ 2.89
Charles Street CFP 59.27
CITY OF FREDERICKSBURG
Little Falls Road CFQ 3.80
Forest Lane Road CFQ 4.68
Blue and Gray Parkway CFP 58.68
Sophia Street CFP 59.46
Landsdowne Road CFP 57.51
Caroline Street CFP 59.40
Princess Anne Street CFP 59.33
Mine Road CFP 54.77
Mills Drive CFP 53.45
SPOTSYLVANIA COUNTY
Summit Crossing Road CFP 51.45
CAROLINE COUNTY
Claiborne Crossing Road CFP 48.63
END ALTERNATIVE AREA 3
Washington, D.C.
Richmond
0 0.75 1.5
Miles
Projection: Lambert Conformal Conic
State Plane Virginia North FIPS 4501 Feet
North American Datum of 1983
Basemap: 2015 USGS Topographic Map, ESRI World Transportation
Legend
Public Crossing Type
At-Grade
Roadway Overpass
Roadway Underpass
Alternative Area Limits
DC2RVA Project Corridor
Virginia Rail Lines
Figure 3-6 Existing Public Crossings Overview: Area 3
DRPT
U.S. Department of Transportation Federal Railroad Administration
www.DC2RVArail.com
DC TO RICHMOND SOUTHEAST HIGH SPEED RAIL


BEGIN ALTERNATIVE AREA 4
Stonewall Jackson Road
CFP 47.27
Woodford Road
CFP 44.54
Woodslane Road
CFP 43.51
Paige Road
CFP 40.40
Route 207
CFP 38.49
Nelson Hill Road
CFP 37.60
Penola Road
CFP 33.00
Colemans Mill Road
CFP 29.70
Dry Bridge Road
CFP 28.38
Ruther Glen Road
CFP 26.93
I-95
CFP 26.51
Doswell Road
CFP 21.88
Kings Dominion Boulevard
CFP 20.81
Taylorsville Road
CFP 19.59
END ALTERNATIVE AREA 4
STAFFORD COUNTY
SPOTSYLVANIA COUNTY
HANOVER COUNTY
CAROLINE COUNTY
Washington, D.C.
Richmond
0 1.25 2.5
Miles
Projection: Lambert Conformal Conic
State Plane Virginia North FIPS 4501 Feet
North American Datum of 1983
Basemap: 2015 USGS
Topographic Map, ESRI
World Transportation
Legend
Public Crossing Type
At-Grade
Roadway Overpass
Roadway Underpass
Alternative Area Limits
DC2RVA Project Corridor
Virginia Rail Lines
Figure 3-7
Existing
Public Crossings
Overview:
Area 4
DRPT
U.S. Department of Transportation
Federal Railroad Administration
www.DC2RVArail.com
DC TO RICHMOND
SOUTHEAST HIGH SPEED RAIL



BEGIN ALTERNATIVE AREA 5
Old Ridge Road
CFP 18.96
Elletts Crossing Road
CFP 17.51
US Route 1
CFP 17.23
W Vaughan Road / Henry Street
CFP 15.64
College Avenue / Henry Clay Street
CFP 14.90
W Patrick Street
CFP 15.21
England Street / Thompson Street
CFP 14.77
E Francis Street
CFP 14.22
Myrtle Street
CFP 14.66
Ashcake Road
CFP 13.85
Gwathmey Church Road
CFP 12.94
HANOVER COUNTY
Elmont Road
CFP 11.54
Cedar Lane
CFP 11.15
Greenwood Road
CFP 9.94
Mill Road
CFP 9.65
I-295 (NB Only)
CFP 8.94
END ALTERNATIVE AREA 5
HENRICO COUNTY
Washington, D.C.
Richmond
0 0.625 1.25
Miles
Projection: Lambert Conformal Conic
State Plane Virginia North FIPS 4501 Feet
North American Datum of 1983
Basemap: 2015 USGS
Topographic Map, ESRI
World Transportation
Legend
Public Crossing Type
At-Grade
Roadway Overpass
Roadway Underpass
Alternative Area Limits
DC2RVA Project Corridor
Virginia Rail Lines
Figure 3-8
Existing
Public Crossings
Overview:
Area 5
DRPT
U.S. Department of Transportation
Federal Railroad Administration
www.DC2RVArail.com
DC TO RICHMOND
SOUTHEAST HIGH SPEED RAIL

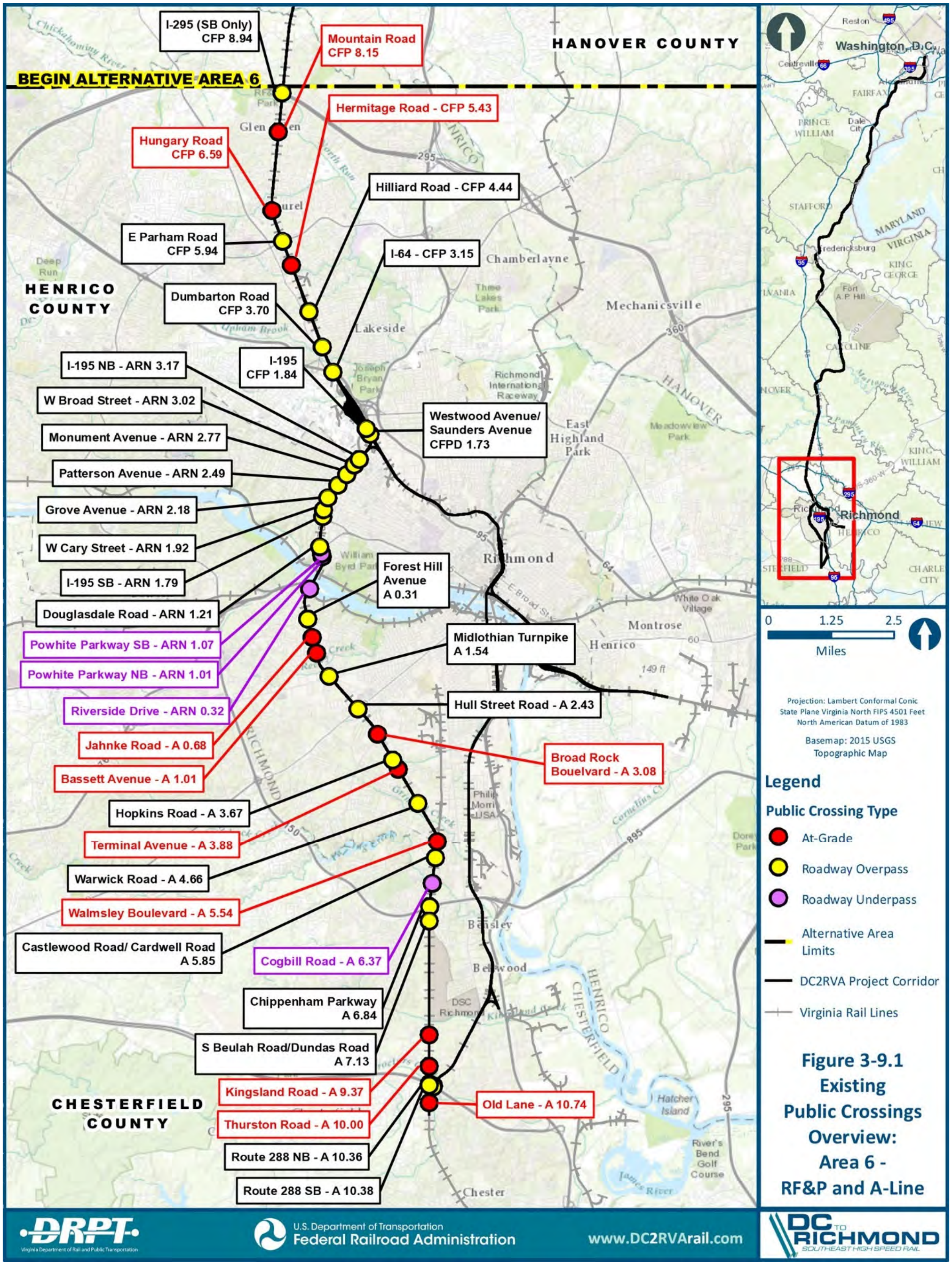
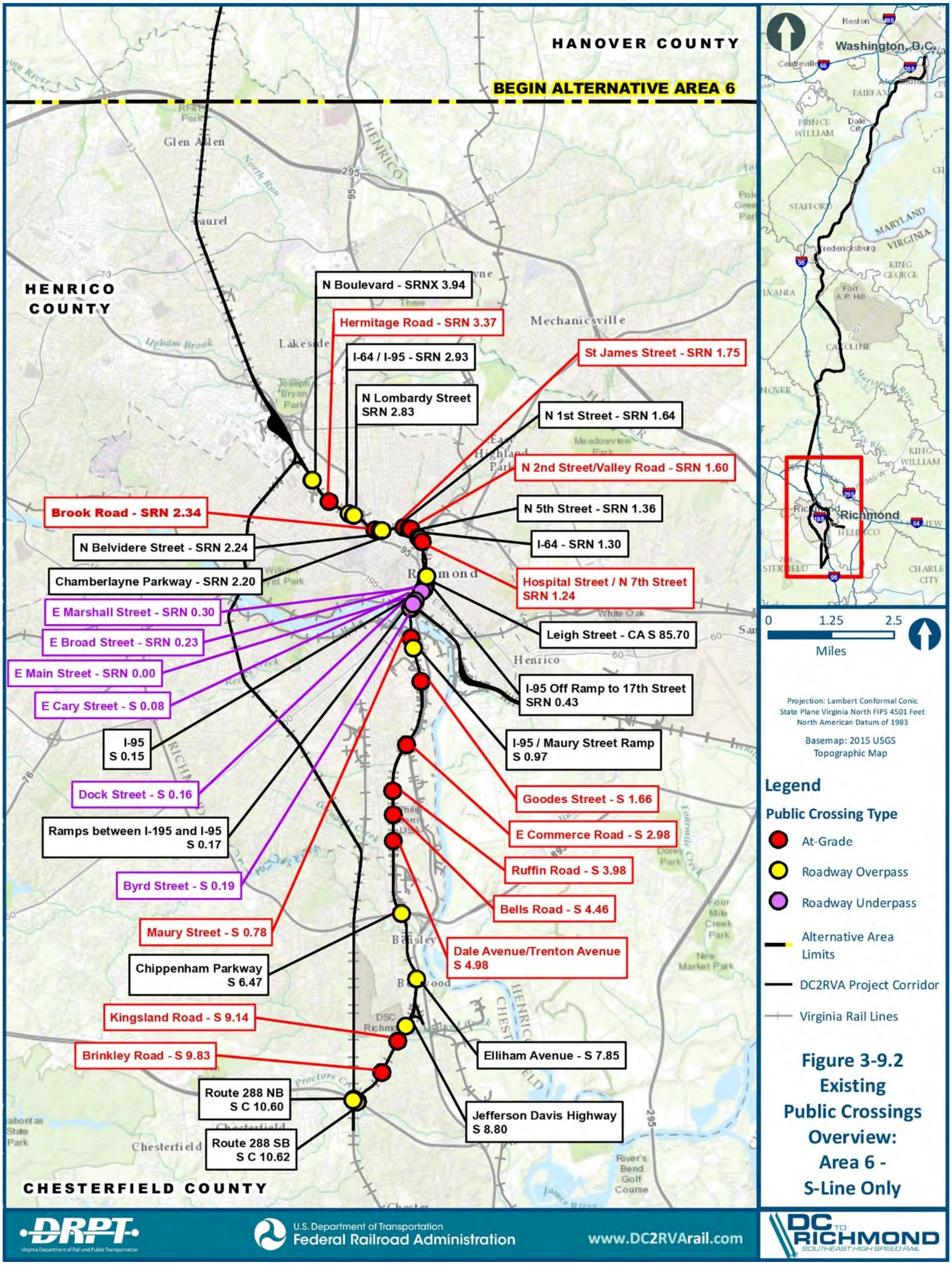


Figure 3-9.1 Existing Public Crossings Overview: Area 6 - RF&P and A-Line


HANOVER COUNTY
BEGIN ALTERNATIVE AREA 6
HENRICO COUNTY
CHESTERFIELD COUNTY
N Boulevard - SRNX 3.94
Hermitage Road - SRN 3.37
I-64 / I-95 - SRN 2.93
N Lombardy Street SRN 2.83
St James Street - SRN 1.75
N 1st Street - SRN 1.64
N 2nd Street/Valley Road - SRN 1.60
Brook Road - SRN 2.34
N 5th Street - SRN 1.36
N Belvidere Street - SRN 2.24
I-64 - SRN 1.30
Chamberlayne Parkway - SRN 2.20
Hospital Street / N 7th Street SRN 1.24
E Marshall Street - SRN 0.30
Leigh Street - CA S 85.70
E Broad Street - SRN 0.23
E Main Street - SRN 0.00
I-95 Off Ramp to 17th Street SRN 0.43
E Cary Street - S 0.08
I-95 S 0.15
I-95 / Maury Street Ramp S 0.97
Dock Street - S 0.16
Goodes Street - S 1.66
Ramps between I-195 and I-95 S 0.17
E Commerce Road - S 2.98
Ruffin Road - S 3.98
Byrd Street - S 0.19
Bells Road - S 4.46
Maury Street - S 0.78
Dale Avenue/Trenton Avenue S 4.98
Chippenham Parkway S 6.47
Kingsland Road - S 9.14
Brinkley Road - S 9.83
Elliham Avenue - S 7.85
Route 288 NB S C 10.60
Jefferson Davis Highway S 8.80
Route 288 SB S C 10.62
Washington, D.C.
Richmond
0 1.25 2.5
Miles
Projection: Lambert Conformal Conic
State Plane Virginia North FIPS 4501 Feet
North American Datum of 1983
Basemap: 2015 USGS Topographic Map
Legend
Public Crossing Type
At-Grade
Roadway Overpass
Roadway Underpass
Alternative Area Limits
DC2RVA Project Corridor
Virginia Rail Lines
Figure 3-9.2 Existing Public Crossings Overview: Area 6 - S-Line Only
DRPT
U.S. Department of Transportation Federal Railroad Administration
www.DC2RVArail.com
DC TO RICHMOND SOUTHEAST HIGH SPEED RAIL

3.2.2.3 Public At-Grade Crossings

There are 55 public at-grade crossings within the DC2RVA corridor (note that the locations and names of these crossings are included on Figure 3-4 through Figure 3-9). These public at-grade roadway crossings range from urban, median-separated, multi-lane facilities that carry more than 15,000 vehicles daily to rural, unstriped local crossings with 100 daily vehicles (representative examples are shown in Figure 3-10).

Figure 3-10: Examples of Public At-Grade Crossings in the DC2RVA Corridor

All public highway-rail crossings are required to have warning/control devices, just as roadway intersections are required to have stop signs or traffic signals. These warning/control devices are specified in the *Manual of Uniform Control Devices* (MUTCD) and include both passive and active types. "Passive" warning devices are the basic devices used at all highway-rail crossings; they include the crossbuck (the X-shaped signs that identify a crossing), signage, and roadway approach pavement markings. "Active" control devices are activated by the passage of a train over detection circuit in the track and are intended to physically warn and/or impede vehicles from the tracks when a train is approaching or occupying the crossing. Typical active traffic control devices include flashing light signals, bells, automatic gates, and highway traffic signals.

In the DC2RVA corridor, most of public at-grade two-lane crossings have active flashing signal lights with automatic gates on the roadway approach lanes (termed a two-quadrant gate system). An automatic gate serves as a physical barrier across the roadway travel lanes when a train is approaching or occupying a crossing. However, when automatic gates are located on the approach lanes only, vehicles are able to cross the centerline pavement marking and navigate around an activated gate with little difficulty.

The larger multi-lane roadway crossings in the DC2RVA corridor typically have active control devices that include either four-quadrant gates or median separation.

- Four-quadrant gates are a system of automatic flashing light signals and automatic gates in which the gates extend across both the approach and the departure sides of roadway. By inhibiting nearly all traffic movements over the crossing when the gates are activated by an approaching train, four-quadrant gates provide an additional measure of safety.
- Median separation and/or treatment, which includes barrier wall systems, wide raised medians, and mountable raised curb systems with vertical median separators, can be used with a two-quadrant gate system to impede vehicles from traversing a crossing when the automatic gate is activated by disallowing vehicles from using the roadway lane serving

traffic flowing in the opposite direction. The barrier provided by the median treatment also provides an additional measure of safety as compared to the two-quadrant gate system.

Additionally, there are six public at-grade crossings that are currently designated[10] as part of a 24-hour "Quiet Zone," which is a section of a rail line that contains one or more consecutive public crossings at which locomotive horns are not routinely sounded:

- Prince William Quiet Zone:
  - Featherstone Road crossing
- Ashland Quiet Zone:
  - West Patrick Street crossing
  - College Avenue / Henry Clay Street crossing
  - England Street / Thompson Street crossing
  - Myrtle Street crossing
  - East Francis Street crossing

FRA's regulations governing train horn use at grade crossings are found at 49 CFR Part 222[11] and mandate that a horn be sounded at every public at-grade crossing (i.e., horns are not required to be sounded at locations where the crossing is grade separated). 49 CFR Part 222 also establishes the procedures necessary for a public authority to establish a Quiet Zone. The Quiet Zone program was established so that communities can opt-out of the mandatory horn signaling, excluding emergency situations. Even in existing Quiet Zones that are based on the "grandfather" provision in the regulation, the locomotive bell must still be rung as a train approaches an at-grade highway–rail crossing. Quiet Zones that may be proposed by local governments in the future would be based on local needs. They must be designed, however, in accordance with FRA standards and approved by FRA. Localities would also fund all improvements, equipment, and signage, and they would provide ongoing maintenance for all Quiet Zones within their jurisdictions.

On the following pages, a single-page "fact-sheet" for each of the 55 public at-grade crossings is presented to succinctly present relevant site-specific transportation data and conditions that may be required for the DC2RVA Project.

Crossing Name: FEATHERSTONE ROAD

Northern Virginia (Alternative Area 2)

Line / Crossing Number: RF&P / 860600A

Jurisdiction: Prince William County

Current Warning Device: Four Quad Gates

2015 AADT: 10,200

Total Number of Daily Trains: 56

Crossing Used By Public Transit? No

General Description of Crossing	Major collector roadway, 2 lanes at crossing with turn lanes before/after. Urban area – dense residential to the east, businesses to the west. Provides access to Route 1 to the west. Provides sole access to residential community to the east (emergency access considerations).
Traffic / Operations	High volume roadway (> 10k) daily. Numerous turn lanes and private access points (both residential and business) in immediate vicinity of crossing. T intersection directly east of crossing.
General Description of Major Environmental	Crossing within 1,000 feet of bay coast. Featherstone National Wildlife Refuge to the south of residence community. Occoquan Bay National Wildlife Refuge and Veterans Memorial Park to the north of residence community.
Existing Property	High density residential within ~100 feet of crossing to the east. Large industrial / commercial properties, access within ~500 feet of crossing to the west.
Connectivity to Adjacent Crossings	Dawson Beach Road – grade separated, 3 rail miles upstream. Existing unpaved roadway connection (private) with structure, next to Veterans Memorial Park (ballfields) and Occoquan Bay National Wildlife Refuge. ~3-mile roadway detour between crossings. No crossings downstream to south (peninsula).
Accessibility	Crossing provides sole access to large residential community and marina between the rail line and the coast.

<u>Crossing Name: POTOMAC AVENUE</u>

Line / Crossing Number: RF&P / 860605J

Current Warning Device: Gates (Non-Quad)

Total Number of Daily Trains: 56

Northern Virginia (Alternative Area 2)

Jurisdiction: Prince William County

2015 AADT: 7,140

Crossing Used By Public Transit? Yes

General Description of Crossing	Local roadway, 2 lanes. Urban area – downtown Quantico, directly adjacent to the VRE/Amtrak Station. To the east, the roadway has on-street parking and store fronts. To the west, it connects to residential military housing. Fuller Road (intersection to the west of crossing) is public access and connects directly to Route 1 and I-95.
Traffic / Operations	High volume roadway (> 5k) daily in 2015. Turning lanes and intersections within ~100 feet on both sides of crossing. Pedestrian crosswalks and on-street parking within ~100 feet on east side of crossing.
General Description of Major Environmental	Marine Corps Base Quantico surrounds downtown Quantico, and is within ~100 feet of west side of crossing – including Town of Quantico Historic District. Potomac River on east side of downtown area.
Existing Property	Dense buildings and infrastructure on east side of crossing. Train station /parking and commercial / military on west side of crossing.
Connectivity to Adjacent Crossings	No public upstream or downstream crossings on the Quantico peninsula.
Accessibility	Sole public access crossing to downtown Quantico.

Crossing Name: BRENT POINT ROAD	**Northern Virginia (Alternative Area 2)**
Line / Crossing Number: RF&P / 860581X	**Jurisdiction:** Stafford County
Current Warning Device: Gates (Non-Quad)	**2015 AADT:** 541
Total Number of Daily Trains: 56	**Crossing Used By Public Transit?** No

General Description of Crossing	Local roadway, 2 lanes. Rural area – undeveloped land on both sides of crossing. Brent Point Road to the east provides sole access into the Widewater peninsula area. To the west, it connects into the winding rural roadway network that provides access to residences east of US Route 1. Arkendale Road parallels the tracks on the north/west.
Traffic / Operations	Low volume roadway daily for 2015. Three-legged intersection of Brent Point Road and Arkendale Road within ~25 feet on west side of crossing (site distance considerations). Arkendale Road parallels the west side of the track and runs north.
General Description of Major Environmental	Widewater State Park within ~200 feet of east/south side of crossing. Wetlands in proximity on all sides of crossing.
Existing Property	No houses or businesses within proximity on either side of crossing.
Connectivity to Adjacent Crossings	Not applicable, provides sole access.
Accessibility	Sole access into Widewater peninsula area and residences.

<u>Crossing Name: MOUNT HOPE CHURCH ROAD</u>	**Northern Virginia (Alternative Area 2)**
Line / Crossing Number: RF&P / 860578P	**Jurisdiction:** Stafford County
Current Warning Device: Gates (Non-Quad)	**2015 AADT:** 214
Total Number of Daily Trains: 56	**Crossing Used By Public Transit?** No

General Description of Crossing	Local roadway, 2 lanes. Rural area. Mount Hope Church Road is approximately 1 mile long, beginning at the T intersection on the east side of the crossing with Brooke Road (Route 608). It provides sole access to a residential area on the west side of the crossing. VRE Brooke Road Station is located directly upstream of crossing.
Traffic / Operations	Low volume roadway daily for 2015. Minimal striping on crossing roadway. Proximity to driveway access (east side).
General Description of Major Environmental	Potential streams / wetland areas on both sides of tracks north of crossing.
Existing Property	Several residences located adjacent to both sides of crossing (closest is within ~100 feet).
Connectivity to Adjacent Crossings	Andrew Chapel Road / Brooke Road (Route 608) crossing (grade separated) is directly upstream: ~1/2 mile (rail) and 2/3 mile (driving along Brooke Road). Eskimo Hill Road, grade-separated ~1 mile downstream, but no connecting western route.
Accessibility	Provides sole access to residential area.

Crossing Name: LANDSDOWNE ROAD

Line / Crossing Number: RF&P / 860558D

Current Warning Device: Gates (Non-Quad)

Total Number of Daily Trains: 58

Fredericksburg (Alternative Area 3)

Jurisdiction: City of Fredericksburg

2015 AADT: 8,772

Crossing Used By Public Transit? No

General Description of Crossing	Major collector roadway, 2 lanes. Rural area – businesses (no residences) in immediate vicinity of crossing. Landsdowne Road runs between Mine Road/Hood Drive (west) and US 17 (east), thereby serving traffic to I-95 and US Route 3, respectively.
Traffic / Operations	High volume roadway (> 5k) daily in 2015. High percentage truck traffic (access to industrial area).
General Description of Major Environmental	None identified.
Existing Property	Commercial businesses (warehouses) in all quadrants of crossing. No residences.
Connectivity to Adjacent Crossings	Blue & Gray Pkwy (Route 3), grade separated crossing just over1 mile (rail) upstream, no convenient alternate driving routes to the west. Mine Road, at-grade crossing ~3 miles (rail) downstream.
Accessibility	High volume through roadway.

Crossing Name: MINE ROAD

Fredericksburg (Alternative Area 3)

Line / Crossing Number: RF&P / 860557W

Jurisdiction: Spotsylvania County

Current Warning Device: Gates (Non-Quad)

2015 AADT: 5,202

Total Number of Daily Trains: 58

Crossing Used By Public Transit? No

General Description of Crossing	Major collector roadway, 2 lanes. Urban area – residences and commercial buildings and access points on both sides of crossing. To the west, Mine Road intersects Route 1 within ~0.5 mile of interchange with I-95. To the east, Benchmark Road (T-intersection with Mine Road) connects Tidewater Trail (Route 2) with US Route 17.
Traffic / Operations	High volume roadway (> 5k) daily in 2015.
General Description of Major Environmental	None identified.
Existing Property	Residential community to the east (elevation is higher than the railroad tracks and parallel roadway). Large commercial / industrial to the west/south, with several access points that would be effected. Undeveloped in west/north.
Connectivity to Adjacent Crossings	Landsdowne Road, at-grade crossing ~3 miles (rail) upstream. Mills Drive / US Route 17, grade separated crossing ~1.5 miles downstream, no connecting roadways on west side.
Accessibility	High volume connecting roadway.

Crossing Name: SUMMIT CROSSING ROAD

Fredericksburg (Alternative Area 3)

Line / Crossing Number: RF&P / 860548X

Jurisdiction: Spotsylvania County

Current Warning Device: Gates (Non-Quad)

2015 AADT: 408

Total Number of Daily Trains: 58

Crossing Used By Public Transit? No

General Description of Crossing	Local roadway, 2 lanes. Rural area – largely undeveloped on both sides of crossing, with a few residential / farm properties. Summit Crossing Road is a narrow road ~3 miles in length, with minimal striping, and connects Massaponax Church Road (west of crossing) to Thorton Rolling Road (east of crossing). There is a dirt road access running parallel to the tracks within ~25 feet of the crossing on both sides.
Traffic / Operations	Low volume roadway.
General Description of Major Environmental	None identified.
Existing Property	Several residences/farm properties in north-east and south-west. Otherwise largely undeveloped area.
Connectivity to Adjacent Crossings	Mills Drive / US Route 17, grade separated ~3 miles (rail) and ~5 miles (roadway) upstream. Claiborne Crossing Road, at-grade ~3 miles (rail) and ~5 miles (roadway) downstream
Accessibility	Low volume connecting roadway.

<u>Crossing Name: CLAIBORNE CROSSING ROAD</u>

Fredericksburg (Alternative Area 3)

Line / Crossing Number: RF&P / 860547R

Jurisdiction: Caroline County

Current Warning Device: Gates (Non-Quad)

2015 AADT: 479

Total Number of Daily Trains: 41

Crossing Used By Public Transit? No

General Description of Crossing	Local roadway, 2 lanes, minimal striping, possibly reduced width. Rural area – mostly undeveloped with sparse residential properties. West of crossing, Summit Crossing Road becomes Guinea Station Road, underpasses I-95, and connects to Route 1. East of crossing, ends in T-intersection with Macedonia Road, which connects to Stonewall Jackson Road.
Traffic / Operations	Low volume roadway.
General Description of Major Environmental	None identified.
Existing Property	Minimal residential properties and access along crossing roadway.
Connectivity to Adjacent Crossings	Summit Crossing Road, at-grade ~3 miles (rail) and ~5 miles (roadway) upstream. Stonewall Jackson Road, at-grade ~1.5 miles (rail) and ~2 miles (roadway) downstream
Accessibility	Low volume through roadway.

<u>Crossing Name: DEBRUEN LANE</u>	**Fredericksburg (Alternative Area 3)**
Line / Crossing Number: RF&P / 860345T	**Jurisdiction:** Stafford County
Current Warning Device: Gates (Non-Quad)	**2015 AADT:** 510
Total Number of Daily Trains: -	**Crossing Used By Public Transit?** No

General Description of Crossing	Local roadway, 2 lanes at crossing, minimal striping. Debruen Lane is approximately 800 feet in total length. To the west of the crossing, it provides residential access and intersects Cool Springs Road within ~350 feet. To the east of the crossing, it provides sole access to a residence and commercial properties.
Traffic / Operations	Low volume road (volume unknown per VDOT). Unsignalized intersection with Cool Springs Road ~350 feet west of crossing.
General Description of Major Environmental	None identified.
Existing Property	2 residences, west side of crossing. 1 house and commercial, east side of crossing.
Connectivity to Adjacent Crossings	White Oak Road (existing roadway overpass) is located less than 1 mile upstream.
Accessibility	Provides sole access to 1 residence on east side of crossing. Commercial buildings on the east side of the crossing may have back access via Baron Park Road.

Crossing Name: FERRY ROAD	**Fredericksburg (Alternative Area 3)**
Line / Crossing Number: RF&P / 860348N	**Jurisdiction:** Stafford County
Current Warning Device: Gates (Non-Quad)	**2015 AADT:** 9,180
Total Number of Daily Trains: -	**Crossing Used By Public Transit?** No

General Description of Crossing	Major collector roadway, 2 lanes. Ferry Road terminates at Kings Highway intersection (less than 300 feet west of crossing, major signalized intersection). East of crossing, Ferry Road provides access to residential neighborhoods.
Traffic / Operations	High volume roadway. Signalized intersection with Kings Highway <300 feet west of crossing. Unsignalized intersection with Mount Vernon Avenue (parallel separated one-way pair) <10 feet east of crossing.
General Description of Major Environmental	George Washington's Ferry Farm adjacent to Kings Highway.
Existing Property	Residential east of crossing. Commercial west of crossing.
Connectivity to Adjacent Crossings	No other public roadway crossings within 1 mile.
Accessibility	Ferry Road is the main major east-west crossing in the area.

Crossing Name: FEDERAL DRIVE	**Fredericksburg (Alternative Area 3)**
Line / Crossing Number: RF&P / 860349V	**Jurisdiction:** Stafford County
Current Warning Device: Gates (Non-Quad)	**2015 AADT:** 1,326
Total Number of Daily Trains: -	**Crossing Used By Public Transit?** No

General Description of Crossing	Local roadway, 2 narrow lanes, minimal striping, limited sight distance due to T-intersection. Federal Drive provides the main south-western entrance to a large residential area east of the crossing. Federal Drive terminates at Kings Highway immediately west of the crossing. Federal Drive operates as a one-way on- and off-ramp to northbound Kings Highway.
Traffic / Operations	Mid-volume local roadway. Federal Drive runs parallel to tracks west of crossing, with one-way operations to access northbound Kings Highway.
General Description of Major Environmental	None identified.
Existing Property	Residences east of crossing.
Connectivity to Adjacent Crossings	No other public roadway crossings within 1 mile.
Accessibility	Federal Drive provides the main south-western entrance to a large residential area east of crossing.

<u>Crossing Name: LITTLE FALLS ROAD</u>	**Fredericksburg (Alternative Area 3)**
Line / Crossing Number: RF&P / 860353K	**Jurisdiction:** Stafford County
Current Warning Device: Flashing Signal	**2015 AADT:** 153
Total Number of Daily Trains: -	**Crossing Used By Public Transit?** No

General Description of Crossing	2 narrow lane local roadway in rural area, minimal striping. Little Falls Road is ~ 0.5 miles is total length and provides sole access to residential / farm area east of the crossing. It terminates at Kings Highway ~1,300 feet west of the crossing.
Traffic / Operations	Low volume local roadway. Kings Highway intersection ~1,200 feet west of crossing. Residential driveways within ~150 feet on both sides of crossing.
General Description of Major Environmental	None identified.
Existing Property	Residential / farm properties on both sides of crossing.
Connectivity to Adjacent Crossings	No other public roadway crossings within 1 mile.
Accessibility	Provides sole access to the residences / farms east of the crossing.

<u>Crossing Name: FOREST LANE ROAD</u>

Line / Crossing Number: RF&P / 860357M

Current Warning Device: Flashing Signal

Total Number of Daily Trains: -

Fredericksburg (Alternative Area 3)

Jurisdiction: Stafford County

2015 AADT: 1,428

Crossing Used By Public Transit? No

General Description of Crossing	2 lane local roadway in rural area. Forest Lane Road is the primary connector into a large farm / residential area, east of the crossing. It terminates at Kings Highway approximately 1 mile west of the crossing.
Traffic / Operations	Mid-volume local roadway. Big Oak Lane intersection ~150 feet east of crossing.
General Description of Major Environmental	None identified.
Existing Property	Farm / residences on both sides of crossing.
Connectivity to Adjacent Crossings	No other public roadway crossings within 1 mile.
Accessibility	Provides sole access to the residences / farms east of the crossing.

Crossing Name: STONEWALL JACKSON ROAD

Line / Crossing Number: RF&P / 860545C

Current Warning Device: Gates (Non-Quad)

Total Number of Daily Trains: 41

Central Virginia (Alternative Area 4)

Jurisdiction: Caroline County

2015 AADT: 1,938

Crossing Used By Public Transit? No

General Description of Crossing	Major collector roadway, 2 lanes. Rural area – mostly undeveloped / farmland with sparse residences. Jackson Shrine / associated park is in north-east quadrant of crossing. Stonewall Jackson Road interchanges with both I-95 and Route 1 to the east. To the west, it terminates at Route 2 / Fredericksburg Turnpike.
Traffic / Operations	Mid-volume roadway. Guinea Station Road intersects with crossing roadway on both sides of crossing within ~500 feet.
General Description of Major Environmental	Fredericksburg and Spotsylvania National Military Park / Jackson Shrine directly adjacent to and accessing crossing roadway in north/east.
Existing Property	West side of crossing, existing farm and some residential (~5) and access within 1,000 feet of crossing. East side of crossing, 1 existing farm/residential property. Otherwise, undeveloped and/or parkland.
Connectivity to Adjacent Crossings	Claiborne Crossing Road, at-grade ~1.5 miles (rail) and ~2 miles (roadway) upstream Woodford Road, at-grade ~3 miles (rail) and ~4 miles (roadway) downstream, but no practical western connection.
Accessibility	Major collector through roadway.

Crossing Name: WOODFORD ROAD

Line / Crossing Number: RF&P / 860542G

Current Warning Device: Gates (Non-Quad)

Total Number of Daily Trains: 41

Central Virginia (Alternative Area 4)

Jurisdiction: Caroline County

2015 AADT: 388

Crossing Used By Public Transit? No

General Description of Crossing	Local roadway, 2 lanes, minimal striping. Rural area – mainly undeveloped / farmland in vicinity, with sparse residential. Woodford Road is approximately 5 miles long, and connects Paige Road (which connects to Route 1) to the east, to Route 2 / Fredericksburg Turnpike to the west.
Traffic / Operations	Low volume roadway. Intersections with private driveways within ~100 feet of crossing on both sides of crossing.
General Description of Major Environmental	None identified.
Existing Property	Mainly undeveloped / farmland in vicinity. 1-3 residential / farm properties on each side of crossing.
Connectivity to Adjacent Crossings	Stonewall Jackson Road, at-grade ~3 miles (rail) and ~4 miles (roadway) upstream, but west connection is not practical. Woodslane Road, at-grade ~1 mile (rail) and ~1-5 miles (roadway) downstream, but much more minor crossing (lower volume roadway).
Accessibility	Rural through roadway with no nearby equivalent alternatives.

<u>Crossing Name: WOODSLANE ROAD</u>	**Central Virginia (Alternative Area 4)**
Line / Crossing Number: RF&P / 860541A	**Jurisdiction:** Caroline County
Current Warning Device: Gates (Non-Quad)	**2015 AADT:** 102
Total Number of Daily Trains: 41	**Crossing Used By Public Transit?** No

General Description of Crossing	Local roadway, 2 lanes, limited striping, located on a curve (limited sight distance). Rural area. Woodslane Road (Route 609) is just over 2 miles in length and runs from Woodford Road (west of crossing) to Fredericksburg Turnpike / Route 2 (east of crossing), providing access to residences / farm properties along its length.
Traffic / Operations	Very low volume roadway ~ 100 daily in 2015. Private driveways within ~300 feet, both sides of crossing.
General Description of Major Environmental	None identified.
Existing Property	Undeveloped south of crossing. Rural farmland north of crossing (~1-2 properties on each side east and west).
Connectivity to Adjacent Crossings	Woodford Road, at-grade just over 1 mile (rail) and 1-5 miles (roadway) upstream. Paige Road, at-grade ~3 miles (rail) and 5 miles (roadway) downstream.
Accessibility	Rural through roadway providing access to farms / residences between two more major roadways.

Crossing Name: PAIGE ROAD

Central Virginia (Alternative Area 4)

Line / Crossing Number: RF&P / 860539Y

Jurisdiction: Caroline County

Current Warning Device: Gates (Non-Quad)

2015 AADT: 479

Total Number of Daily Trains: 41

Crossing Used By Public Transit? No

General Description of Crossing	Minor collector roadway, 2 lanes. Rural area – mainly undeveloped. Paige Road terminates at Fredericksburg Turnpike / Route 2, approximately 1 mile east of the crossing. West of the crossing, Paige Road terminates at US Route 1.
Traffic / Operations	Low volume roadway.
General Description of Major Environmental	None identified.
Existing Property	Mostly undeveloped, but houses are mostly within ~100 feet of roadway. 1 residential property, west side. 4-5 residential properties, east side.
Connectivity to Adjacent Crossings	Woodslane Road, at-grade ~3 miles (rail) and 5-6 miles (roadway) upstream, but much more rural roadway than crossing roadway. Route 207, grade separated ~2 miles (rail) and 4 miles (roadway, east only, west connectivity not practical) downstream.
Accessibility	Paige Road is the largest road crossing the tracks within the vicinity of this crossing.

Crossing Name: PENOLA ROAD

Central Virginia (Alternative Area 4)

Line / Crossing Number: RF&P / 860527E

Jurisdiction: Caroline County

Current Warning Device: Gates (Non-Quad)

2015 AADT: 428

Total Number of Daily Trains: 41

Crossing Used By Public Transit? No

General Description of Crossing	Local roadway, 2 lanes, limited striping. Rural area – mostly undeveloped with a cluster of houses along the intersecting roadway at the crossing. Penola Road terminates at Rogers Clark Boulevard north/west of the crossing. East of the crossing, Penola Road connects to US Route 301.
Traffic / Operations	Low volume roadway. Polecat Lane (residential roadway access) is within ~50 feet of north / west side of crossing.
General Description of Major Environmental	None identified.
Existing Property	Undeveloped, no structures south / east of crossing. Residential cluster (> 10 properties) along Polecat Lane in direct proximity to crossing.
Connectivity to Adjacent Crossings	Colonial Road, grade separated ~5 miles (rail) and ~10 miles (roadway) upstream. Colemans Mill, at-grade ~3 miles (rail) and ~6-8 miles (roadway) downstream.
Accessibility	Low volume through roadway serving residential areas.

Crossing Name: COLEMANS MILL ROAD	**Central Virginia (Alternative Area 4)**
Line / Crossing Number: RF&P / 860525R	**Jurisdiction:** Caroline County
Current Warning Device: Gates (Non-Quad)	**2015 AADT:** 449
Total Number of Daily Trains: 41	**Crossing Used By Public Transit?** No

General Description of Crossing	Local roadway, 2 lanes, minimal striping. Rural area – mainly undeveloped on both sides of crossing. Colemans Mill Road is approximately 1 mile in length and provides access between Dry Bridge Road and Rogers Clark Boulevard, which themselves intersect just over a mile south of this at-grade crossing. Track is curved, sight distance issue.
Traffic / Operations	Low volume roadway.
General Description of Major Environmental	Stream along north/west side of crossing.
Existing Property	South/east side of crossing undeveloped. North/west side of crossing has a couple residence / farm properties.
Connectivity to Adjacent Crossings	Penola Road, at-grade ~3 miles (rail) and over 5 miles (roadway) upstream. Dry Bridge Road, grade-separated ~1 mile (rail) and ~2 miles (roadway) downstream.
Accessibility	Colemans Mill Road, Dry Bridge Road and Rogers Clark Boulevard provide a connected eastern-side access.

<u>Crossing Name: DOSWELL ROAD</u>	**Central Virginia (Alternative Area 4)**
Line / Crossing Number: RF&P / 860520G	**Jurisdiction:** Hanover County
Current Warning Device: Gates (Non-Quad)	**2015 AADT:** 316
Total Number of Daily Trains: 41	**Crossing Used By Public Transit?** No

General Description of Crossing	Local roadway, 2 lanes, limited striping. Rural area. This is a public roadway that provides access through the middle of the railroad crossing, and provides sole access on the west side of I-95 to the residential / commercial area on the east side of the tracks.
Traffic / Operations	Low volume roadway. Ill-defined traffic channelization and access through rail yard. Higher percentage truck traffic (access to industrial area).
General Description of Major Environmental	Doswell Road is the northern limit of the Doswell Historic District.
Existing Property	Railyard with structure within Y-crossing of tracks. Residential properties to the west of crossing.
Connectivity to Adjacent Crossings	I-95, grade separated ~5 miles (rail) and 8 miles (roadway) upstream. Kings Dominion Boulevard, grade separated just over1 mile (rail) and 2 miles (roadway) downstream.
Accessibility	Crossing provides sole access on west side of I-95 to area. Accessibility along western side of crossing functions more like a parking lot than a roadway.

Crossing Name: W VAUGHAN RD / HENRY ST	**Ashland (Alternative Area 5)**
Line / Crossing Number: RF&P / 860513W	**Jurisdiction:** Hanover County
Current Warning Device: Gates (Non-Quad)	**2015 AADT:** 1,326
Total Number of Daily Trains: 40	**Crossing Used By Public Transit?** No

General Description of Crossing	Local roadway, 2 lanes. Rural area. W Vaughan Road / Henry Street is less than 1 mile long and is the northernmost east-west crossing of the tracks on the north side of the town of Ashland. To the west, it connects to N James Street and to the east, it connects to Route 1. Fire station, school, and water treatment facility in proximity of crossing.
Traffic / Operations	Mid volume roadway. New roadway intersection to undeveloped area (potential new development) on west side of crossing. Henry Street intersection within ~500 feet of east side of crossings.
General Description of Major Environmental	School (John M Gandy ES) drop-off and entrance within 1,000 feet on east side of crossing. The new, and only, fire station in town is on the east side of the tracks and there are currently no grade-separated tracks to allow for crossing during emergencies or while trains are stopped on the tracks for long periods of time.
Existing Property	South/west and north/east quadrants are mainly undeveloped / farmland. Sewage treatment facility in north/west. Residences / school in south/east.
Connectivity to Adjacent Crossings	Route 1, grade separated ~2 miles (rail) and 3-4 miles (roadway) upstream of crossing. W Patrick Street, at-grade, 0.5 miles (rail and roadway) downstream in downtown Ashland.
Accessibility	Through street. Northernmost east-west crossing in the town of Ashland grid.

Crossing Name: W PATRICK STREET

Line / Crossing Number: RF&P / 860512P

Current Warning Device: Gates (Non-Quad)

Total Number of Daily Trains: 40

Ashland (Alternative Area 5)

Jurisdiction: Hanover County

2015 AADT: 304

Crossing Used By Public Transit? No

General Description of Crossing	Minor collector roadway, 2 lanes, minimal striping. Urban area (downtown Ashland). W Patrick Street provides access to and through Randolph Macon College's sports complex area. N Center Street runs parallel to both sides of railroad tracks, and intersects with a surface parking lot directly at the crossing.
Traffic / Operations	Low volume roadway. N Center Street operates as a parallel one-way pair on both sides of tracks. Crossing intersects into a surface parking lot.
General Description of Major Environmental	Ashland Historic District. Blincoe Field / sports complex of Randolph Macon College (NHRP-listed).
Existing Property	Randolph Macon College surrounds the crossing, which is located in their sports complex area.
Connectivity to Adjacent Crossings	W Vaughan Street, at-grade ~0.5 mile (rail) and ~.75 miles (roadway) upstream. College Avenue / Henry Clay Road, at-grade ~0.3 miles (rail) and ~0.5 miles (roadway) downstream.
Accessibility	Through street used to access college sports complex area.

Crossing Name: COLLEGE AVE / HENRY CLAY RD

Ashland (Alternative Area 5)

Line / Crossing Number: RF&P / 860462N

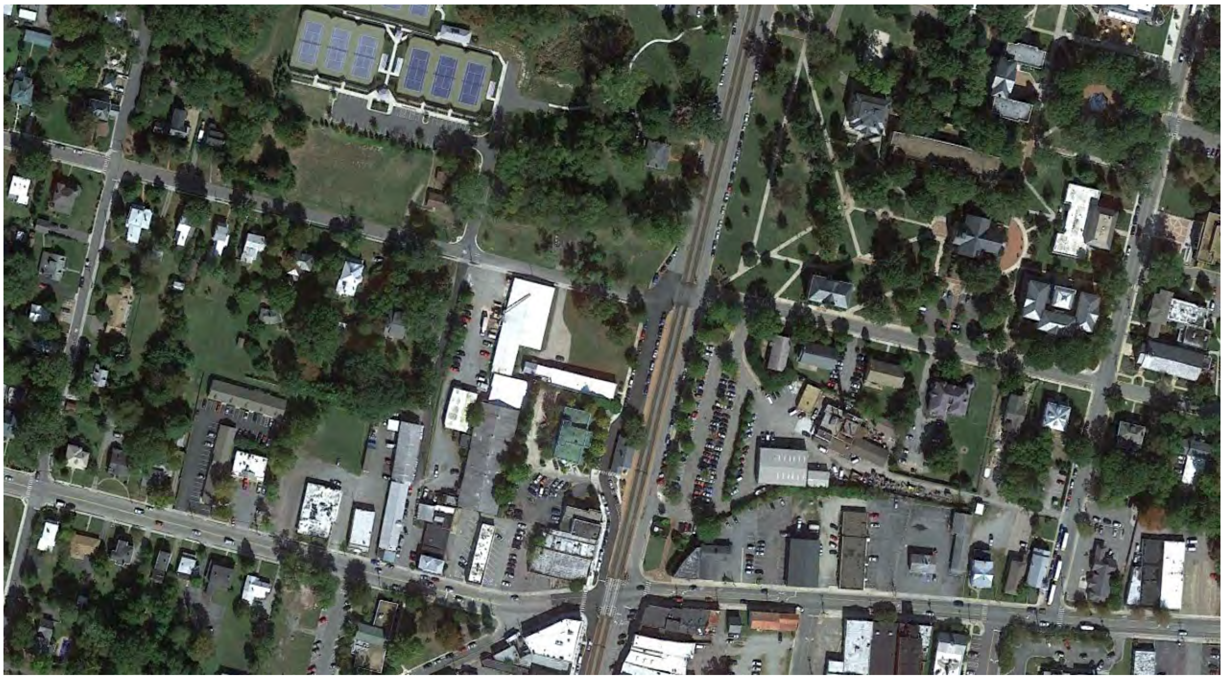
Jurisdiction: Hanover County

Current Warning Device: Gates (Non-Quad)

2015 AADT: 1,326

Total Number of Daily Trains: 40

Crossing Used By Public Transit? No



General Description of Crossing	Major collector, 2 lanes, minimal striping. Urban area (downtown Ashland). College Avenue / Henry Clay Road is just over a mile in length and provides connection between Thompson Street (west) to US Route 1 (east), through Randolph Macon College.
Traffic / Operations	Mid-volume roadway. N Center Street operates as a parallel one-way pair on both sides of tracks. Roadway parallel parking in proximity to crossing.
General Description of Major Environmental	Ashland Historic District.
Existing Property	College on north side of crossing, including sports complex and dense campus buildings. Dense residential / commercial on south side of crossing.
Connectivity to Adjacent Crossings	W Patrick Street, at-grade ~0.3 miles (rail) and ~0.5 miles (roadway) upstream. England Street / Thompson Street, at-grade ~.1 miles (rail) and ~0.3 miles (roadway) downstream.
Accessibility	Through street used to access college and residential areas.

Crossing Name: ENGLAND ST / THOMPSON ST | **Ashland (Alternative Area 5)**

Line / Crossing Number: RF&P / 860459F

Jurisdiction: Hanover County

Current Warning Device: Gates (Non-Quad)

2015 AADT: 14,280

Total Number of Daily Trains: 40

Crossing Used By Public Transit? No

General Description of Crossing	Minor arterial roadway, 3 lanes. Urban area – the main roadway through downtown Ashland. England Street / Thompson Street has dedicated turn lanes, on-street parking, and is part of a 7-legged intersection at the crossing. Ashland train station in north/west quadrant of crossing.
Traffic / Operations	High volume roadway. Part of a 7-legged intersection at crossing. High pedestrian crossing and school bus crossing area.
General Description of Major Environmental	Ashland Historic District.
Existing Property	Dense commercial / residential on all sides of crossing. Ashland train station in north/west quadrant of crossing.
Connectivity to Adjacent Crossings	College Avenue / Henry Clay Road, at-grade ~.1 miles (rail) and ~0.3 miles (roadway) upstream. Myrtle Street, at-grade ~.1 miles (rail) and ~.3 miles (roadway) downstream.
Accessibility	Minor arterial roadway that is the main street through downtown Ashland.

<u>Crossing Name: MYRTLE STREET</u>

Ashland (Alternative Area 5)

Line / Crossing Number: RF&P / 860454W

Jurisdiction: Hanover County

Current Warning Device: Gates (Non-Quad)

2015 AADT: 1,836

Total Number of Daily Trains: 40

Crossing Used By Public Transit? No

General Description of Crossing	Major collector roadway, 2 lanes. Urban area (downtown Ashland). Myrtle Street is just over ½ mile in length and connects Hanover Road (to the west) to Us Route 1 (to the east), through dense residential community.
Traffic / Operations	Mid-volume roadway. Center Street (parallel to tracks) is one-way on west side of tracks. Pedestrian crossing area. Nearby surface parking lot.
General Description of Major Environmental	Ashland Historic District (east side of crossing).
Existing Property	Dense residential / commercial on all sides of crossing.
Connectivity to Adjacent Crossings	England Street / Thompson Street, at-grade ~.1 miles (rail) and ~.3 miles (roadway) upstream. E Francis Street, at-grade ~.5 miles (rail and roadway) downstream.
Accessibility	Through street used to access residential areas and connects directly to US Route 1 to the east.

Crossing Name: E FRANCIS STREET	**Ashland (Alternative Area 5)**
Line / Crossing Number: RF&P / 860450U	**Jurisdiction:** Hanover County
Current Warning Device: Gates (Non-Quad)	**2015 AADT:** 1,428
Total Number of Daily Trains: 40	**Crossing Used By Public Transit?** No

General Description of Crossing	Local roadway, 2 lanes. Rural area (southern limit of Ashland). E Francis Street is approximately ½ mile in length and provides the southern-most east-west roadway connection to the residential grid street network in Ashland.
Traffic / Operations	Mid-volume roadway. Center Street (parallel to tracks) is one-way on west side of tracks.
General Description of Major Environmental	Ashland Historic District on both sides of tracks.
Existing Property	Dense residential properties and access on all sides of tracks.
Connectivity to Adjacent Crossings	Myrtle Street, at-grade ~.5 miles (rail and roadway) upstream. Ashcake Road, at-grade ~.3 miles (rail) and ~0.5 miles (roadway) downstream.
Accessibility	Short through roadway that provides access to residential properties.

Crossing Name: ASHCAKE ROAD

Line / Crossing Number: RF&P / 860448T

Current Warning Device: Gates (Non-Quad)

Total Number of Daily Trains: 40

Ashland (Alternative Area 5)

Jurisdiction: Hanover County

2015 AADT: 7,752

Crossing Used By Public Transit? No

General Description of Crossing	Minor arterial roadway, 2 lanes. Urban area – crossing is located just south of the town of Ashland, and connects to the town via two local roadways that run parallel to the railroad tracks and intersect at the crossing. To the east, Ashcake Road connects to US Route 1 and beyond. To the west, it connects to US Route 33 and beyond.
Traffic / Operations	High volume roadway. S Center Street (west side, north and south of crossing) and S Railroad Avenue (east side, north of crossing only) parallel the railroad tracks and intersect Ashcake Road within a few feet of the crossing.
General Description of Major Environmental	Carter Park in north / east quadrant.
Existing Property	Numerous residences in north/east (~15). Undeveloped in north/west. Pond / a few outlying residences in south/west. Industrial / commercial in south/east.
Connectivity to Adjacent Crossings	E Francis Street, at-grade ~0.5 miles (rail and roadway) upstream in town of Ashland. Gwathmey Church Road, at-grade ~1 mile (rail and roadway) downstream – a minor local crossing with no connectivity.
Accessibility	High volume, through roadway that serves the network as a minor arterial roadway.

Crossing Name: GWATHMEY CHURCH ROAD

Ashland (Alternative Area 5)

Line / Crossing Number: RF&P / 860447L

Jurisdiction: Hanover County

Current Warning Device: Gates (Non-Quad)

2015 AADT: 163

Total Number of Daily Trains: 40

Crossing Used By Public Transit? No

General Description of Crossing	Minor collector roadway, 2 lanes, minimal striping. Rural area. Gwathmey Church Road is approximately ½ mile in length and provides the sole access to the residential community on the east side of the tracks. To the west, it connects to Elmont Road.
Traffic / Operations	Low volume roadway. Center Street Road, north of crossing, runs parallel to tracks and terminates in a 3-legged intersection at the crossing.
General Description of Major Environmental	None identified.
Existing Property	Dense residential on west side of crossing, houses within ~ 50 feet of roadway. Undeveloped and some residential (larger properties) east side of crossing.
Connectivity to Adjacent Crossings	Ashcake Road, at-grade ~1 miles (rail) and ~4 miles (roadway, east side only) upstream. Elmont Road, at-grade ~1.5 miles (rail) and ~2 miles (roadway, east side only) downstream.
Accessibility	Crossing provides sole access to residences on east side of crossing.

Crossing Name: ELMONT ROAD

Ashland (Alternative Area 5)

Line / Crossing Number: RF&P / 860445X

Jurisdiction: Hanover County

Current Warning Device: Gates (Non-Quad)

2015 AADT: 2,142

Total Number of Daily Trains: 40

Crossing Used By Public Transit? No

General Description of Crossing	Major collector roadway, 2 lanes. Rural area. Elmont Road begins at Cedar Lane within ½ mile of the crossing, to the east. To the west, Elmont Road runs north towards Ashcake Road and beyond (whereas Cedar Lane runs more due west to Ashland Road).
Traffic / Operations	Mid-volume roadway.
General Description of Major Environmental	None identified.
Existing Property	Buildings (both residential and commercial) within < 100 feet of crossing on both sides of tracks. Undeveloped with residential driveway access, both sides of crossing.
Connectivity to Adjacent Crossings	Gwathmey Church Road, at-grade ~1.5 miles (rail) and ~2 miles (roadway, west side only) upstream. Cedar Lane, at-grade ~0.5 miles (rail) and ~ 1-1.5 miles (roadway) downstream.
Accessibility	Major collector roadway that serves as the primary connector to the network north / west of the crossing.

Crossing Name: CEDAR LANE	**Ashland (Alternative Area 5)**
Line / Crossing Number: RF&P / 860443J	**Jurisdiction:** Hanover County
Current Warning Device: Gates (Non-Quad)	**2015 AADT:** 1,938
Total Number of Daily Trains: 40	**Crossing Used By Public Transit?** No

General Description of Crossing	Major collector roadway, 2 lanes. Rural area – undeveloped areas and larger residential properties. To the east, Cedar Lane terminates at US Route 1 in proximity to the interchange with I-95 at Sliding Hill. To the west, it terminates at Ashland Road. Existing driveway access close to crossing to the west.
Traffic / Operations	Mid-volume roadway.
General Description of Major Environmental	Pond in north/east.
Existing Property	Large residential properties and/or driveway access that would be effected on both sides of crossing.
Connectivity to Adjacent Crossings	Elmont Road, at-grade ~0.5 miles (rail) and 1.5 miles (roadway) upstream, which is another major collector roadway that serves a different area than Cedar Lane. Greenwood Road, grade separated ~1 mile (rail) and 2-4 miles (roadway) downstream.
Accessibility	Major collector roadway that serves as the primary connector to the network west of the crossing.

<u>**Crossing Name: MILL ROAD**</u>	**Ashland (Alternative Area 5)**
Line / Crossing Number: RF&P / 860441V	**Jurisdiction:** Henrico County
Current Warning Device: Gates (Non-Quad)	**2015 AADT:** 2,754
Total Number of Daily Trains: 40	**Crossing Used By Public Transit?** No

General Description of Crossing	Major collector roadway, 2 lanes. Urban area. Mill Road is approximately 2 miles in length, and connects Mountain Road to the south (west of crossing) with Greenwood Road, the intersection with which is located immediately east of the crossing.
Traffic / Operations	Mid-volume roadway. Mill Road terminates at a T-intersection within ~100 feet of crossing, east side. Intersection with Greenwood Road is within 2,000 feet of crossing, east side.
General Description of Major Environmental	Hunton Community Center property is located within ~100 feet, east side of crossing.
Existing Property	Community center property, east side. Undeveloped with sparse residential, north / west side.
Connectivity to Adjacent Crossings	Greenwood Road, grade separated ~0.25 miles (rail) and ~0.5 miles (roadway, east side only) upstream. Mountain Road, at-grade, ~1.5 miles (rail) and ~1.5-3 miles (roadway) downstream.
Accessibility	Through roadway, connecting mainly residential community north/east of I-295 to residential community south/west of it.

Crossing Name: MOUNTAIN ROAD	**Richmond (Alternative Area 6)**
Line / Crossing Number: RF&P / 860438M	**Jurisdiction:** Henrico County
Current Warning Device: Four Quad Gates	**2015 AADT:** 5,304
Total Number of Daily Trains: 40	**Crossing Used By Public Transit?** No

General Description of Crossing	Minor arterial roadway, 2 lanes. Urban area. Mountain Road roughly parallels I-295 and intersects with at least three north-south roadways that interchange with the interstate (US Route 33, Woodman Road, and US Route 1), and serves the largely and densely residential area that is Glen Allen.
Traffic / Operations	High volume roadway. Intersections with north-south roads within ~500 feet on both sides of the crossing. Center turn lane on west side of crossing.
General Description of Major Environmental	None identified.
Existing Property	Commercial and undeveloped on west side of crossing. Industrial / commercial in north/east. Residential primary in south/east. Trains block both Hungary Road and Mountain Road at the same time.
Connectivity to Adjacent Crossings	I-295, grade separated ~1 mile (rail) and over 2 miles (roadway) upstream. Mill Road, at-grade ~1.5 miles (rail) and 2 miles (roadway) upstream. Hungary Road, at-grade ~1.5 miles (rail) and 2-3 miles (roadway) downstream.
Accessibility	Minor arterial roadway that serves traffic throughout Glen Allen from I-295 and beyond.

Crossing Name: HUNGARY ROAD	**Richmond (Alternative Area 6)**
Line / Crossing Number: RF&P / 860438M	**Jurisdiction:** Henrico County
Current Warning Device: Gates w/ Median Separator	**2015 AADT:** 16,320
Total Number of Daily Trains: 40	**Crossing Used By Public Transit?** No

General Description of Crossing	Minor arterial roadway, 4 lanes. Urban area – it is the main roadway serving the Laurel area with dense residential development. ½ mile to the west of the crossing, Hungary Road intersects US Route 33 / Staples Mill Road. Existing crossing treatment is medians with gates.
Traffic / Operations	Very high volume. 4 lanes of traffic, with driveways within ~200 feet on both sides of crossing.
General Description of Major Environmental	None identified.
Existing Property	Residential properties and access, with some commercial, on both sides of crossing. Trains block both Hungary Road and Mountain Road at the same time.
Connectivity to Adjacent Crossings	Mountain Road, at-grade ~1.5 miles (rail) and 2-3 miles (roadway) upstream. E Parham Road, grade separated, ~0.5 miles (rail) and 1 mile (roadway) downstream.
Accessibility	Minor arterial, 4-lane roadway with high accessibility and connectivity to the network.

Crossing Name: HERMITAGE ROAD	**Richmond (Alternative Area 6)**
Line / Crossing Number: RF&P / 860435S	**Jurisdiction:** Henrico County
Current Warning Device: Gates (Non-Quad)	**2015 AADT:** 4,284
Total Number of Daily Trains: 40	**Crossing Used By Public Transit?** No

General Description of Crossing	Major collector roadway, 2 lanes. Urban area – located between commercial / industrial that is adjacent to US Route 33, and residential area. Approximately 1,000 feet to the west of the crossing, Hermitage Road intersects (and terminates) at US Route 33 / Staples Mill Road. To the east, Hermitage Road terminates at Woodman Road.
Traffic / Operations	Mid-volume roadway. Industrial access roadway within ~500 feet of crossing, west side. Oakway Avenue (residential roadway) within ~200 feet of crossing, east side. Broadway Avenue (residential roadway) within ~500 feet of crossing, east side.
General Description of Major Environmental	None identified.
Existing Property	Industrial / commercial on west side, and south / east side of crossing. Industrial / commercial immediately adjacent to roadway, transitions to residential properties on north / east side of crossing.
Connectivity to Adjacent Crossings	E Parham Road, grade separated ~0.5 mile (rail) and 1 mile (roadway) upstream. Hilliard Road, grade separated ~1 mile (rail) and 2-3 miles (roadway) downstream.
Accessibility	Major collector roadway providing through access to large, dense residential area.

Crossing Name: JAHNKE ROAD

Richmond (Alternative Area 6)

Line / Crossing Number: A-LINE / 623663D

Jurisdiction: City of Richmond

Current Warning Device: Gates (Non-Quad)

2015 AADT: 12,240

Total Number of Daily Trains: 34

Crossing Used By Public Transit? Yes

General Description of Crossing	Minor arterial roadway, 2 lanes. Urban area – dense residential in vicinity of crossing, as well as an elementary school. To the west, Jahnke Road interchanges with both the Powhite Pkwy and the Chippenham Pkwy. To the east, it terminates at Forest Hill Avenue (which also interchanges with the Powhite Pkwy).
Traffic / Operations	High volume roadway. Clarence Street (residential roadway) within ~300 feet of crossing, east side. Boroughbridge Road (residential roadway) within ~500 feet of crossing, west side.
General Description of Major Environmental	Area on west of crossing (to railroad tracks) is part of the Cedarhurst Neighborhood Historic District. Westover Hills Elementary School is located within ~500 feet crossing, east side.
Existing Property	Dense residential properties in close proximity to roadway on both sides of crossing. School property in north/east.
Connectivity to Adjacent Crossings	Forest Hill Avenue, grade separated ~0.5 mile (rail) and ~1 mile (roadway) upstream. Bassett Avenue, at-grade ~0.5 mile (rail) and ~1 mile (roadway) downstream
Accessibility	High volume through roadway.

Crossing Name: BASSETT AVENUE

Richmond (Alternative Area 6)

Line / Crossing Number: A-LINE / 623664K

Jurisdiction: City of Richmond

Current Warning Device: Gates (Non-Quad)

2015 AADT: 1,399

Total Number of Daily Trains: 34

Crossing Used By Public Transit? No

General Description of Crossing	Local roadway, 2 lanes, minimal striping. Urban area. Bassett Avenue just over ½ mile total length and is part of the grid network of streets serving this residential area. To the east, it intersection Westover Hills Road and beyond. It terminates at Faye Street approximately 1,500 feet east of the crossing.
Traffic / Operations	Mid volume roadway. Intersections within ~250 feet of both sides of crossing.
General Description of Major Environmental	None identified.
Existing Property	Dense residential properties on all sides of crossing.
Connectivity to Adjacent Crossings	Jahnke Road, at-grade ~~0.5 mile (rail) and ~1 mile (roadway) upstream Midlothian Turnpike, grade separated ~.5 mile (rail) and ~1 mile (roadway) downstream.
Accessibility	A short through-street serving a residential area.

Crossing Name: BROAD ROCK BOULEVARD

Richmond (Alternative Area 6)

Line / Crossing Number: A-LINE / 623668M

Jurisdiction: City of Richmond

Current Warning Device: Gates w/ Median Separator

2015 AADT: 19,380

Total Number of Daily Trains: 34

Crossing Used By Public Transit? Yes

General Description of Crossing	Other principal arterial roadway, 4 lanes, median separated. Urban area – high density development along roadway, including veterans' hospital. Major intersection with Belt Boulevard just east of crossing. Broad Rock Boulevard connects to Hull Street Road to the north/east, and to the west, interchanges with Chippenham Pkwy.
Traffic / Operations	Very high volume. (Highest at grade crossing volumes in entire corridor). Major intersection with Belt Boulevard within ~500 feet of crossing, east side. Sidewalks leading up to tracks, both sides (pedestrian crossing). Historical accidents / fatalities.
General Description of Major Environmental	McGuire Veterans Hospital complex in north / east. School playground fields / access within 1,000 feet on west / south side.
Existing Property	High density residential on both sides of crossing.
Connectivity to Adjacent Crossings	Hull Street, grade separated ~0.5 mile (rail) and 1-2 miles (roadway) upstream. Hopkins Road, grade separated ~0.5 mile (rail) and 1 mile (roadway) downstream.
Accessibility	Principal arterial roadway with through access and connectivity.

<u>Crossing Name: TERMINAL AVENUE</u>

Richmond (Alternative Area 6)

Line / Crossing Number: A-LINE / 623670N

Jurisdiction: City of Richmond

Current Warning Device: Gates (Non-Quad)

2015 AADT: 683

Total Number of Daily Trains: 34

Crossing Used By Public Transit? No

General Description of Crossing	Local roadway, 2 lanes that provides access to 4 residences, minimal striping. Urban area. Terminal Avenue is just over ½ mile in total length, and is an unclassified local roadway between Hopkins Road (west of crossing) to E Belt Boulevard (east of crossing).
Traffic / Operations	Low volume roadway. Intersection with E Belt Boulevard ~250 feet to the east of crossing. Intersection with Hopkins Road ~1000 feet to the west of crossing. Parallel parking on crossing roadway.
General Description of Major Environmental	None identified.
Existing Property	Residential properties and undeveloped on all sides of crossing.
Connectivity to Adjacent Crossings	Hopkins Road, grade separated ~.2 miles (rail) and ~.5 miles (roadway) upstream. Warwick Road / Bells Road, grade separated ~.75 miles (rail) and ~1.5 miles (roadway) downstream).
Accessibility	Low volume local roadway that connects E Belt Boulevard and Hopkins Road, which themselves interchange approximately 1000 feet north of the crossing.

<u>Crossing Name: WALMSLEY BOULEVARD</u>

Line / Crossing Number: A-LINE / 623672C

Current Warning Device: Gates (Non-Quad)

Total Number of Daily Trains: 34

Richmond (Alternative Area 6)

Jurisdiction: City of Richmond

2015 AADT: 4,998

Crossing Used By Public Transit? No

General Description of Crossing	Minor arterial roadway, 2 lanes. Urban area – dense residential properties east of crossing truck distribution center west of crossing. Walmsley Boulevard terminates at US Route 1 approximately ½ mile east of the crossing. Large bump over track (5mph speed limit sign).
Traffic / Operations	High volume roadway. Intersection with Caldwell Avenue (east side) and industrial driveway access (west side) within ~700 feet of crossing. High percentage truck traffic (access to industrial area).
General Description of Major Environmental	None identified.
Existing Property	Commercial/industrial and undeveloped on west side of crossing. Dense residential in close proximity to roadway on east side of crossing.
Connectivity to Adjacent Crossings	Warwick Road, grade separated ~1 mile (rail) and 2 miles (roadway) upstream. Castlewood Road, grade separated ~0.5 mile (rail) and 1 mile (roadway) downstream.
Accessibility	Through minor arterial roadway.

Crossing Name: KINGSLAND ROAD	**Richmond (Alternative Area 6)**
Line / Crossing Number: A-LINE / 623678T	**Jurisdiction:** Chesterfield County
Current Warning Device: Gates (Non-Quad)	**2015 AADT:** 2,142
Total Number of Daily Trains: 34	**Crossing Used By Public Transit?** No

General Description of Crossing	Major collector roadway, 2 lanes. Rural area. Kingsland Road is approximately 4 miles in total length and crosses both the A and S Lines. In this vicinity of this crossing, it provides east-west access through and to residences.
Traffic / Operations	Mid-volume roadway. Firethorne Lane intersection (residential area) within ~350 feet, east side of crossing. Private driveway access within ~25 feet, west side of crossing.
General Description of Major Environmental	None identified.
Existing Property	Dense residential communities, east side of crossing. Undeveloped / larger residential properties, west side of crossing.
Connectivity to Adjacent Crossings	S Beulah Road, grade separated ~2 miles (rail) and ~4 miles (roadway) upstream. Thurston Road, at-grade ~.5 miles (rail) and ~1.5 miles (roadway) downstream.
Accessibility	Through roadway providing access to residences / residential communities.

Crossing Name: THURSTON ROAD	**Richmond (Alternative Area 6)**
Line / Crossing Number: A-LINE / 623679A	**Jurisdiction:** Chesterfield County
Current Warning Device: Gates (Non-Quad)	**2015 AADT:** 459
Total Number of Daily Trains: 34	**Crossing Used By Public Transit?** No

General Description of Crossing	Local roadway, 2 lanes, minimal striping, limited sight distance. Rural area. Thurston Road is approximately ½ mile in length and connects to Hopkins Road to the west and Dorsey Road to the east. It provides access to residential properties along its length.
Traffic / Operations	Low volume roadway.
General Description of Major Environmental	None identified.
Existing Property	Mainly undeveloped with sparse residential and associated farmland on all sides of crossing.
Connectivity to Adjacent Crossings	Kingsland Road, at-grade ~.5 miles (rail) and ~1.5 miles (roadway) upstream. Old Lane, at-grade ~0.5 miles (rail) and ~1.5 miles (roadway) downstream.
Accessibility	Through roadway providing local access.

<u>Crossing Name: OLD LANE</u>

Richmond (Alternative Area 6)

Line / Crossing Number: A- & S-LINE / 623680U

Jurisdiction: Chesterfield County

Current Warning Device: Gates (Non-Quad)

2015 AADT: 4,896

Total Number of Daily Trains: 34

Crossing Used By Public Transit? No

General Description of Crossing	Major collector roadway, 2 lanes. Rural. Old Lane is less than ½ mile in length and provides connectivity between Hopkins Road (west) to Chester Road (east). The area is mainly undeveloped with large commercial / industrial properties adjacent to Chester Road.
Traffic / Operations	Mid-volume roadway. Dedicated turn lanes to/from industrial area, immediately east of crossing (driveway ~250 feet of crossing). Intersection with Chester Road within ~550 feet of crossing, east side.
General Description of Major Environmental	None identified.
Existing Property	Undeveloped / sparse residential, west side of crossing. Large commercial / industrial properties, east side of crossing.
Connectivity to Adjacent Crossings	Thurston Road, at-grade ~0.5 miles (rail) and ~1.5 miles (roadway) upstream. Centralia Road, at-grade ~.3 miles (rail) and ~.75 miles (roadway) downstream.
Accessibility	Through connecting roadway between two larger roadways.

<u>Crossing Name: HERMITAGE ROAD</u>	**Richmond (Alternative Area 6)**
Line / Crossing Number: S-LINE / 623518E	**Jurisdiction:** City of Richmond
Current Warning Device: Gates w/ Median Separator	**2015 AADT:** 10,200
Total Number of Daily Trains: 21	**Crossing Used By Public Transit?** No

General Description of Crossing	Minor arterial roadway, 4 lanes – divided/median separated. Urban – dense residential and commercial. Hermitage Road is the primary north-south roadway that connects downtown Richmond (to the south) to this commercial / sports area.
Traffic / Operations	High volume roadway. Intersection with W Leigh Street within ~750 feet south / west of crossing. Ownby Lane intersection within ~250 feet north / east of crossing. Sidewalks on both sides of roadway, both sides of crossing (pedestrian crossing). Surface parking access, south side of crossing.
General Description of Major Environmental	None identified.
Existing Property	High density residential and commercial on all sides of crossing.
Connectivity to Adjacent Crossings	North Boulevard, grade separated ~.5 miles (rail) and ~1 mile (roadway) upstream. Recently has been rehabilitated. N Lombardy Street, grade separated ~.5 miles (rail) and ~1 mile (roadway) downstream.
Accessibility	High volume minor arterial roadway providing through access.

Crossing Name: BROOK ROAD

Richmond (Alternative Area 6)

Line / Crossing Number: S-LINE / 623522U

Jurisdiction: City of Richmond

Current Warning Device: Gates w/ Median Separator

2015 AADT: 8,262

Total Number of Daily Trains: 21

Crossing Used By Public Transit? No

General Description of Crossing	Minor arterial roadway, 4 lanes – divided/median separated. Urban area – mainly dense commercial / industrial, in direct proximity to I-64 and US Route 1 interchange.
Traffic / Operations	High volume roadway. The Chamberlayne Avenue / US Route 1 grade separated crossing is only 372' to the east and includes an on-ramp on the track side as well as a high tension power line tower.
General Description of Major Environmental	None identified.
Existing Property	I-64 / US Route 1 interchange south / west of crossing. Mainly dense commercial / industrial properties north / east of crossing.
Connectivity to Adjacent Crossings	N Lombardy Street, grade separated ~.5 miles (rail) and ~1 miles (roadway) upstream. Route 301 / Route 1 NB / Chamberlayne Avenue / N Belvidere Street, grade separated ~.1 miles (rail) and ~.2 miles (roadway) downstream.
Accessibility	High volume minor arterial roadway providing through movement to Chamberlayne Parkway.

<u>Crossing Name: ST JAMES STREET</u>	**Richmond (Alternative Area 6)**
Line / Crossing Number: S-LINE / 623525P	**Jurisdiction:** City of Richmond
Current Warning Device: Gates (Non-Quad)	**2015 AADT:** 1,000
Total Number of Daily Trains: 21	**Crossing Used By Public Transit?** No

General Description of Crossing	Local roadway, 2 lanes. Urban areas to north and south, while crossing is mainly undeveloped with dense residential to south and north. St James Street is a north-south roadway that connects to residential grid networks on both sides of the crossing.
Traffic / Operations	Mid-volume roadway through 2045.
General Description of Major Environmental	Cemetery on north side within 1000 feet of crossing.
Existing Property	Undeveloped north / west. Commercial / industrial large property north / east. Dense residential properties on the south side of crossing.
Connectivity to Adjacent Crossings	Route 301 / Route 1 NB / Chamberlayne Avenue / N Belvidere Street and Chamberlayne Parkway crossings, grade separated ~.5 miles (rail) and ~1-2 miles (roadway) upstream. N 1st Street, grade separated ~.1 miles (rail) and ~.5 miles (roadway) downstream.
Accessibility	Mid volume through local roadway.

<u>Crossing Name: N 2ND STREET / VALLEY ROAD</u>	**Richmond (Alternative Area 6)**
Line / Crossing Number: S-LINE / 623527D	**Jurisdiction:** City of Richmond
Current Warning Device: Gates (Non-Quad)	**2015 AADT:** 2,142
Total Number of Daily Trains: 21	**Crossing Used By Public Transit?** No

General Description of Crossing	Local roadway, 2 lanes, minimal striping, limited roadway sight distance due to curve. Urban – dense residential areas on both sides of crossing, but commercial / industrial at crossing location between the two adjacent grade separated crossings of N 1st Street and N 5th Road.
Traffic / Operations	Mid-volume roadway through 2045. Serves industrial area – high percentage of truck traffic.
General Description of Major Environmental	Cemeteries on both sides of crossing within ~1000 feet.
Existing Property	Industrial /commercial area located directly north of the crossing. Dense residential within ~1000 feet south of the crossing.
Connectivity to Adjacent Crossings	N 1st Street, grade separated ~.1 mile (rail) and ~0.5-1 mile (roadway) upstream. N 5th Street, grade separated ~.2 miles (rail) and ~2 miles (roadway) downstream.
Accessibility	Local roadway serving traffic through a commercial / industrial area to residential areas on both sides of crossing.

<u>Crossing Name: HOSPITAL ST / N 7TH ST</u>	**Richmond (Alternative Area 6)**
Line / Crossing Number: S-LINE / 623530L	**Jurisdiction:** City of Richmond
Current Warning Device: Gates (Non-Quad)	**2015 AADT:** 5,814
Total Number of Daily Trains: 21	**Crossing Used By Public Transit?** No

General Description of Crossing	Minor arterial roadway, 2 lanes, minimal striping. Urban – large commercial / industrial properties at crossing, though Hospital street connects to residential areas. I-64 overpass Hospital Street within approximately 300 feet of crossing. Located on a restricted speed curve for the track.
Traffic / Operations	High volume roadway. N 7th Street forms a 3-legged intersection at the exact railway crossing.
General Description of Major Environmental	Cemeteries within ~1000 feet on west side of crossing.
Existing Property	Large commercial / industrial east of crossing. I-64 overpass directly west of crossing. Hazmat facility nearby.
Connectivity to Adjacent Crossings	N 5th Street, grade separated ~.2 miles (rail) and ~2 miles (roadway) upstream. Route 33 / Leigh Street, grade separated ~.5 miles (rail) and ~2 miles (roadway) upstream.
Accessibility	Higher volume minor arterial roadway providing east-west through connectivity to residential areas on either side of the interstate highways.

Crossing Name: MAURY STREET

Line / Crossing Number: S-LINE / 623539X

Current Warning Device: Flashing Lights

Total Number of Daily Trains: 21

Richmond (Alternative Area 6)

Jurisdiction: City of Richmond

2015 AADT: 2,589

Crossing Used By Public Transit? No

General Description of Crossing	Local roadway, 2 lanes. Urban. Maury Street provides sole access to an industrial area that is located on the east side of I-95, which Maury Street underpasses directly east of the crossing.
Traffic / Operations	Mid-volume roadway. High percentage truck traffic (access to industrial area). I-95 located east of crossing, but not directly accessible via Maury Street.
General Description of Major Environmental	Manchester Warehouse & Industrial Historic District is located along Maury Street, west of crossing.
Existing Property	Large industrial / warehouse properties west side of crossing and south / east side of crossing. Open fields north / east side of crossing.
Connectivity to Adjacent Crossings	None upstream on same side of river. I-95 Maury Street Ramp, grade separated immediately adjacent, but does not access the Maury Street surface street network.
Accessibility	Crossing provides sole access into an industrial area on the east side of I-95.

Crossing Name: GOODES STREET	**Richmond (Alternative Area 6)**
Line / Crossing Number: S-LINE / 623543M	**Jurisdiction:** City of Richmond
Current Warning Device: None	**2015 AADT:** 204
Total Number of Daily Trains: 21	**Crossing Used By Public Transit?** No

General Description of Crossing	Local roadway, 2 lanes, minimal striping. Rural. Goodes Street provides the sole access from Commerce Road to a commercial / industrial area located on the east side of I-95 (Goodes Street underpass I-95 east of crossing).
Traffic / Operations	Low volume roadway. High percentage truck traffic (access to commercial / industrial area). I-95 located east of crossing, but not directly accessible via Goodes Street. Goodes Street has a 90-degree bend within ~50 feet of crossing, east side.
General Description of Major Environmental	None identified.
Existing Property	Undeveloped on east side of crossing. Large industrial / commercial properties on west side of crossing.
Connectivity to Adjacent Crossings	I-95 Maury Street Ramp, grade separated immediately upstream, but does not access the Maury Street surface street network E Commerce Street, at-grade ~1 mile (rail) and ~1.5 miles (roadway, west side only) downstream.
Accessibility	Crossing provides sole access into a commercial / industrial area on the east side of I-95.

<u>Crossing Name: E COMMERCE ROAD</u>	**Richmond (Alternative Area 6)**
Line / Crossing Number: S-LINE / 623545B	**Jurisdiction:** City of Richmond
Current Warning Device: Gates (Non-Quad)	**2015 AADT:** 4,284
Total Number of Daily Trains: 21	**Crossing Used By Public Transit?** No

General Description of Crossing	Minor arterial roadway, 2 lanes, with significant skew at crossing, minimal striping. Urban. E Commerce Road is the primary access point to the north side of the large industrial region that is located just south of this crossing.
Traffic / Operations	High volume roadway. I-95 located directly east of crossing roadway, but no direct access.
General Description of Major Environmental	None identified.
Existing Property	Undeveloped and mixed industrial / commercial in immediate vicinity of crossing.
Connectivity to Adjacent Crossings	Goodes Street, at-grade ~1 mile (rail) and ~1.5 miles (roadway, west side only) upstream. Ruffin Road, at-grade ~1 mile (rail) and 1.5 miles (roadway) downstream.
Accessibility	Primary access point to north side of large industrial region.

<u>Crossing Name: RUFFIN ROAD</u>

Line / Crossing Number: S-LINE / 623547P

Current Warning Device: Gates (Non-Quad)

Total Number of Daily Trains: 21

Richmond (Alternative Area 6)

Jurisdiction: City of Richmond

2015 AADT: 1,836

Crossing Used By Public Transit? Yes

General Description of Crossing	Major collector roadway, 2 lanes. Urban – dense residential communities and industry. It is approximately ½ mile in total length, and connects Commerce Road to the east and US Route 1 to the west. Community center is located on east side of crossing. Public transit utilizes the crossing. Parallel parking along the crossing roadway.
Traffic / Operations	Mid-volume roadway.
General Description of Major Environmental	Recreational fields on north side of roadway, east side of crossing.
Existing Property	Undeveloped and mixed industrial / commercial in immediate vicinity of crossing.
Connectivity to Adjacent Crossings	E Commerce Street, at-grade ~1 mile (rail) and 1.5 miles (roadway) upstream. Bells Road, at-grade ~.5 miles (rail) and 1-2 miles (roadway) downstream.
Accessibility	Major collector roadway, through crossing.

<u>Crossing Name: BELLS ROAD</u>	**Richmond (Alternative Area 6)**
Line / Crossing Number: S-LINE / 623548W	**Jurisdiction:** City of Richmond
Current Warning Device: Gates w/ Median Separator	**2015 AADT:** 8,976
Total Number of Daily Trains: 21	**Crossing Used By Public Transit?** No

General Description of Crossing	Minor arterial roadway, 4 lanes. Urban – high density residential to the west of the crossing, and along Bells Road, industrial / commercial area to the east of the crossing. Bells Road is median separated (raised grassed medians, broken by turning lanes). It connects Commerce Road to the east and US Route 1 and beyond to the west.
Traffic / Operations	High volume roadway. High truck volumes serving industrial area.
General Description of Major Environmental	None identified.
Existing Property	High density residential on west side of crossing. Industrial / commercial on east side of crossing.
Connectivity to Adjacent Crossings	Ruffin Road, at-grade ~.5 miles (rail) and 1-2 miles (roadway) upstream. Dale Avenue, at-grade ~.5 miles (rail) and ~1 mile (roadway, west side) or ~1.5 miles (roadway, east side via Trenton Avenue) downstream.
Accessibility	Through roadway – minor arterial roadway with good connectivity to network.

Crossing Name: DALE AVE / TRENTON AVE **Richmond (Alternative Area 6)**

Line / Crossing Number: S-LINE / 623549D

Jurisdiction: City of Richmond

Current Warning Device: Gates (Non-Quad)

2015 AADT: 0

Total Number of Daily Trains: 21

Crossing Used By Public Transit? No

General Description of Crossing	Local roadway, 2 narrow lanes, minimal striping, limited sight distance. Rural. Directly east of crossing, Dale Avenue has a 90-degree turn and becomes Trenton Avenue and provides access to the industrial / commercial area that connects to Commerce Road. Prior to this existing conditions assessment, Dale Avenue was used as a short cut connector roadway by local vehicles; however, under existing conditions, it does not function as a public roadway. The existing crossing is verified to operate with gated access across Trenton Avenue to restrict public access into the industrial area; since vehicles cannot use this as a normal thoroughfare, there are no vehicles to detour.
Traffic / Operations	Low volume roadway.
General Description of Major Environmental	None identified.
Existing Property	Undeveloped / no structures on east side of crossing. Residential in north / west quadrant. Undeveloped / no structures in south / west quadrant.
Connectivity to Adjacent Crossings	Bells Road, at-grade ~.5 miles (rail) and ~1 mile (roadway, west side) or ~1.5 miles (roadway, east side via Trenton Avenue) upstream. Cogbill Road, grade separated ~1 mile (rail) and ~1.5 miles (roadway, west side only) downstream.
Accessibility	Low connectivity to network – roadway is a short connector roadway.

Crossing Name: KINGSLAND ROAD	**Richmond (Alternative Area 6)**
Line / Crossing Number: S-LINE / 623559	**Jurisdiction:** Chesterfield County
Current Warning Device: Gates (Non-Quad)	**2015 AADT:** 2,040
Total Number of Daily Trains: 21	**Crossing Used By Public Transit?** No

General Description of Crossing	Major collector roadway, 2 lanes, limited sight distance. Urban. Kingsland Road is approximately 4 miles in total length and crosses both the A and S Lines. In this vicinity of this crossing, it provides east-west access through residential area to connect traffic to US Route 1 less than ½ mile east of crossing.
Traffic / Operations	Mid-volume roadway. Kingsland Road terminates in a T-intersection (with Chester Road) within ~100 feet of crossing, east side.
General Description of Major Environmental	None identified.
Existing Property	Mixed residential / undeveloped (no structures) in vicinity of crossing. US Route 1 is less than ½ mile to the east of the crossing.
Connectivity to Adjacent Crossings	Route 1, grade separated ~.3 miles (rail) and ~.5 miles (roadway, west side only) upstream. Brinkley Road, at-grade ~.7 miles (rail) and ~1 mile (roadway) downstream.
Accessibility	Through roadway that connects residential areas to Route 1.

Crossing Name: BRINKLEY ROAD	**Richmond (Alternative Area 6)**
Line / Crossing Number: S-LINE / 623660H	**Jurisdiction:** Chesterfield County
Current Warning Device: Gates (Non-Quad)	**2015 AADT:** 1,836
Total Number of Daily Trains: 21	**Crossing Used By Public Transit?** No

General Description of Crossing	Local roadway, 2 lanes, minimal striping, limited sight distance. Rural. Brinkley Road dead-ends, to the west, in a residential area. The Brinkley Road crossing provides connection from Thurston Road / Dorsey Road, the intersection with which is located within 150 feet west of crossing. East of crossing, Brinkley Road T-intersects Chester Road within 50 feet of crossing.
Traffic / Operations	Mid-volume roadway. Intersections with north-south roadways directly on either side of crossing.
General Description of Major Environmental	None identified.
Existing Property	Undeveloped / low density residential in vicinity of crossing.
Connectivity to Adjacent Crossings	Kingsland Road, at-grade ~.7 miles (rail) and ~1 mile (roadway) upstream. Old Lane, at-grade ~1 mile (rail) and ~1.5 miles (roadway, west side only) downstream.
Accessibility	Provides local residential traffic access between Dorsey Road and Chester Road, both of which connect to alternate railroad crossing roadways.

3.2.2.4 Summary of Private Crossings

The 40 private at-grade and grade-separated crossings are summarized Table 3-8; data includes rail line and location, crossing type, and the existing warning device. This table includes any new crossings that could be created as part of the DC2RVA Project. The exact location (CFP milepost) and name of each of these crossings are presented by alternative area in Figure 3-11 through Figure 3-14 (note that areas without any private crossings are not included in the series of figures).

TABLE 3-8. SUMMARY OF PRIVATE CROSSINGS (BY BUILD ALTERNATIVE AREA)

Jurisdiction	Crossing Name	Rail Line	Milepost	Crossing Type	Warning Device *(At-Grade Only)*
Arlington (Long Bridge Approach) (Alternative Area 1)					
There are no private crossings located in this area.					
Northern Virginia (Alternative Area 2)					
Arlington County	Parking Access Roadway	RF&P	CFP 108.61	Grade Separated	-
City of Alexandria	Unnamed Private Crossing	RF&P	CFP 104.42	At-Grade	None
Fairfax County	Unnamed Private Crossing	RF&P	CFP 96.04	Grade Separated	-
Prince William County	Marina Way / Occoquan River Private Crossing	RF&P	CFP 89.54	Grade Separated	-
	Cherry Hill Road Private Crossing	RF&P	CFP 82.37	At-Grade	Flashing Signal w/ Gates
	Martin Street Private Crossing	RF&P	CFP 78.62	Grade Separated	-
	Henderson Road / Epperson Avenue Private Crossing	RF&P	CFP 78.17	At-Grade	Flashing Signal w/ Gates
	Bauer Road Private Crossing	RF&P	CFP 77.45	Grade Separated	-
Stafford County	Flemming Street Private Crossing	RF&P	CFP 76.64	At-Grade	Flashing Signal w/ Gates
	Wrights Private Crossing	RF&P	CFP 74.84	Grade Separated	-
	Unnamed Private Crossing	RF&P	CFP 74.34	Grade Separated	-
	Lees Private Crossing	RF&P	CFP 73.20	At-Grade	Passive *(Ropes by Owner)*
	Unnamed Private Crossing / Aquia Creek	RF&P	CFP 70.76	Grade Separated	-
	Leeland Road Private Crossing	RF&P	CFP 65.25	Grade Separated	-
Fredericksburg (Alternative Area 3)					
Stafford County	Unnamed Private Crossing	RF&P	CFP 60.57	Grade Separated	-
Spotsylvania County	Eagle Drive Access Private Crossing	RF&P	CFP 53.80	Grade Separated	-
Stafford County	Hot Top Road	FBP	CFQ 1.09	At-Grade	Locking Gate (Passive w/ Stop Signs)

TABLE 3-8. SUMMARY OF PRIVATE CROSSINGS (BY BUILD ALTERNATIVE AREA)

Jurisdiction	Crossing Name	Rail Line	Milepost	Crossing Type	Warning Device *(At-Grade Only)*
	Driveway (Private) (Access to Federal Drive)	FBP	CFQ 2.98	At-Grade	Passive (Stop Signs)
	Cleek Lane (Driveway, Private)	FBP	CFQ 3.56	At-Grade	None
	Driveway (Private) (Access to Cleek Lane)	FBP	CFQ 3.67	At-Grade	None
	Driveway (Private) (Access to Forest Lane)	FBP	CFQ 4.55	At-Grade	Passive (Stop Signs)
Central Virginia (Alternative Area 4)					
Caroline County	Jones Private Crossing	RF&P	CFP 45.74	At-Grade	None
	Rixey Road Private Crossing	RF&P	CFP 41.75	At-Grade	None
	Roes Private Crossing	RF&P	CFP 38.99	At-Grade	None
	Unnamed Private Crossing	RF&P	CFP 36.94	At-Grade	None
	Unnamed Private Crossing	RF&P	CFP 36.59	At-Grade	None
	Unnamed Private Crossing	RF&P	CFP 34.02	At-Grade	None
	Unnamed Private Crossing	RF&P	CFP 33.62	At-Grade	None
	Georges Private Crossing	RF&P	CFP 31.35	At-Grade	None
	Chandlers Private Crossing	RF&P	CFP 24.37	At-Grade	None
	Unnamed Private Crossing	RF&P	CFP 23.83	Grade Separated	-
Hanover County	Excelsior Mill Private Crossing	RF&P	CFP 21.68	At-Grade	None
Ashland (Alternative Area 5)					
There are no private crossings located in this area.					
Richmond (Alternative Area 6)					
City of Richmond	Manchester Road Private Crossing	S-Line	S 0.61	Grade Separated	-
	4th Street Extension Private Crossing	S-Line	S 1.19	At-Grade	Flashing Signal w/ Gates
	Unnamed Private Crossing	S-Line	S 1.27	Grade Separated	-
	Federal Paper Private Crossing	S-Line	S 2.37	At-Grade	None
Chesterfield County	Cogbill Road Private Crossing	S-Line	S 5.98	Grade Separated	-
	Texaco Road Private Crossing	S-Line	S 6.38	At-Grade	Passive
	Station Road Private Crossing	S-Line	S 6.74	At-Grade	-
	Marina Drive Private Crossing	S-Line	S 6.88	Grade Separated	Passive

Note that this table includes the existing public crossing(s) in the Franconia to Occoquan Project (which is the subject of a separate Categorical Exclusion as part of the DC2RVA Project) as well as in the Powell's Creek to Arkendale section for reference.

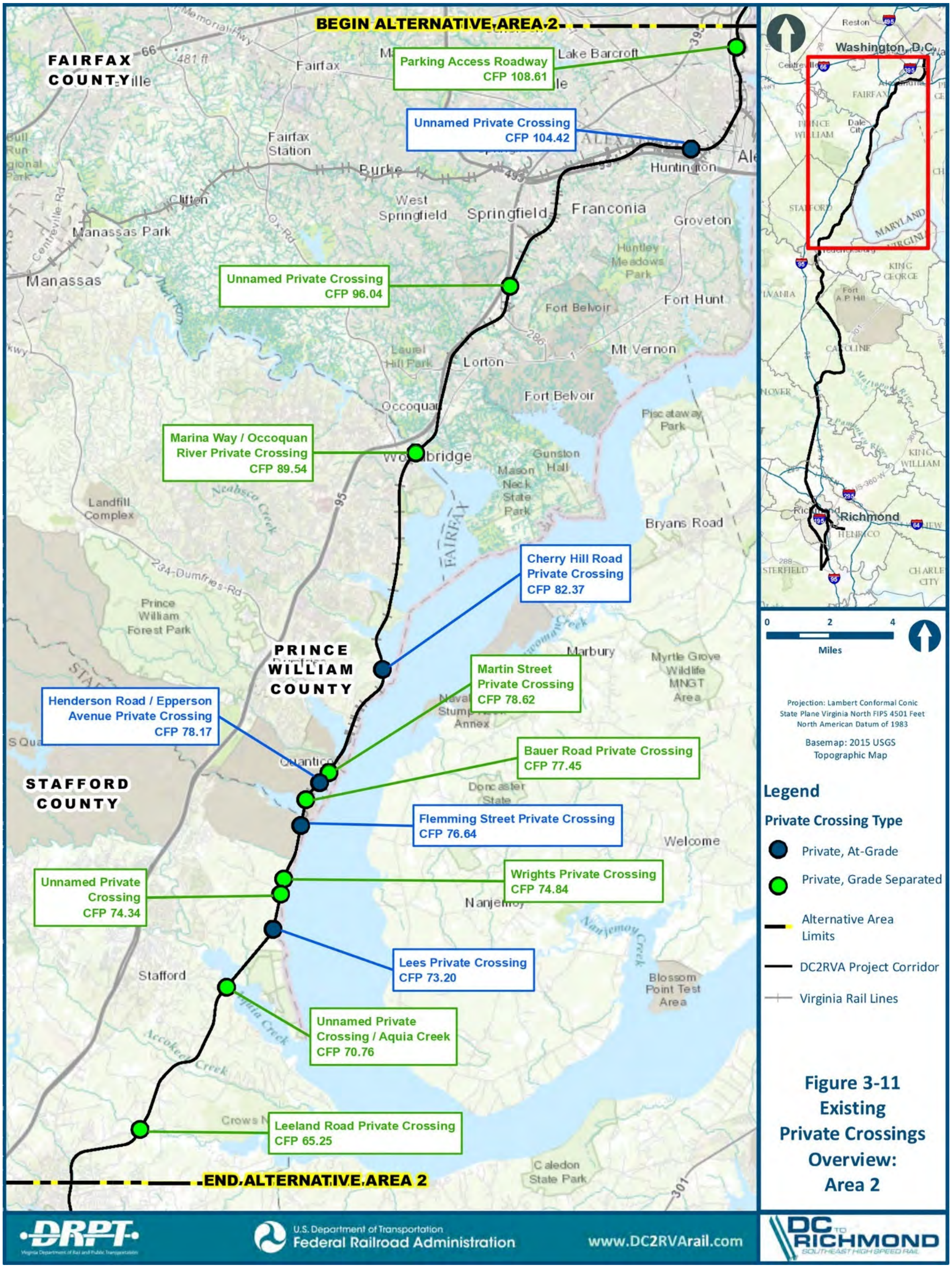


Figure 3-11 Existing Private Crossings Overview: Area 2

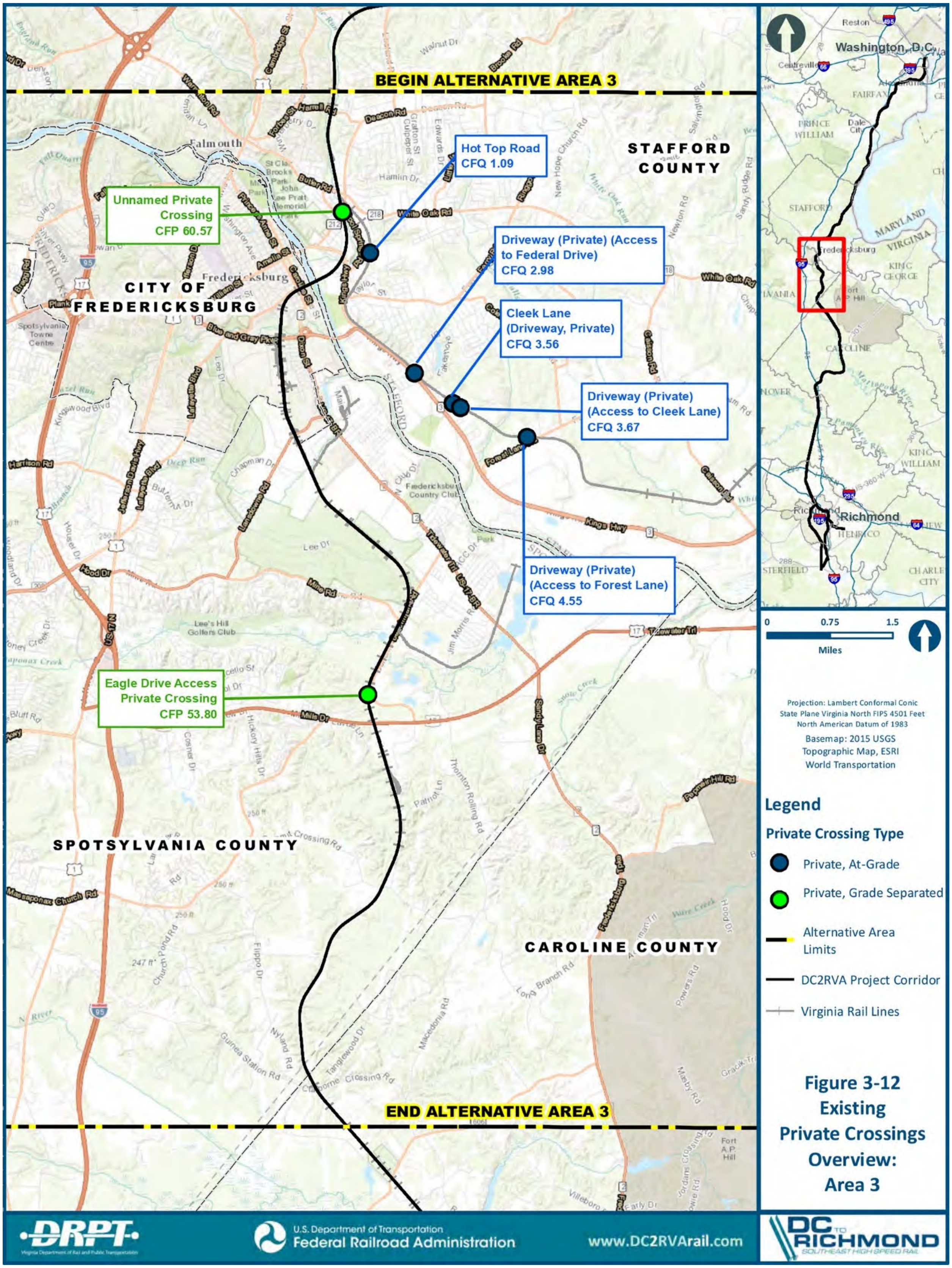


Figure 3-12
Existing Private Crossings Overview: Area 3

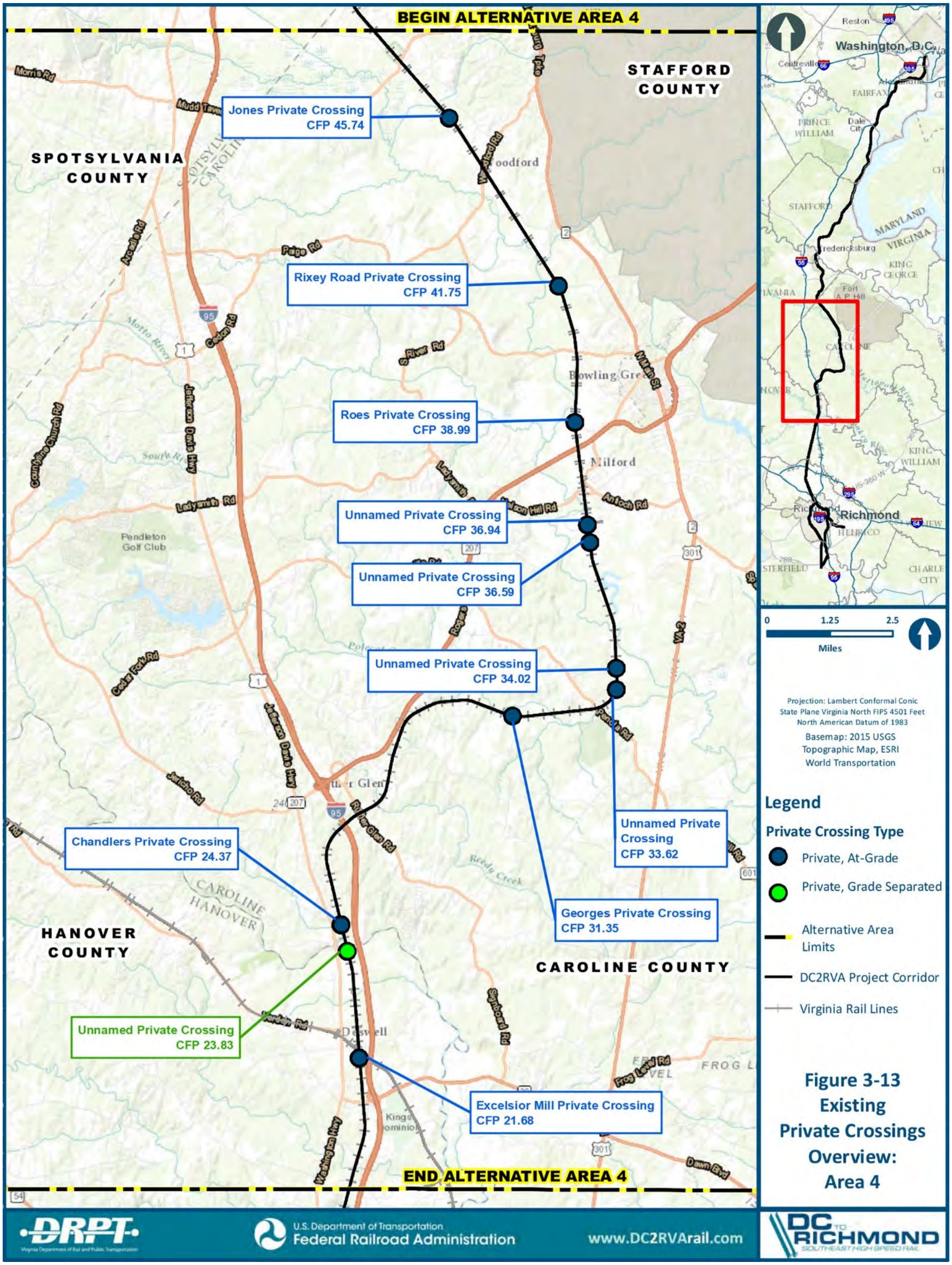


Figure 3-13
Existing
Private Crossings
Overview:
Area 4

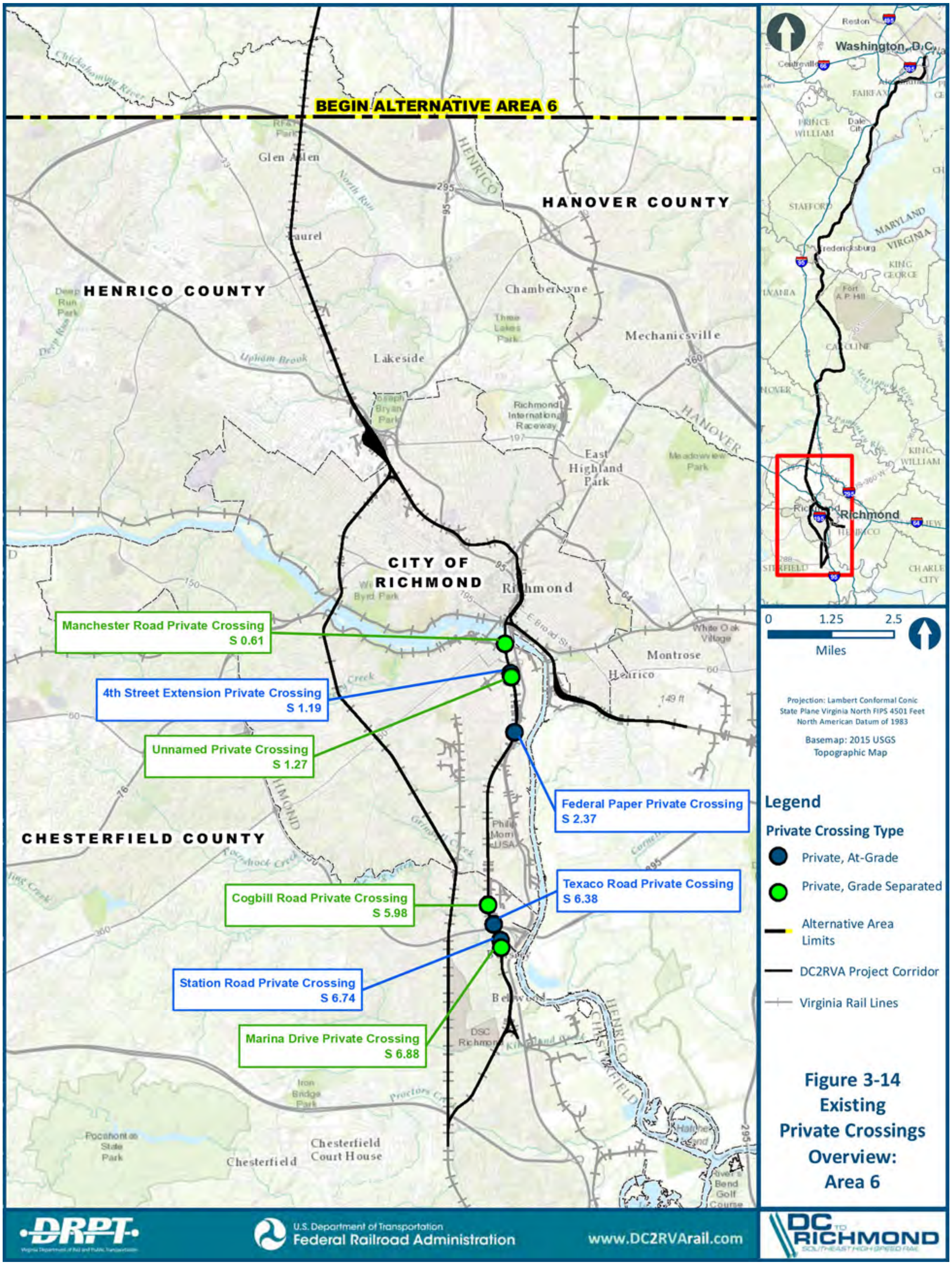


Figure 3-14
Existing
Private Crossings
Overview:
Area 6

3.2.2.5 Private At-Grade Crossings

Private at-grade crossings are defined as highway-rail crossings located on roadways that are not intended for use by the public nor maintained by a public authority. There are 24 private at-grade crossings that operate within the DC2RVA corridor (note that the locations and names are shown in Figure 3-11 through Figure 3-14 in the previous section)

These private at-grade roadway crossings typically serve as driveways to residences, provide access between farm and/or undeveloped land tracts on both sides of the railroad, or provide access to industrial properties (representative examples shown in Figure 3-15).

Figure 3-15. Examples of Private At-Grade Crossings in the DC2RVA Corridor

The private at-grade crossings within the DC2RVA corridor are typical of private crossings in general, located on narrow or unpaved roadways with minimal warning devices. Most of residential, farm, and industrial private crossings provide sole access to the property (i.e., there are no alternate routes to access the property across the railroad tracks). In general, the private crossings with active control devices (i.e., automatic gates) are those serving industrial areas. Residential and farm crossings typically have signage as the sole passive warning device. Private crossings can be controlled by a barrier gate, which is a moveable gate (manual or automatic) that is kept in the controlled position (i.e., blocking the travel lanes) and opening only on demand; however, none of the private crossings in the DC2RVA corridor currently use barrier gates.

On the following pages, a single-page "fact-sheet" for each of the 24 public at-grade crossings is presented to succinctly present relevant site-specific transportation data and conditions that may be required for the DC2RVA Project.

Crossing Name: UNNAMED PRIVATE CROSSING

Line / Crossing Number: RF&P / Unknown09

Current Warning Device: None

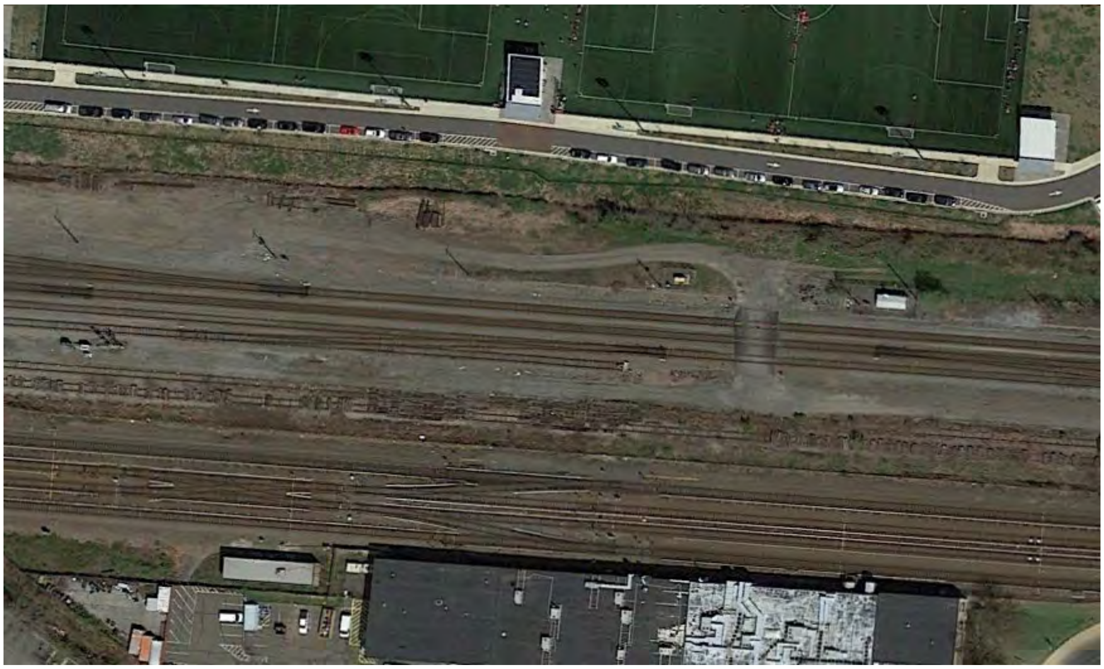
Sole Access? Yes

Northern Virginia (Alternative Area 2)

Jurisdiction: City of Alexandria

Crossing Type: Railroad Exclusive Access

Number of Lanes: 2



General Description of Crossing

- Unpaved roadway that crosses CSX tracks only
- Appears to be within railroad ROW
- Roadway connects to Business Center Drive
- No residences served by crossing
- No businesses served by crossing

<u>Crossing Name: CHERRY HILL ROAD</u>

Line / Crossing Number: RF&P / 860601G

Current Warning Device: Flashing signal with gates

Sole Access? Yes, roadway dead-ends on east side of crossing

Northern Virginia (Alternative Area 2)

Jurisdiction: Prince William County

Crossing Type: Commercial / Residential

Number of Lanes: 2

General Description of Crossing

- Paved roadway
- Marina access with popular restaurant
- Serves 1-2 residential properties
- Connecting unpaved road serves industrial area to the south (not pictured)
- Limited striping, pavement width, and sight distance at crossing

Crossing Name: HENDERSON RD / EPPERSON AVE

Northern Virginia (Alternative Area 2)

Line / Crossing Number: RF&P / 860609L

Jurisdiction: Prince William County

Current Warning Device: Flashing signal with gates

Crossing Type: Military

Sole Access? No, though connection to southern adjacent crossing appears to be blockaded / restricted. Connection to northern crossing through dense residential.

Number of Lanes: 2

General Description of Crossing

- Paved roadway
- Crossing just over ½ mile south of public Quantico crossing (Potomac Avenue)
- Provides access to industrial (water treatment) at crossing; high density residential north of crossing; and airfield area (restricted access) south of crossing.
- Close proximity to buildings.

Crossing Name: FLEMMING STREET

Line / Crossing Number: RF&P / 860586G

Current Warning Device: Flashing signal with gates

Sole Access? No

Paved Roadway? Yes

Northern Virginia (Alternative Area 2)

Jurisdiction: Stafford County

Crossing Type: Military

Number of Lanes: 2

General Description of Crossing

- Paved roadway
- Only crossing of tracks in this area of Quantico (south of waterway/airport)
- Access to upstream grade-separated crossing provided via Bauer Road (east side of tracks)
- Industrial area on east side of tracks
- High density residential or office on west side of tracks
- Close proximity to water

Crossing Name: LEES PRIVATE CROSSING

Line / Crossing Number: RF&P / 860582E

Current Warning Device: Passive (Owner installed ropes)

Sole Access? Yes, east side

Northern Virginia (Alternative Area 2)

Jurisdiction: Stafford County

Crossing Type: Residential

Number of Lanes: 1

General Description of Crossing

- Driveway to 1 property.
- Driveway connects to Arkendale Road.
- Limited width, no striping (unpaved), good site distance at crossing

Crossing Name: JONES PRIVATE CROSSING	**Central Virginia (Alternative Area 4)**
Line / Crossing Number: RF&P / 860543N	**Jurisdiction:** Caroline County
Current Warning Device: None	**Crossing Type:** Farm
Sole Access? No – Unpaved road continues on west side of tracks to connect to Woodford Road	**Number of Lanes:** 1

General Description of Crossing

- Unpaved roadway
- Single property farm access between fields and/or undeveloped areas
- Connects to Rozell Road / 609 on east side of tracks
- Dead end roads on west side of tracks

Crossing Name: RIXEY ROAD

Line / Crossing Number: RF&P / 860540T

Current Warning Device: None

Sole Access? Yes, west side.

Central Virginia (Alternative Area 4)

Jurisdiction: Caroline County

Crossing Type: Residential

Number of Lanes: 1

General Description of Crossing

- Unpaved roadway
- Driveway to single property (house and fields) on west side of crossing

Crossing Name: ROES PRIVATE CROSSING	**Central Virginia (Alternative Area 4)**
Line / Crossing Number: RF&P / 860538S	**Jurisdiction:** Caroline County
Current Warning Device: None	**Crossing Type:** Farm / Residential
Sole Access? No – unpaved connection on both sides of crossing to main roadway	**Number of Lanes:** 1

General Description of Crossing

- Unpaved roadway
- Connects to Rogers Clark Boulevard on both sides of crossing (median separated high speed road)
- Residential on east side of crossing

<u>Crossing Name: UNNAMED PRIVATE CROSSING</u>

Central Virginia (Alternative Area 4)

Line / Crossing Number: RF&P / 860531U

Jurisdiction: Caroline County

Current Warning Device: None

Crossing Type: Residential / Farm

Sole Access? Yes, west side

Number of Lanes: 1

General Description of Crossing

– Paved roadway

– Driveway to 1-2 residences and farm fields

– Connects to Industrial Drive on east side of crossing

<u>Crossing Name: UNNAMED PRIVATE CROSSING</u>

Central Virginia (Alternative Area 4)

Line / Crossing Number: RF&P / 860530M

Jurisdiction: Caroline County

Current Warning Device: None

Crossing Type: Residential

Sole Access? Yes, west side

Number of Lanes: 1

General Description of Crossing

- Paved roadway
- Connects to end of Industrial Drive (east side of crossing)
- Connects to 1-2 residences, south-west side of crossing
- Active spur

Crossing Name: UNNAMED PRIVATE CROSSING

Line / Crossing Number: RF&P / 860528L

Current Warning Device: None

Sole Access? Yes

Central Virginia (Alternative Area 4)

Jurisdiction: Caroline County

Crossing Type: Farm

Number of Lanes: 1

General Description of Crossing

- Unpaved roadway
- Access between fields
- Connects to unpaved track system throughout fields
- No nearby residences or structures. Closest structure is ~1/2 mile on the west of crossing.
- No residences served by crossing

<u>Crossing Name: GEORGES PRIVATE CROSSING</u>

Central Virginia (Alternative Area 4)

Line / Crossing Number: RF&P / 860526X

Jurisdiction: Caroline County

Current Warning Device: None

Crossing Type: Farm / Residential

Sole Access? Yes

Number of Lanes: 1

General Description of Crossing

- Unpaved roadway
- Access between field / undeveloped areas
- May be a residence / RV north-east of crossing that is served by crossing
- Connects to unpaved track system throughout undeveloped area
- Closest structure is ~1,500 feet south of crossing

Crossing Name: CHANDLERS PRIVATE CROSSING

Line / Crossing Number: RF&P / 860521N

Current Warning Device: None

Sole Access? Yes, east side

Central Virginia (Alternative Area 4)

Jurisdiction: Caroline County

Crossing Type: Farm

Number of Lanes: 1

General Description of Crossing

- Unpaved roadway
- Access to undeveloped areas (forested, not open fields) and track network on east side of crossing.
- Cleared area may be used for RV parking. No permanent residence structure present on aerial imagery.
- This crossing may be effected by the future potential Carmel Church improvements (area of land bounded by 95 and railroad tracks).

Crossing Name: EXCELSIOR MILL

Line / Crossing Number: RF&P / 860519M

Current Warning Device: None

Sole Access? Yes, east side

Central Virginia (Alternative Area 4)

Jurisdiction: Hanover County

Crossing Type: Residential

Number of Lanes: 1

General Description of Crossing

- Unpaved roadway
- Driveway to one residential property on east side of crossing
- Connects to Doswell Park Road on west side of crossing

<u>Crossing Name: 4th STREET EXTENSION</u>	**Richmond (Alternative Area 6)**
Line / Crossing Number: S-LINE / 623541Y	**Jurisdiction:** City of Richmond
Current Warning Device: Flashing signal with gates	**Crossing Type:** Industrial
Sole Access? Yes (assuming private underpass not currently functioning, see below).	**Number of Lanes:** 2

General Description of Crossing

- Paved roadway
- Driveway access to industrial area
- Private underpass (deficient, poor drainage, small) located ~500 feet south of crossing, provides access to same area.

Crossing Name: FEDERAL PAPER PRIVATE CROSSING

Line / Crossing Number: S-LINE / 623544U

Current Warning Device: None

Sole Access? No

Richmond (Alternative Area 6)

Jurisdiction: City of Richmond

Crossing Type: Industrial

Number of Lanes: 1

General Description of Crossing

- Unpaved crossing connecting industrial area
- Unpaved tracks continue to quarry area (north of crossing) to crossing at that location

<u>Crossing Name: TEXACO ROAD</u>	**Richmond (Alternative Area 6)**
Line / Crossing Number: S-LINE / 623552L	**Jurisdiction:** Chesterfield County
Current Warning Device: Passive (assumed, inconclusive in aerial)	**Crossing Type:** Industrial
Sole Access? No – but connecting roadway circuitous route through industrial area to the north (so may not be feasible)	**Number of Lanes:** 2

General Description of Crossing

- Paved roadway
- Southern-most crossing into large industrial area
- Crossing connects to US Route 1 on the west

<u>Crossing Name: STATION ROAD</u>	**Richmond (Alternative Area 6)**
Line / Crossing Number: S-LINE / 623554A	**Jurisdiction:** Chesterfield County
Current Warning Device: Passive (assumed, inconclusive in aerial)	**Crossing Type:** Industrial
Sole Access? Yes, east side	**Number of Lanes:** 1

General Description of Crossing

- Paved roadway
- Driveway to residence (1) and industrial area
- Connects to Station Road, west side of crossing

3.2.3 Pedestrian Corridor Crossings

The DC2RVA corridor has 19 dedicated pedestrian-only crossings, including 11 at-grade pedestrian crossings, 6 grade-separated pedestrian overpasses, and 2 pedestrian underpasses, as detailed in the sections below.

Safety at pedestrian crossings was not assessed as part of the alternatives development and screening process. The pedestrian grade-separated overpasses were assessed for each pedestrian crossing and no issues were found. DRPT determined the existing or planned pedestrian crossings along the corridor did not constrain the preliminary alignments evaluated for the DC2RVA Project except for the following:

- Pedestrian bridge over track for Franconia Springfield VRE Station (CFP 97.87)
- Pedestrian bridge over tracks for Rippon Station (CFP 85.30)

Details of the pedestrian crossing assessments can be found in the *Alternatives Technical Report* (Appendix A of the Draft EIS).

3.2.3.1 At-Grade Pedestrian Crossings

All at-grade pedestrian road crossings are located in the town of Ashland and include the following mid-block crossing locations, which are shown in Figure 3-16:

- Randolph-Macon College Sports Complex and Fields (connects Brock Sports Complex with the ball fields on the other side of the tracks)
- Randolph-Macon College Main Campus (immediately across from the main campus entrance)
- Ashland Station
- Thompson Street/England Street
- Robinson Street
- Lee Street
- Cox Lane/Maiden Lane
- Arlington Street
- Howard Street
- Francis Street
- Early Street

3.2.3.2 Grade Separated Pedestrian Crossings

All of the grade-separated pedestrian overpasses are located in the Northern Virginia portion of the DC2RVA corridor, where land use and populations are denser compared to the southern portion of the corridor.

- Pedestrian bridge over tracks for Franconia Springfield VRE Station
- Pedestrian bridge over tracks at Woodbridge Station
- Pedestrian bridge over tracks at Veterans Memorial Park
- Pedestrian bridge over tracks at Rippon Station
- Industrial access pedestrian bridge (near CFP 81.87)
- Pedestrian bridge over tracks (near CFP 76.68)

The grade separated pedestrian underpasses cross the Mt. Vernon Trail in Arlington and the industrial DuPont crossing south of Richmond

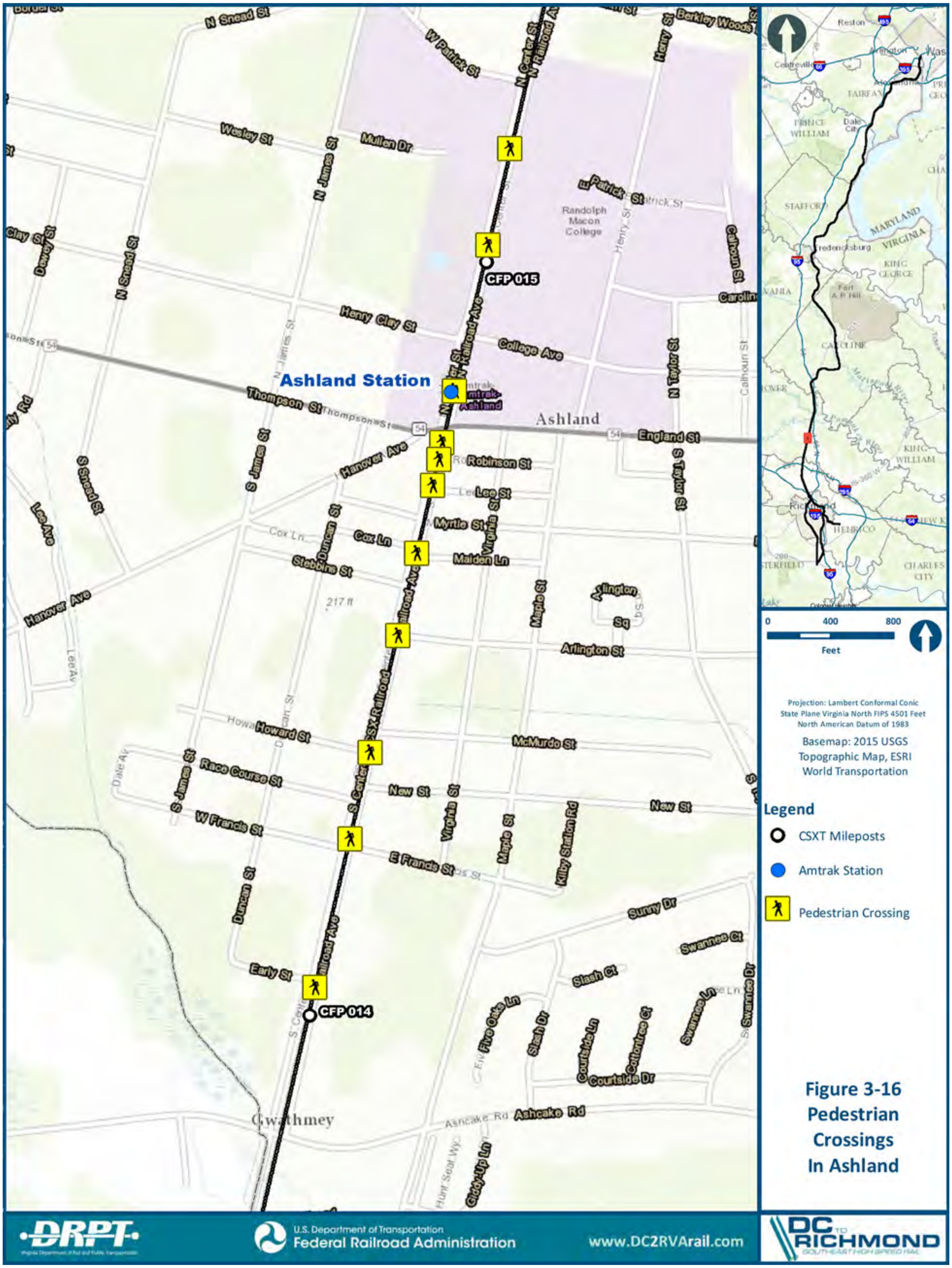


Figure 3-16: Pedestrian Crossings in Ashland

4 REGIONAL ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION

The anticipated effects on the DC2RVA Project area transportation network of the No Build and Build conditions is presented at the same two scales as the Affected Environment Transportation Facilities section: Regional Scale and Corridor Scale (as defined in Chapter 3).

The Regional Scale includes the future year conditions of the rail improvements (both increased daily trains and associated increased ridership from a regional level) and the analysis of how those improvements are anticipated to affect the greater roadway network. The Regional Scale Environmental Consequences include the following (in order of presentation within this Chapter):

- DC2RVA train service through the corridor, including the type and number of increases in daily trips through the DC2RVA corridor and associated ridership projections.
- 2025 No Build daily traffic volumes, including a summary of how the future year growth rate was developed and the resulting changes to the regional roadway network, including the I-95 facility.
- Effects due to increases in DC2RVA ridership along the corridor. This includes:
  - Effects on the regional roadway network from the DC2RVA Project, including the number of vehicles anticipated to be removed from the transportation network due to DC2RVA ridership.
  - Effects on the adjacent roadways to the Amtrak stations that are being served by the DC2RVA intercity passenger trains for 2025 No Build and Build conditions. This includes estimates of the number of motor vehicle trips anticipated to be generated by passengers accessing each station for each Build Alternative.
  - Effects on parking needs at the existing and proposed Amtrak stations.

Refer to Chapter 5 for presentation of the Corridor Scale Environmental Consequences.

The discussion on environmental consequences summarizes potential effects that may result from the construction and operation of the DC2RVA Project. In accordance with Project planning dates for physical impacts, analyses of transportation facilities are estimated for 2025 (see Section 2.1.2).

The effects presented in this chapter are based on the conceptual engineering developed for each of the Build Alternatives within the six areas defined for the Project in detail in Chapter 2 of the Draft EIS and summarized below:

Alternative Area	**Alternative**	**Description**	***Abbreviated Description****
Area 1: Arlington (Long Bridge Approach)	1A	Add Two Tracks on the East	*Add 2 Tracks East*
	1B	Add Two Tracks on the West	*Add 2 Tracks West*
	1C	Add One Track East and One Track West	*Add 1 Track East & West*
Area 2: Northern Virginia	2A	Add One Track/Improve Existing Track	*Add 1 Track*
Area 3: Fredericksburg (Dahlgren Spur to Crossroads)	3A	Maintain Two Tracks Through Town	*Maintain Existing*
	3B	Add One Track East of Existing	*Add 1 Track*
	3C	Add Two-Track Bypass East	*2-Track East Bypass*
Area 4: Central Virginia (Crossroads to Doswell)	4A	Add One Track/Improve Existing Track	*Add 1 Track*
Area 5: Ashland (Doswell to I-295)	5A	Maintain Two Tracks Through Town	*Maintain Existing*
	5A–Ashcake	Maintain Two Tracks Through Town (Relocate Station to Ashcake)	*Maintain Existing (New Station)*
	5B	Add One Track East of Existing	*Add 1 Track*
	5B–Ashcake	Add One Track East of Existing (Relocate Station to Ashcake)	*Add 1 Track (New Station)*
	5C	Add Two-Track West Bypass	*2-Track West Bypass*
	5C–Ashcake	Add Two-Track West Bypass (Relocate Station to Ashcake)	*2-Track West Bypass (New Station)*
	5D–Ashcake	Three Tracks Centered Through Town (Add One Track, Relocate Station to Ashcake)	*Center 3 Tracks (New Station)*
Area 6: Richmond (I-295 to Centralia)	6A	Staples Mill Road Station Only	*Staples Mill Only*
	6B–A-Line	Boulevard Station Only, A-Line	*Boulevard Rd Only (A-Line)*
	6B–S-Line	Boulevard Station Only, S-Line	*Boulevard Rd Only (S-Line)*
	6C	Broad Street Station Only	*Broad St Only*
	6D	Main Street Station Only	*Main St Only*
	6E	Split Service, Staples Mill Road/Main Street Stations	*Split Service*
	6F	Full Service, Staples Mill Road/Main Street Stations	*Full Service*
	6G	Shared Service, Staples Mill Road/Main Street Stations	*Shared Service*

*Tables within this chapter use abbreviated descriptions, as required for space constraints.

Effects associated with the physical improvements of the DC2RVA Franconia to Occoquan project are being evaluated in a separate Categorical Exclusion document, but do not affect the regional scale analysis presented in this chapter.

4.2 DC2RVA TRAIN SERVICE AND RIDERSHIP

Under 2025 Build conditions, intercity passenger rail ridership is projected to increase due to increased train frequency, availability, and reliability, as well as trends in general population growth. The future year increases in ridership from the DC2RVA Project could affect the regional roadway network[12] in the following two ways:

- Decreases in vehicles using the roadway network (i.e., mainly I-95) between Washington, D.C. and Richmond. *Refer to Section 4.4 for this analysis.*
- Increases in vehicles using the roadway network directly adjacent to the train station(s) that provide service. *Refer to Section 4.5 for this analysis.*

Refer to Chapter 2 of this Draft EIS for descriptions and data for the 2015 and 2025 No Build and Build passenger train service conditions. The DC2RVA Project 2025 Build conditions would add nine new passenger rail round trips, to be incorporated into Amtrak's passenger rail network:

- Four new round trip Interstate Corridor (SEHSR) passenger trains, with stops at the following stations within the DC2RVA corridor:
  - Alexandria
  - Fredericksburg
  - Richmond (station location within the city varies by Build Alternative)

  This service would complement Amtrak's current Interstate Corridor (Carolinian) service by providing additional frequencies to North Carolina. The SEHSR trains would have slightly different service patterns within the Project corridor than the existing Amtrak service and use different routes south of the Project corridor, where SEHSR trains are anticipated to provide a faster and more direct route to Raleigh and Charlotte, NC.

- Five new round trip Northeast Regional (SEHSR) passenger trains, with stops at the following stations within the DC2RVA corridor:
  - Alexandria
  - Woodbridge
  - Quantico
  - Fredericksburg,
  - Ashland (station location within town varies by Build Alternative)
  - Richmond (station location within the city varies by Build Alternative)

  This service would provide additional frequencies on the same routes of existing Amtrak Northeast Regional (Virginia) services and would terminate in Virginia (3 in Norfolk; 1 in Newport News; and 1 in Richmond).

Table 4-1 presents the annual ridership at each of these stations, represented as a total number of boardings and alightings (i.e., a total number of train passengers getting on and off of the train) for 2015, 2025 No Build, and 2025 Build conditions, by Build Alternative. Differences in ridership for Build conditions throughout the DC2RVA corridor result from the various station alternatives in Richmond, so the ridership is presented by the seven Richmond area station alternatives (ridership is projected to be identical for Build Alternatives 6B–A-Line and 6B–S-Line, so they are presented as a single Build Alternative 6). The table also compares each of the Build conditions to the No Build, as a percentage of total ridership.

Table 4-1: Annual DC2RVA Ridership[1] at Stations in Project Area (Boardings and Alightings[2])

Station	2015	2025	2025 Build Alternatives						
			6A	6B[3]	6C	6D	6E	6F	6G
	Existing Conditions	No Build	Staples Mill Only	Boulevard Rd Only	Broad St Only	Main St Only	Split Service	Full Service	Shared Service
Alexandria	174,238	208,496	233,602 (12%)	227,706 (9%)	224,571 (8%)	228,278 (9%)	230,896 (11%)	230,840 (11%)	233,030 (12%)
Woodbridge	23,836	31,191	82,694 (165%)	82,304 (164%)	81,140 (160%)	82,521 (165%)	82,171 (163%)	83,057 (166%)	83,467 (168%)
Quantico	34,754	37,945	45,313 (19%)	44,943 (18%)	44,278 (17%)	45,118 (19%)	45,398 (20%)	45,257 (19%)	45,527 (20%)
Fredericksburg	127,535	168,627	305,177 (81%)	311,500 (85%)	311,761 (85%)	314,017 (86%)	301,810 (79%)	303,303 (80%)	303,120 (80%)
Ashland Station	28,013	32,694	47,368 (45%)	50,437 (54%)	54,002 (65%)	55,771 (71%)	45,701 (40%)	44,165 (35%)	44,388 (36%)
Staples Mill Road, Richmond	351,156	407,119	714,795 (76%)	-	-	-	588,610 (45%)	417,774 (3%)	514,975 (26%)
Boulevard Road, Richmond	-	-	-	700,152 (new)	-	-	-	-	-
Broad Street, Richmond	-	-	-	-	677,667 (new)	-	-	-	-
Main Street, Richmond	46,849	50,846	-	-	-	725,586 (1,327%)	107,090 (111%)	370,238 (628%)	254,728 (401%)
Total Corridor Stations	**1,028,488**	**1,248,848**	**1,929,413 (54%)**	**1,895,121 (52%)**	**1,849,827 (48%)**	**1,910,001 (53%)**	**1,879,581 (51%)**	**1,951,631 (56%)**	**1,941,560 (55%)**

[1] The annual ridership represents the DC2RVA Project. It excludes passengers on VRE, the Auto Train, and the long distance trains to Georgia/Florida. Ridership forecasts for the Build Alternatives only differ based on which station option is used in Richmond.
[2] Boardings and alightings represent train passengers getting on and off of the train, respectively.
[3] The DC2RVA passenger train ridership is the same for Build Alternatives 6B–A-Line and 6B–S-Line, so they are presented in this table as a single Build Alternative 6B.

The ridership data indicates the following by 2025:

- The total DC2RVA ridership throughout the corridor is anticipated to increase approximately 50% for all Build Alternatives (ranging from a low of 48% for Build Alternative 6C Broad Street Station Only, to a high of 56% for Build Alternative 6F, Full Service, Staples Mill Road/Main Street Stations).
- DC2RVA ridership at the Alexandria station is anticipated to increase approximately 10% (ranging from 8% to 12%).
- DC2RVA ridership at the Fredericksburg station is anticipated to increase approximately 160% (ranging from 160% to 168%).
- DC2RVA ridership at the Quantico station is anticipated to increase approximately 20% (ranging from 17% to 20%).
- DC2RVA ridership at the Ashland station is anticipated to increase approximately 35-45% for the two station Build Alternatives (6E, 6F, and 6G) and approximately 45-70% for the single station Build Alternatives, with a high of a 71% Change for Build Alternative 6D Main Street Station Only.
- DC2RVA ridership at the Staples Mill Station is anticipated to increase approximately 75% if it is the only station in service, with a range of increases between 3% (6F Full Service) to 45% (6E Split Service) for the two station Build Alternatives.
- DC2RVA ridership at the Main Street Station is anticipated to increase approximately 1,327% if it is the only station in service, with a range of increases between 111% (6E Split Service) to 628% (6F Full Service) for the two station Build Alternatives.

4.3 FUTURE YEAR ROADWAY TRAFFIC VOLUMES (NO BUILD)

4.3.1 Development of Future Year Growth Rate

Future year traffic volumes were developed by applying an estimated growth rate to "base year" traffic. The base year used for this analysis is 2014, the most recently available full year data set at the time that the analysis was performed. The source for this data is the VDOT GIS online database for Annual Average Daily Traffic with Vehicle Classification for 2014[13].

An annual growth rate was developed by examining trends in historical traffic volume growth based on available VDOT publications of vehicle miles traveled (VMT) data. From 1975 to 2000, six data sets are available (1975, 1980, 1985, 1990, 1995, 2000) while from 2001 to 2014, data is available for every year. Data from both the pre- and post-2000 files were combined; the resulting data set includes VMT for interstate highways and primary roads for each jurisdiction in the DC2RVA Project area. Table 4-2A summarizes the year-on-year VMT growth by year for the entire study area, excluding the city of Fredericksburg.

Table 4-2A: Summary of VMT, Primary and Interstate Roadways in DC2RVA Regional Corridor (Excluding Fredericksburg)

Year	VMT	Growth Rate per Year
1975	15,242,124	4%
1980	18,424,554	5%
1985	23,078,994	8%
1990	32,026,351	6%
1995	42,001,026	1%
2000	44,961,979	0%
2001	44,879,748	4%
2002	46,832,631	1%
2003	47,365,306	6%
2004	50,149,209	1%
2005	50,841,095	1%
2006	51,210,655	2%
2007	52,138,741	0%
2008	52,089,647	-2%
2009	51,220,169	2%
2010	52,446,649	-2%
2011	51,638,327	4%
2012	53,481,631	-1%
2013	53,145,353	1%
2014	53,470,318	--
	Avg. Yearly Growth Rate 2000-2014	**1.267%**
	Avg. Yearly Growth Rate 1975-2014	**2.230%**

Traffic growth within the city of Fredericksburg was tabulated separately because the urban area data set for Fredericksburg is not available in the same format for pre-2000. As a result, an average annual growth rate was calculated for the years 2000-2014 (0.498 percent per year) and then the pre-2000 growth rates were calculated by assuming that the growth rate for the primary and interstate roads in Fredericksburg between 1975 and 1999 are comparable to the growth rate for the primary and interstate roads in all other jurisdictions[14]. The resulting growth rates from 1975 to 2014 for the city of Fredericksburg are shown in Table 4-2B.

Table 4-2B. Summary of VMT, Primary and Interstate, City of Fredericksburg

Year	VMT	Percent
1975	604,166	0.876%
1980	630,621	0.876%
1985	658,233	0.876%
1990	687,056	0.876%
1995	717,140	0.876%
2000	748,541	-1%

Table 4-2B. Summary of VMT, Primary and Interstate, City of Fredericksburg

Year	VMT	Percent
2001	742,276	4%
2002	768,361	1%
2003	772,685	0%
2004	774,532	7%
2005	827,589	2%
2006	840,597	-2%
2007	822,981	-6%
2008	776,171	2%
2009	792,326	1%
2010	799,556	-3%
2011	775,682	1%
2012	784,744	-1%
2013	780,105	2%
2014	797,787	--
Avg. Yearly Growth Rate 2000-2014		**0.498%**
Avg. Yearly Growth Rate 1975-2014		**0.876%**

Growth rates for secondary roads (for which data was not available prior to the year 2000) were estimated using a similar approach to that used for the city of Fredericksburg primary and interstate roads. Since data is available for the years 2000 through 2014, the average growth rate on secondary roads was calculated and resulted in an average annual growth rate of 1.382%. It was assumed, again, that the growth rate for secondary roads from 1975 to 1999 is comparable to the growth rate for the primary and interstate roads for all other jurisdictions[15]. The secondary roadway designation is used in Virginia counties; therefore, for this analysis, there are no secondary roadways within the city of Fredericksburg dataset. The resulting growth rates from 1975 to 2014 for all jurisdictions in the DC2RVA corridor are shown in Table 4-3.

Table 4-3: Summary of VMT, DC2RVA Corridor, Secondary Roadways

Year	VMT	Percent
1975	11,353,345	2.431%
1980	12,733,448	2.431%
1985	14,281,316	2.431%
1990	16,017,341	2.431%
1995	17,964,396	2.431%
2000	20,148,134	7%
2001	21,552,030	6%
2002	22,758,333	1%
2003	23,093,852	1%
2004	23,422,793	6%
2005	24,752,197	2%

Table 4-3: Summary of VMT, DC2RVA Corridor, Secondary Roadways

Year	VMT	Percent
2006	25,151,575	3%
2007	25,924,451	6%
2008	27,488,803	-7%
2009	25,680,771	2%
2010	26,203,872	0%
2011	26,212,464	-7%
2012	24,430,235	0%
2013	24,415,638	-1%
2014	24,135,827	--
Avg. Yearly Growth Rate 2000-2014		**1.382%**
Avg. Yearly Growth Rate 1975-2014		**2.431%**

The growth rates from Tables 4-2 to 4-3 were then combined to provide an estimate of total VMT growth for all jurisdictions and for the entire period from 1975 to 2014, as shown in Table 4-4. The calculated average annual growth rate from 1975 to 2014, as shown in the table, is 1.967 percent. For purposes of estimating future growth, therefore, the rounded value of 2.0 percent annual average growth per year (linear growth, non-compounded), was used for forecasting future roadway traffic for 2015 and 2025 at the Regional Scale.

Table 4-4: Estimated VMT, All Jurisdictions

Year	VMT	Percent
1975	27,199,635	3%
1980	31,788,623	4%
1985	38,018,543	6%
1990	48,730,748	5%
1995	60,682,562	2%
2000	65,858,654	2%
2001	67,174,054	5%
2002	70,359,325	1%
2003	71,231,843	4%
2004	74,346,534	3%
2005	76,420,880	1%
2006	77,202,827	2%
2007	78,886,173	2%
2008	80,354,621	-3%
2009	77,693,266	2%
2010	79,450,077	-1%
2011	78,626,474	0%
2012	78,696,610	0%
2013	78,341,096	0%

Table 4-4: Estimated VMT, All Jurisdictions

Year	VMT	Percent
2014	78,403,932	--
	Avg. Yearly Growth Rate 2000-2014	**1.274%**
	Avg. Yearly Growth Rate 1975-2014	**1.967%**

4.3.2 Regional Roadway Network Conditions (No Build)

Table 4-5 summarizes the estimated traffic on the regional roadway for existing conditions (2015) as well as 2025 No Build conditions. The data indicates an overall increase of 20 percent in total vehicle miles traveled (VMT)[16] by 2025, without the DC2RVA rail improvements.

The I-95 facility represents approximately 280 directional roadway miles (including I-395) of the total regional roadway miles between Washington, D.C. and Richmond within the DC2RVA corridor. I-95 is projected to carry approximately 45.4 million vehicle-miles by 2025, which represents almost 50 percent of the total vehicles-miles in the regional area.

Table 4-5: Regional Roadway Network, No Build Conditions

	Directional Measure	Interstate and US Routes	State Primary Route	State Secondary Route	Urban Routes	Total
2015 Total	ADT	47,856,880	14,744,998	5,748,709	1,029,843	69,380,430
	Length	895.0	530.7	422.2	70.8	1,918.7
	VMT	60,815,804	13,903,153	3,658,472	618,849	78,996,278
2025 No Build Total	ADT	57,240,582	17,636,174	6,875,907	1,231,773	82,984,436
	Length	895.0	530.7	422.2	70.8	1,918.7
	VMT	72,740,471	16,629,261	4,375,819	740,192	94,485,743

4.4 RIDERSHIP EFFECTS ON REGIONAL ROADWAYS

The DC2RVA improvements are expected to result in an increase of up to 854,000 annual rail passenger trips[17] (as compared to the No Build alternative). By shifting this travel to rail, DRPT anticipates that up to 2,050 vehicles per day and 250,000 daily vehicle-miles would be removed from the parallel roads of I-95 and U.S. Route 1 in the 123-mile project corridor – annually this equates to removing 656,000 vehicles per year and 80 million annual vehicle miles from the system[18]. This represents a reduction in vehicle-miles both annually and daily of approximately 0.6 percent.

4.5 RIDERSHIP EFFECTS AT DC2RVA STATIONS

4.5.1 Effects on Roadways Adjacent to Stations

The purpose of this evaluation is to assess the potential effects on the major roadways that are located adjacent[19] to the Amtrak stations that are served by the DC2RVA passenger trains.

Changes in vehicular traffic resulting from the implementation of each alternative is a function of projected annual rail ridership as provided by the DC2RVA Rail Ridership model[20]; increases or decreases in ridership at a specific station would translate to associated increases or decreases in the number of vehicle trips to and from that station. The analysis was based on the annual ridership at each station (as presented in the previous section), represented as a total number of boardings and alightings (i.e., a total number of train passengers getting on and off of the train) for 2015, 2025 No Build, and 2025 Build conditions, by Build Alternative.

4.5.1.1 Methodology

Since roadway traffic data is typically reported on a daily basis, the first step in the analysis process was to convert ridership data from annual to daily. To ensure that major infrastructure projects are neither over-designed nor under-designed, infrastructure plans are developed to serve higher than average demand but not the highest demand. The process of converting from annual to daily ridership used for this analysis accounts for some peaking by dividing annual ridership not by 365 (days per year) but by 320. As a result, the analysis reflects daily ridership approximately 15 percent higher than for an "average" day.

The analysis of traffic operations is based on a single hour, typically representing one or more of the highest (or peak) hours of the day. Therefore, the daily ridership estimated as described in the previous paragraph was converted to peak hour. For purposes of this analysis, peak hour ridership was assumed to be 8.5 percent of the estimated daily ridership (it is important to note that this is the peak within a typical day, and not the peak hour over the course of a full year). Based on the resulting estimates of peak hour ridership at each station (which represents both boardings and alightings), the number of passengers using various transportation modes to travel to and from each station was calculated using the mode split assumptions shown in Table 4-6 below. Stations were categorized as either urban (with higher percentages of public transit, pedestrian, and drop-off modes) or suburban (with higher percentages of passengers who drive).

Table 4-6: Passenger Arrival / Departure Mode Split Assumptions

Transportation Mode		Suburban Stations[1]	Urban Stations[2]
Motor Vehicle Trips	Drive & Park	49%	22%
	Kiss & Ride	18%	20%
	Taxi / Car Service	12%	29%
Public Transit		20%	12%
Walk		0%	15%
Other Miscellaneous Trips[3]		1%	2%
	Total	100%	100%

[1] Suburban Stations include: Woodbridge, Quantico, Ashland, and Staples Mill
[2] Urban Stations include: Alexandria, Fredericksburg, and downtown Richmond
[3] Other transportation modes include bicycles

For the motor vehicle trips, the total number of peak hour vehicle trips in to the station and out of the station that each passenger would create was estimated based on the following assumptions:

- Drive & Park: Each passenger would create a single vehicle trip (one-way in **<u>or</u>** one-way out of the station). Arriving passengers would go to their parked vehicle and drive out; departing passengers would drive in and park their vehicle.

- Kiss & Ride: Each passenger would create two vehicle trips (one-way in **and** one-way out of the station). Arriving passengers would be picked up by a vehicle that has entered the station area and takes them away; departing passengers would be dropped off by a vehicle that then leaves the station area without them.
- Taxi / Car Service: This was separated into two categories: 1) passengers who get into a waiting vehicle that is already in the station area from a separate trip, and 2) passengers who get into a vehicle that is called into the station area specifically for them (similar to Kiss & Ride). Each passenger either would create a single vehicle trip (those who use a waiting vehicle) or would create two vehicle trips (those who use a vehicle that was not already waiting at the station). A 50 percent/50 percent split was assumed for this mode.

Once the trips were calculated by mode for the peak hour (using the above mode split and vehicle trip assumptions), these trips were converted back to daily to allow for comparison with the estimates of daily traffic on roadways adjacent to the stations. The same ratio (with peak hour representing 8.5 percent of daily) was applied to calculate the daily trips by mode. The resulting daily vehicle trips in and out of the station area for the motor vehicle mode, as calculated at each station for No Build and Build conditions, are presented in Table 4-7 through Table 4-14.

Calculations were rounded results up to the nearest whole passenger and/or vehicle trip.

Table 4-7: 2025 Daily Passenger & Vehicle Trips by Mode, No Build

Station	Drive & Park			Kiss & Ride			Taxi / Auto Service			Transit	Walk	Other
	Psngrs	Trips		Psngrs	Trips		Psngrs	Trips		Psngrs	Psngrs	Psngrs
		In	Out		In	Out		In	Out			
Alexandria	153	82	82	141	141	141	200	153	153	82	106	24
Woodbridge	59	35	35	24	24	24	24	24	24	24	0	12
Quantico	71	35	35	24	24	24	24	24	24	35	0	12
Fredericksburg	118	59	59	106	106	106	165	129	129	71	82	12
Ashland	59	35	35	24	24	24	24	24	24	24	0	12
Richmond Staples Mill	635	318	318	235	235	235	165	129	129	259	0	0
Richmond Boulevard	0	0	0	0	0	0	0	0	0	0	0	0
Richmond Broad Street	0	0	0	0	0	0	0	0	0	0	0	0
Richmond Main	47	24	24	35	35	35	59	47	47	24	35	0

Table 4-8: 2025 Daily Passenger & Vehicle Trips by Mode, 6A Staples Mill Only

Station	Drive & Park			Kiss & Ride			Taxi / Auto Service			Transit	Walk	Other
	Psngrs	Trips		Psngrs	Trips		Psngrs	Trips		Psngrs	Psngrs	Psngrs
		In	Out		In	Out		In	Out			
Alexandria	165	82	82	153	153	153	224	176	176	94	118	24

Table 4-8: 2025 Daily Passenger & Vehicle Trips by Mode, 6A Staples Mill Only

Station	Drive & Park			Kiss & Ride			Taxi / Auto Service			Transit	Walk	Other
	Psngrs	Trips		Psngrs	Trips		Psngrs	Trips		Psngrs	Psngrs	Psngrs
		In	Out		In	Out		In	Out			
Woodbridge	141	71	71	59	59	59	35	35	35	59	0	12
Quantico	82	47	47	35	35	35	24	24	24	35	0	12
Fredericksburg	224	118	118	200	200	200	282	212	212	118	153	12
Ashland	82	47	47	35	35	35	24	24	24	35	0	0
Richmond Staples Mill	1,106	553	553	412	412	412	271	212	212	447	0	12
Richmond Boulevard	0	0	0	0	0	0	0	0	0	0	0	0
Richmond Broad Street	0	0	0	0	0	0	0	0	0	0	0	0
Richmond Main	0	0	0	0	0	0	0	0	0	0	0	0

Table 4-9: 2025 Daily Passenger & Vehicle Trips by Mode, 6B Boulevard Rd Only

Station	Drive & Park			Kiss & Ride			Taxi / Auto Service			Transit	Walk	Other
	Psngrs	Trips		Psngrs	Trips		Psngrs	Trips		Psngrs	Psngrs	Psngrs
		In	Out		In	Out		In	Out			
Alexandria	165	82	82	153	153	153	212	165	165	94	118	24
Woodbridge	129	71	71	47	47	47	35	35	35	59	0	12
Quantico	71	35	35	35	35	35	24	24	24	35	0	12
Fredericksburg	224	118	118	200	200	200	294	224	224	118	153	12
Ashland	82	47	47	35	35	35	24	24	24	35	0	0
Richmond Staples Mill	0	0	0	0	0	0	0	0	0	0	0	0
Richmond Boulevard	482	247	247	447	447	447	635	482	482	271	329	24
Richmond Broad Street	0	0	0	0	0	0	0	0	0	0	0	0
Richmond Main	0	0	0	0	0	0	0	0	0	0	0	0

The DC2RVA passenger train ridership is the same for both the 6B–A-Line and 6B–S-Line Build Alternatives, so are presented in this table as a single 6B Alternative.

Table 4-10: 2025 Daily Passenger & Vehicle Trips by Mode, 6C Broad St Only

Station	Drive & Park			Kiss & Ride			Taxi / Auto Service			Transit	Walk	Other
	Psngrs	Trips		Psngrs	Trips		Psngrs	Trips		Psngrs	Psngrs	Psngrs
		In	Out		In	Out		In	Out			
Alexandria	165	82	82	141	141	141	212	165	165	94	106	24
Woodbridge	129	71	71	47	47	47	35	35	35	59	0	12
Quantico	71	35	35	35	35	35	24	24	24	35	0	12
Fredericksburg	224	118	118	200	200	200	294	224	224	118	153	12
Ashland	94	47	47	35	35	35	24	24	24	35	0	0
Richmond Staples Mill	0	0	0	0	0	0	0	0	0	0	0	0
Richmond Boulevard	0	0	0	0	0	0	0	0	0	0	0	0
Richmond Broad Street	424	212	212	388	388	388	553	424	424	235	294	35
Richmond Main	0	0	0	0	0	0	0	0	0	0	0	0

Table 4-11. 2025 Daily Passenger & Vehicle Trips by Mode, 6D Main St Only

Station	Drive & Park			Kiss & Ride			Taxi / Auto Service			Transit	Walk	Other
	Psngrs	Trips		Psngrs	Trips		Psngrs	Trips		Psngrs	Psngrs	Psngrs
		In	Out		In	Out		In	Out			
Alexandria	165	82	82	153	153	153	212	165	165	94	118	24
Woodbridge	129	71	71	47	47	47	35	35	35	59	0	12
Quantico	71	35	35	35	35	35	24	24	24	35	0	12
Fredericksburg	224	118	118	200	200	200	294	224	224	129	153	12
Ashland	94	47	47	35	35	35	24	24	24	35	0	12
Richmond Staples Mill	0	0	0	0	0	0	0	0	0	0	0	0
Richmond Boulevard	0	0	0	0	0	0	0	0	0	0	0	0
Richmond Broad Street	0	0	0	0	0	0	0	0	0	0	0	24
Richmond Main	506	259	259	459	459	459	659	494	494	282	341	0

Table 4-12: 2025 Daily Passenger & Vehicle Trips by Mode, 6E Split Service

Station	Drive & Park			Kiss & Ride			Taxi / Auto Service			Transit	Walk	Other
	Psngrs	Trips		Psngrs	Trips		Psngrs	Trips		Psngrs	Psngrs	Psngrs
		In	Out		In	Out		In	Out			
Alexandria	165	82	82	153	153	153	212	165	165	94	118	24
Woodbridge	129	71	71	47	47	47	35	35	35	59	0	12
Quantico	82	47	47	35	35	35	24	24	24	35	0	12

Table 4-12: 2025 Daily Passenger & Vehicle Trips by Mode, 6E Split Service

Station	Drive & Park			Kiss & Ride			Taxi / Auto Service			Transit	Walk	Other
	Psngrs	Trips		Psngrs	Trips		Psngrs	Trips		Psngrs	Psngrs	Psngrs
		In	Out		In	Out		In	Out			
Fredericksburg	212	106	106	200	200	200	282	212	212	118	153	12
Ashland	82	47	47	35	35	35	24	24	24	35	0	12
Richmond Staples Mill	906	459	459	341	341	341	224	176	176	376	0	0
Richmond Boulevard	0	0	0	0	0	0	0	0	0	0	0	0
Richmond Broad Street	0	0	0	0	0	0	0	0	0	0	0	12
Richmond Main	82	47	47	71	71	71	106	82	82	47	59	0

Table 4-13: 2025 Daily Passenger & Vehicle Trips by Mode, 6F Full Service

Station	Drive & Park			Kiss & Ride			Taxi / Auto Service			Transit	Walk	Other
	Psngrs	Trips		Psngrs	Trips		Psngrs	Trips		Psngrs	Psngrs	Psngrs
		In	Out		In	Out		In	Out			
Alexandria	165	82	82	153	153	153	212	165	165	94	118	24
Woodbridge	141	71	71	59	59	59	35	35	35	59	0	12
Quantico	82	47	47	35	35	35	24	24	24	35	0	12
Fredericksburg	212	106	106	200	200	200	282	212	212	118	153	12
Ashland	71	35	35	35	35	35	24	24	24	35	0	12
Richmond Staples Mill	647	329	329	247	247	247	165	129	129	271	0	0
Richmond Boulevard	0	0	0	0	0	0	0	0	0	0	0	0
Richmond Broad Street	0	0	0	0	0	0	0	0	0	0	0	12
Richmond Main	259	129	129	235	235	235	341	259	259	141	176	0

Table 4-14: 2025 Daily Passenger & Vehicle Trips by Mode, 6G Shared Service

Station	Drive & Park			Kiss & Ride			Taxi / Auto Service			Transit	Walk	Other
	Psngrs	Trips		Psngrs	Trips		Psngrs	Trips		Psngrs	Psngrs	Psngrs
		In	Out		In	Out		In	Out			
Alexandria	165	82	82	153	153	153	212	165	165	94	118	24
Woodbridge	141	71	71	59	59	59	35	35	35	59	0	0
Quantico	82	47	47	35	35	35	24	24	24	35	0	0
Fredericksburg	212	106	106	200	200	200	282	212	212	118	153	0
Ashland	71	35	35	35	35	35	24	24	24	35	0	0
Richmond Staples Mill	800	400	400	294	294	294	200	153	153	329	0	0
Richmond Boulevard	0	0	0	0	0	0	0	0	0	0	0	0
Richmond Broad Street	0	0	0	0	0	0	0	0	0	0	0	0
Richmond Main	176	94	94	165	165	165	235	176	176	106	129	0

As the final step in this evaluation, the daily trips by mode (as described above) were compared to the daily volumes of the adjacent roadways[1], which are presented in Table 4-15 below.

Table 4-15: Adjacent Facility Volumes, by Station Served

Station	Adjacent Facility	From	To	2014 Volume	2025 Volume
Alexandria	King Street (VA 7)	Russell Road	West Street	16,000	19,520
	Duke Street (VA 236)	Telegraph Road	S Henry Street	22,000	26,840
Woodbridge	Route 1	Opitz Boulevard	Fairfax County Line	36,000	43,920
Quantico	Barnett Avenue	Fuller Road	Henderson Road	5,000	6,100
Fredericksburg	Princess Anne Street	Dixon Street	Route 1	2,700	3,294
	Caroline Street	Dixon Street	Lafayette Boulevard	2,300	2,806
Ashland	England / Thompson Street	Hanover Avenue	Route 1	14,000	17,080
Staples Mill (Richmond)	Staples Mill Road	Bremner Boulevard	Hilliard Road	37,000	45,140
Boulevard Road (Richmond)	N Boulevard Road	U.S. 33 / U.S. 250	I-95	21,000	25,620
	Robin Hood Road	N Boulevard Road	Hermitage Road	16,000	19,520
Broad Street (Richmond)	W Broad Street	N Boulevard Road	Hermitage Road	24,000	29,280
	W Leigh Street	N Boulevard Road	Hermitage Road	7,600	9,272
Main Street (Richmond)	E Main Street &	14th Street	Route 360	21,000	25,620
	E Broad Street	14th Street	Route 360	26,000	31,720

Source: VDOT 2014, grown to 2025 using an assumed 2% annual growth rate (linear, non-compounding). Exception is Barnett Avenue (not available in PDFs); estimated volume based on adjacent roadway volumes.

The above table assumes that the station location within Ashland is the same as the existing condition, which is located in the middle of town on the north side of England/Thompson Street on the west side of the rail corridor. However, the Build Alternatives for the Ashland Area do include an alternate station location south of Ashcake Road is proposed. This analysis analyzes the single new proposed location separately at the end of the results section.

4.5.1.2 Results

The number of daily passengers and associated estimates of daily motor vehicle trips for each station are presented in Tables 4-16 through 4-22 for each of the seven station Build Alternatives in Richmond, respectively. A summary table is presented in Table 4-23. "Nominal" increases in total daily traffic are defined as less than 1% changes over the course of the day.

On an overall basis, the results indicate the following:

- For each Build Alternative, the DC2RVA ridership equates to over 2,000 new daily motor vehicle trips at each station (for each single-station alternative) or combination of stations (for each two-station alternative).

[1] Adjacent roadway(s) at stations were defined as those that vehicles (including personal motor vehicle, transit, or drop-off service such as taxis) could use to access the station.

- Most roadways adjacent to the stations would experience nominal increases in traffic (under 1% increases in total daily traffic) for most Build conditions. While increases in DC2RVA ridership would cause increases in traffic adjacent to DC2RVA stations, the levels of increase in ridership do not directly correlate to the same increases in traffic. In general, the majority of the roadways adjacent to the stations are multiple lane facilities with high carrying capacity under existing conditions that could accommodate increases in vehicular trips due to the DC2RVA Project.
- Overall, the highest increases in traffic on adjacent roadways due to the DC2RVA ridership are anticipated at the Fredericksburg Station: traffic is projected to increase approximately 7 to 8% on the adjacent roadways of Princess Anne Street and Caroline Street for all Build Alternatives. The volumes on these two facilities represent some of the lowest existing and future daily volumes on adjacent roadways to stations for the project.
- For the single station Build Alternatives in the Richmond area, the greatest increases in traffic on adjacent roadways are anticipated for the two stations that are not currently served by any passenger trains (Boulevard and Broad Street stations), which are projected to increase approximately 5%. Traffic increases adjacent to the Main Street Station and Staples Mill Station are projected to increase approximately 4% and 2%, respectively.
- For the two-station Build Alternatives in the Richmond area, the traffic increases vary by station; however, all projected traffic increases are anticipated to be under 2% at both Staples Mill Road and Main Street stations for all Build conditions.
- Reductions in traffic due to the DC2RVA ridership are anticipated at stations that are being served in the No Build condition but are not being served in the Build condition.

Results detailed by Build Alternative include the following. The details prioritize the vehicular trip and increases in traffic at the station(s) served by each specific Build Alternative and highlight other station locations.

2025 Build Alternative 6A Staples Mill Station Only

Vehicle trips:

- Approximately 1,000 additional daily vehicle trips at Staples Mill Station
- Approximately 500 additional daily vehicle trips at Fredericksburg Station
- All other stations approximately 175 additional daily trips or less

Changes in traffic:

- 2.2% projected increase in traffic on Staples Mill Road
- 7.7% projected increase in traffic adjacent to Fredericksburg Station
- 0.4% projected reduction in traffic adjacent to the Main Street Station
- All other stations projected to experience nominal daily traffic increases

2025 Build Alternative 6B Boulevard Station Only

Vehicle trips:

- Approximately 2,400 total daily vehicle trips at new Boulevard Station

- Approximately 500 additional daily vehicle trips at Fredericksburg Station
- All other stations approximately 150 additional daily trips or less

Changes in traffic:

- 5.2% projected increase in traffic on N Boulevard Road and Robin Hood Road that serve vehicular trips to the Boulevard Station area
- 8.1% projected increase in traffic adjacent to Fredericksburg Station
- 3% projected reduction in traffic adjacent to the Staples Mill Station
- 0.4% projected reduction in traffic adjacent to the Main Street Station
- All other stations projected to experience nominal daily traffic increases

2025 Build Alternative 6C Broad Street Station Only

Vehicle trips:

- Approximately 2,100 total daily vehicle trips at new Boulevard Station
- Approximately 500 additional daily vehicle trips at Fredericksburg Station
- All other stations approximately 150 additional daily trips or less

Changes in traffic:

- 5.3% projected increase in traffic on W Broad Street and W Leigh Street that serve vehicular trips to the Broad Street Station area
- 8.1% projected increase in traffic adjacent to Fredericksburg Station
- 3% projected reduction in traffic adjacent to the Staples Mill Station
- 0.4% projected reduction in traffic adjacent to the Main Street Station
- All other stations projected to experience nominal daily traffic increases

2025 Build Alternative 6D Main Street Station Only

Vehicle trips:

- Approximately 2,200 additional total daily vehicle trips at Main Street Station
- Approximately 500 additional daily vehicle trips at Fredericksburg Station
- All other stations approximately 150 additional daily trips or less

Changes in traffic:

- 3.9% projected increase in traffic on E Main Street and E Broad Street that service vehicular trips to the Main Street Station area
- 8.1% projected increase in traffic adjacent to Fredericksburg Station
- 3% projected reduction in traffic adjacent to the Staples Mill Station
- All other stations projected to experience nominal daily traffic increases

2025 Build Alternative 6E Split Service, Staples Mill Road/Main Street Stations

Vehicle trips:

- Approximately 600 additional total daily trips at Staples Mill Station and 200 additional total daily trips at Main Street Station
- Approximately 450 additional daily vehicle trips at Fredericksburg Station
- All other stations approximately 150 additional daily trips or less

Changes in traffic:

- 1.3% projected increase in traffic adjacent to Staples Mill Station and 0.3% projected increase in traffic adjacent to Main Street Station
- 7.2% projected increase in traffic adjacent to Fredericksburg Station
- All other stations projected to experience nominal daily traffic increases

2025 Build Alternative 6F Full Service, Staples Mill Road/Main Street Stations

Vehicle trips:

- Approximately 50 additional total daily trips at Staples Mill Station and 1,000 additional total daily trips at Main Street Station
- Approximately 450 additional daily vehicle trips at Fredericksburg Station
- All other stations approximately 175 additional daily trips or less

Changes in traffic:

- 0.1% projected increase in traffic adjacent to Staples Mill Station and 1.8% projected increase in traffic adjacent to Main Street Station
- 7.3% projected increase in traffic adjacent to Fredericksburg Station
- All other stations projected to experience nominal daily traffic increases

2025 Build Alternative 6G Shared Service, Staples Mill Road/Main Street Stations

Vehicle trips:

- Approximately 350 additional total daily trips at Staples Mill Station and 700 additional total daily trips at Main Street Station
- Approximately 450 additional daily vehicle trips at Fredericksburg Station
- All other stations approximately 175 additional daily trips or less

Changes in traffic:

- 0.7% projected increase in traffic adjacent to Staples Mill Station and 1.1% projected increase in traffic adjacent to Main Street Station
- 7.3% projected increase in traffic adjacent to Fredericksburg Station

All other stations projected to experience nominal daily traffic increases.

Table 4-16: Ridership Effects on Roadways, 2025 Build Alternative 6A Staples Mill Station Only

Station	Daily Number of Passengers			Daily Number of Motor Vehicle Trips			Adjacent Roadway, 2025 Conditions		% Change in Traffic due to DC2RVA Ridership
	No Build	Build	*Difference*	No Build	Build	*Difference*	Facility	Daily Volume (No Build)	
Alexandria, VA	652	731	*79*	753	824	*71*	VA 7 & VA 236	46,360	0.2%
Woodbridge, VA	98	259	*161*	165	329	*165*	U.S. 1	43,920	0.4%
Quantico, VA	119	142	*23*	165	212	*47*	Barnett Avenue	6,100	0.8%
Fredericksburg	527	954	*427*	588	1,059	*471*	Princess Anne & Caroline Streets	6,100	7.7%
Ashland Station	103	149	*46*	165	212	*47*	England / Thompson Street	17,080	0.3%
Staples Mill Road, Richmond	1,273	2,234	*961*	1,365	2,353	*988*	Staples Mill Road	45,140	2.2%
Boulevard Road, Richmond	-	-	-	-	-	-	N Boulevard Road & Robin Hood Road	45,140	0.0%
Broad Street, Richmond	-	-	-	-	-	-	W Broad Street & W Leigh Street	38,552	0.0%
Main Street, Richmond	159	-	*(159)*	212	-	*(212)*	E Main Street & E Broad Street	57,340	-0.4%

Motor vehicle trips are one-way; entering and exiting the station area would be two trips.
The station(s) served within Richmond for the Build Alternative shown is highlighted in gray text for ease of reference.

Table 4-17: Ridership Effects on Roadways, 2025 Build Alternative 6B Boulevard Station Only

Station	Daily Number of Passengers			Daily Number of Motor Vehicle Trips			Adjacent Roadway, 2025 Conditions		% Change in Traffic due to DC2RVA Ridership
	No Build	Build	*Difference*	No Build	Build	*Difference*	Facility	Daily Volume (No Build)	
Alexandria, VA	652	712	*60*	753	800	*47*	VA 7 & VA 236	46,360	0.1%
Woodbridge, VA	98	258	*160*	165	306	*141*	U.S. 1	43,920	0.3%
Quantico, VA	119	141	*22*	165	188	*24*	Barnett Avenue	6,100	0.4%
Fredericksburg	527	974	*447*	588	1,082	*494*	Princess Anne & Caroline Streets	6,100	8.1%
Ashland Station	103	158	*55*	165	212	*47*	England / Thompson Street	17,080	0.3%
Staples Mill Road, Richmond	1,273	-	*(1,273)*	1,365	-	*(1,365)*	Staples Mill Road	45,140	-3.0%
Boulevard Road, Richmond	-	2,188	*2,188*	-	2,353	*2,353*	N Boulevard Road & Robin Hood Road	45,140	5.2%
Broad Street, Richmond	-	-	-	-	-	-	W Broad Street & W Leigh Street	38,552	0.0%
Main Street, Richmond	159	-	*(159)*	212	-	*(212)*	E Main Street & E Broad Street	57,340	-0.4%

The DC2RVA passenger train ridership is the same for both the 6B–A-Line and 6B–S-Line Build Alternatives, so are presented in this table as a single 6B Alternative.
Motor vehicle trips are one-way; entering and exiting the station area would be two trips.
The station(s) served within Richmond for the Build Alternative shown is highlighted in gray text for ease of reference.

Table 4-18: Ridership Effects on Roadways, 2025 Build Alternative 6C Broad Street Station Only

Station	Daily Number of Passengers			Daily Number of Motor Vehicle Trips			Adjacent Roadway, 2025 Conditions		% Change in Traffic due to DC2RVA Ridership
	No Build	Build	*Difference*	No Build	Build	*Difference*	Facility	Daily Volume (No Build)	
Alexandria, VA	652	702	*50*	753	776	*24*	VA 7 & VA 236	46,360	0.1%
Woodbridge, VA	98	254	*156*	165	306	*141*	U.S. 1	43,920	0.3%
Quantico, VA	119	139	*20*	165	188	*24*	Barnett Avenue	6,100	0.4%
Fredericksburg	527	975	*448*	588	1,082	*494*	Princess Anne & Caroline Streets	6,100	8.1%
Ashland Station	103	169	*66*	165	212	*47*	England / Thompson Street	17,080	0.3%
Staples Mill Road, Richmond	1,273	-	*(1,273)*	1,365	-	*(1,365)*	Staples Mill Road	45,140	-3.0%
Boulevard Road, Richmond	-	-	-	-	-	-	N Boulevard Road & Robin Hood Road	45,140	0.0%
Broad Street, Richmond	-	1,890	*1,890*	-	2,047	*2,047*	W Broad Street & W Leigh Street	38,552	5.3%
Main Street, Richmond	159	-	*(159)*	212	-	*(212)*	E Main Street & E Broad Street	57,340	-0.4%

Motor vehicle trips are one-way; entering and exiting the station area would be two trips.
The station(s) served within Richmond for the Build Alternative shown is highlighted in gray text for ease of reference.

Table 4-19: Ridership Effects on Roadways, 2025 Build Alternative 6D Main Street Station Only

Station	Daily Number of Passengers			Daily Number of Motor Vehicle Trips			Adjacent Roadway, 2025 Conditions		% Change in Traffic due to DC2RVA Ridership
	No Build	Build	*Difference*	No Build	Build	*Difference*	Facility	Daily Volume (No Build)	
Alexandria, VA	652	714	*62*	753	800	*47*	VA 7 & VA 236	46,360	0.1%
Woodbridge, VA	98	258	*160*	165	306	*141*	U.S. 1	43,920	0.3%
Quantico, VA	119	141	*22*	165	188	*24*	Barnett Avenue	6,100	0.4%
Fredericksburg	527	982	*455*	588	1,082	*494*	Princess Anne & Caroline Streets	6,100	8.1%
Ashland Station	103	175	*72*	165	212	*47*	England / Thompson Street	17,080	0.3%
Staples Mill Road, Richmond	1,273	-	*(1,273)*	1,365	-	*(1,365)*	Staples Mill Road	45,140	-3.0%
Boulevard Road, Richmond	-	-	-	-	-	-	N Boulevard Road & Robin Hood Road	45,140	0.0%
Broad Street, Richmond	-	-	-	-	-	-	W Broad Street & W Leigh Street	38,552	0.0%
Main Street, Richmond	159	2,268	*2,109*	212	2,424	*2,212*	E Main Street & E Broad Street	57,340	3.9%

Motor vehicle trips are one-way; entering and exiting the station area would be two trips.
The station(s) served within Richmond for the Build Alternative shown is highlighted in gray text for ease of reference.

Table 4-20: Ridership Effects on Roadways, 2025 Build Alternative 6E Split Service, Staples Mill Road/Main Street Stations

Station	Daily Number of Passengers			Daily Number of Motor Vehicle Trips			Adjacent Roadway, 2025 Conditions		% Change in Traffic due to DC2RVA Ridership
	No Build	Build	*Difference*	No Build	Build	*Difference*	Facility	Daily Volume (No Build)	
Alexandria, VA	652	722	*70*	753	800	*47*	VA 7 & VA 236	46,360	0.1%
Woodbridge, VA	98	257	*159*	165	306	*141*	U.S. 1	43,920	0.3%
Quantico, VA	119	142	*23*	165	212	*47*	Barnett Avenue	6,100	0.8%
Fredericksburg	527	944	*417*	588	1,035	*447*	Princess Anne & Caroline Streets	6,100	7.3%
Ashland Station	103	143	*40*	165	212	*47*	England / Thompson Street	17,080	0.3%
Staples Mill Road, Richmond	1,273	1,840	*567*	1,365	1,953	*588*	Staples Mill Road	45,140	1.3%
Boulevard Road, Richmond	-	-	-	-	-	-	N Boulevard Road & Robin Hood Road	45,140	0.0%
Broad Street, Richmond	-	-	-	-	-	-	W Broad Street & W Leigh Street	38,552	0.0%
Main Street, Richmond	159	335	*176*	212	400	*188*	E Main Street & E Broad Street	57,340	0.3%

Motor vehicle trips are one-way; entering and exiting the station area would be two trips.
The station(s) served within Richmond for the Build Alternative shown is highlighted in gray text for ease of reference.

Table 4-21: Ridership Effects on Roadways, 2025 Build Alternative 6F Full Service, Staples Mill Road/Main Street Stations

Station	Daily Number of Passengers			Daily Number of Motor Vehicle Trips			Adjacent Roadway, 2025 Conditions		% Change in Traffic due to DC2RVA Ridership
	No Build	Build	*Difference*	No Build	Build	*Difference*	Facility	Daily Volume (No Build)	
Alexandria, VA	652	722	*70*	753	800	*47*	VA 7 & VA 236	46,360	0.1%
Woodbridge, VA	98	260	*162*	165	329	*165*	U.S. 1	43,920	0.4%
Quantico, VA	119	142	*23*	165	212	*47*	Barnett Avenue	6,100	0.8%
Fredericksburg	527	948	*421*	588	1,035	*447*	Princess Anne & Caroline Streets	6,100	7.3%
Ashland Station	103	139	*36*	165	188	*24*	England / Thompson Street	17,080	0.1%
Staples Mill Road, Richmond	1,273	1,306	*33*	1,365	1,412	*47*	Staples Mill Road	45,140	0.1%
Boulevard Road, Richmond	-	-	-	-	-	-	N Boulevard Road & Robin Hood Road	45,140	0.0%
Broad Street, Richmond	-	-	-	-	-	-	W Broad Street & W Leigh Street	38,552	0.0%
Main Street, Richmond	159	1,157	*998*	212	1,247	*1,035*	E Main Street & E Broad Street	57,340	1.8%

Motor vehicle trips are one-way; entering and exiting the station area would be two trips.
The station(s) served within Richmond for the Build Alternative shown is highlighted in gray text for ease of reference.

Table 4-22: Ridership Effects on Roadways, 2025 Build Alternative 6G Shared Service, Staples Mill Road/Main Street Stations

Station	Daily Number of Passengers			Daily Number of Motor Vehicle Trips			Adjacent Roadway, 2025 Conditions		% Change in Traffic due to DC2RVA Ridership
	No Build	Build	*Difference*	No Build	Build	*Difference*	Facility	Daily Volume (No Build)	
Alexandria, VA	652	729	*77*	753	800	*47*	VA 7 & VA 236	46,360	0.1%
Woodbridge, VA	98	261	*163*	165	329	*165*	U.S. 1	43,920	0.4%
Quantico, VA	119	143	*24*	165	212	*47*	Barnett Avenue	6,100	0.8%
Fredericksburg	527	948	*421*	588	1,035	*447*	Princess Anne & Caroline Streets	6,100	7.3%
Ashland Station	103	139	*36*	165	188	*24*	England / Thompson Street	17,080	0.1%
Staples Mill Road, Richmond	1,273	1,610	*337*	1,365	1,694	*329*	Staples Mill Road	45,140	0.7%
Boulevard Road, Richmond	-	-	-	-	-	-	N Boulevard Road & Robin Hood Road	45,140	0.0%
Broad Street, Richmond	-	-	-	-	-	-	W Broad Street & W Leigh Street	38,552	0.0%
Main Street, Richmond	159	797	*638*	212	871	*659*	E Main Street & E Broad Street	57,340	1.1%

Motor vehicle trips are one-way; entering and exiting the station area would be two trips.
The station(s) served within Richmond for the Build Alternative shown is highlighted in gray text for ease of reference.

Table 4-23: Summary of Ridership Effects on Station Roadways, % Change in Traffic on Adjacent Roadways due to DC2RVA Intercity Passenger Trains

Station	2025 Build Alternatives						
	6A	6B	6C	6D	6E	6F	6G
	Staples Mill Only	Boulevard Rd Only	Broad St Only	Main St Only	Split Service	Full Service	Shared Service
Alexandria, VA	0.2%	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
Woodbridge, VA	0.4%	0.3%	0.3%	0.3%	0.3%	0.4%	0.4%
Quantico, VA	0.8%	0.4%	0.4%	0.4%	0.8%	0.8%	0.8%
Fredericksburg	7.7%	8.1%	8.1%	8.1%	7.3%	7.3%	7.3%
Ashland Station	0.3%	0.3%	0.3%	0.3%	0.3%	0.1%	0.1%
Staples Mill Road, Richmond	2.2%	-3.0%	-3.0%	-3.0%	1.3%	0.1%	0.7%
Boulevard Road, Richmond	0.0%	5.2%	0.0%	0.0%	0.0%	0.0%	0.0%
Broad Street, Richmond	0.0%	0.0%	5.3%	0.0%	0.0%	0.0%	0.0%
Main Street, Richmond	-0.4%	-0.4%	-0.4%	3.9%	0.3%	1.8%	1.1%

The % Changes shown in this table compare the 2025 Build to the 2025 No Build conditions. For details, refer to Tables 4-17 to 4-23.
The station(s) served within Richmond for the Build Alternative shown is highlighted in gray text for ease of reference.

4.5.1.3 Results, Ashcake Road Alternate Station Locations

The section analyzes the ridership effects at the new proposed station location south of Ashcake Road.

Ashcake Road at the rail corridor is projected to carry 9,300 vehicles per day by 2025 (based on the same growth assumptions as used previous in this analysis). Ashcake Road carries less vehicles than England/Thompson Street, which is adjacent to the existing station location and the proposed DC2RVA ridership / vehicular trip estimates remain the same, regardless of station location. Therefore, the proposed DC2RVA ridership would have a greater effect on traffic for any Build Alternative that includes the station location along Ashcake Road compared to England/Thompson Street; however, all increases remain less than 1% change in traffic (i.e., nominal). A summary of this comparison is provided below in Table 4-24.

Table 4-24: Ridership Effects: Station Location Comparison in Ashland

Build Alternative	Difference in Total Daily Trips, Build to No Build	Existing Station Location North of England / Thompson Street		Alternate Station Location South of Ashcake Road	
		Daily Volume (No Build)	% Increase in Traffic	Daily Volume (No Build)	% Increase in Traffic
6A Staples Mill Only	47	17,080	0.28%	9,300	0.51%
6B Boulevard Rd Only	47	17,080	0.28%	9,300	0.51%
6C Broad St Only	47	17,080	0.28%	9,300	0.51%
6D Main St Only	47	17,080	0.28%	9,300	0.51%
6E Split Service	47	17,080	0.28%	9,300	0.51%
6F Full Service	24	17,080	0.14%	9,300	0.25%
6G Shared Service	24	17,080	0.14%	9,300	0.25%

4.5.2 Parking Needs at Stations

DRPT used an Amtrak-approved method to determine the parking demand at each Amtrak station in the DC2RVA corridor, and is based on projected DC2RVA ridership. Parking factors vary by type of station (i.e., station location in an urban or more rural area) as well as by type of Amtrak service (i.e., there are different parking requirements for long distance versus regional train passengers).

4.5.2.1 Methodology

Ridership can be adversely affected by a lack of adequate parking. Amtrak recommends that parking capacities at its stations should be based on at least a twenty-year projection of ridership growth. Accordingly, DRPT determined it appropriate to conduct the DC2RVA parking analysis based on projections for the year 2045.

Parking factors vary by type of station and type of Amtrak service.

- There are four levels of stations based on Amtrak station planning and programming guidelines:
  - **Large Stations** are fully staffed, with multiple transit services and amenities. Large stations have multiple tracks and platforms, and frequently serve as both a terminal and a through station as they are typically located in dense urban downtowns with connecting modes of transit.
  - **Medium Stations** have lower levels of staff, and with some supporting transit and amenities. These stations typically have, or would have two or more platforms for multiple tracks, elevators and escalators for vertical circulation, and a tunnel below the tracks or an overhead bridge to cross tracks and access platforms between tracks.
  - **Caretaker Stations** consist of enclosed waiting spaces but no ticket agents and only limited amenities. These stations typically open a minimum of one hour before train arrival until one hour after departure.
  - **Unstaffed Stations** have platforms with only shelters and/or canopies, and no amenities. There are no unstaffed stations in the DC2RVA Project corridor; all DC2RVA stations are defined as Large, Medium, or Caretaker stations.
- Two geographic locations for DC2RVA Amtrak stations were considered: city center (high-density urban) or suburban (medium-density). It is assumed that a suburban station requires more parking than one located in a city center; this is because city center locations typically depend more on mass transit and other modes to get customers to the station (thereby reducing parking requirements).
- The Amtrak product line includes four types of passenger service that were considered in the parking analysis: ACELA, Regional, State Corridor, and Long Distance. There is no current ACELA ridership at the DC2RVA stations.

Total daily station parking space demand was calculated using a methodology used by Amtrak which takes into account the percentage of riders/customers based on type of services.

While station ridership quantifies the size of the potential market for parking at a station, not all ridership is relevant when considering parking demand. Only "originating" ridership, which includes boardings and alightings associated with the beginning or end of a trip, generates demand for access services such as parking. This specifically excludes connecting ridership associated with transfers. In addition, parking at a station actually serves two one-way trips on Amtrak, the outgoing trip from the station after parking and the return trip back to the station where the parked vehicle is used to leave the station. Thus, the relevant potential market for parking is originating boardings and alightings divided by two, as shown in the equations above.

The process described above was used to determine an annual parking demand (based on the projected annual ridership). DRPT then calculated a range of daily parking space demand by dividing the annual ridership by 365 days (low end, represents average parking assuming mid-week and weekend parking) and by 270 days (high end, represents more of a typical week-day only parking).

4.5.2.2 Results

The parking demand was determined for each Amtrak station in the DC2RVA corridor by Build Alternative, as shown in the Table 4-25 through 4-35 below; a summary table is provided in Table 4-36. The results do not vary by Build Alternative with the exception of the Richmond stations.

The ridership projections vary based on the 7 station alternatives in the Richmond area; for the purposes of this analysis, the DC2RVA ridership for Staples Mill Only Build Alternative 6A were used, as worst-case, for the parking demand at the non-Richmond stations (Alexandria, Fredericksburg, Woodbridge, and Ashland).

Table 4-25: Build Alternative 2A – Alexandria Station Parking Demand

Amtrak Passenger Service	Annual Parking Demand	Daily Parking Space Demand: Low	Daily Parking Space Demand: High
ACELA	0	0	0
Regional	23,844	65	88
State Corridor	17,323	47	64
Long Distance	10,041	28	37
TOTAL DAILY RANGE:		**140**	**190**
Station Size:	*Medium*		
Geographic Location:	*Suburban*		

Table 4-26: Build Alternative 2A – Woodbridge Station Parking Demand

Amtrak Passenger Service	Annual Parking Demand	Daily Parking Space Demand: Low	Daily Parking Space Demand: High
ACELA	0	0	0
Regional	6,986	19	26
State Corridor	5,620	15	21
Long Distance	0	0	0
TOTAL DAILY RANGE:		**35**	**47**
Station Size:	*Caretaker*		
Geographic Location:	*Suburban*		

Table 4-27: All Build Alternatives, Area 3 – Fredericksburg Station Parking Demand

Amtrak Passenger Service	Annual Parking Demand	Daily Parking Space Demand: Low	Daily Parking Space Demand: High
ACELA	0	0	0
Regional	39,887	109	148
State Corridor	11,793	32	44
Long Distance	0	0	0
TOTAL DAILY RANGE:		**142**	**191**
Station Size:	*Medium*		
Geographic Location:	*Suburban*		

Table 4-28: All Build Alternatives, Area 5 – Ashland Station Parking Demand

Amtrak Passenger Service	Annual Parking Demand	Daily Parking Space Demand: Low	Daily Parking Space Demand: High
ACELA	0	0	0
Regional	7,585	21	28
State Corridor	2,846	8	11

Table 4-28: All Build Alternatives, Area 5 – Ashland Station Parking Demand

Amtrak Passenger Service	Annual Parking Demand	Daily Parking Space Demand: Low	Daily Parking Space Demand: High
Long Distance	0	0	0
TOTAL DAILY RANGE:		**29**	**39**
Station Size:	*Caretaker*		
Geographic Location:	*Suburban*		

Table 4-29: Build Alternative 6A – Staples Mill Road Only Parking Demand

Amtrak Passenger Service	Annual Parking Demand	Daily Parking Space Demand: Low	Daily Parking Space Demand: High
ACELA	0	0	0
Regional	92,393	253	342
State Corridor	56,258	154	208
Long Distance	21,882	60	81
TOTAL DAILY RANGE:		**467**	**632**
Station Size:	*Large*		
Geographic Location:	*Suburban*		

Table 4-30: Build Alternative 6B – Boulevard Road Only Parking Demand

Amtrak Passenger Service	Annual Parking Demand	Daily Parking Space Demand: Low	Daily Parking Space Demand: High
ACELA	0	0	0
Regional	89,840	246	333
State Corridor	55,769	153	207
Long Distance	21,882	60	81
TOTAL DAILY RANGE:		**459**	**620**
Station Size:	*Large*		
Geographic Location:	*Suburban*		

Note that this analysis is applicable to both 6B–A-Line and 6B–S-Line; the ridership does not vary by the two Build Alternative 6B options.

Table 4-31: Build Alternative 6C – Broad Street Only Parking Demand

Amtrak Passenger Service	Annual Parking Demand	Daily Parking Space Demand: Low	Daily Parking Space Demand: High
ACELA	0	0	0
Regional	87,412	239	324
State Corridor	53,613	147	199
Long Distance	21,882	60	81
TOTAL DAILY RANGE:		**446**	**603**
Station Size:	*Large*		
Geographic Location:	*Suburban*		

Table 4-32: Build Alternative 6D – Main Street Only Parking Demand

Amtrak Passenger Service	Annual Parking Demand	Daily Parking Space Demand: Low	Daily Parking Space Demand: High
ACELA	0	0	0
Regional	31,868	87	118
State Corridor	25,345	69	94
Long Distance	13,137	36	49
TOTAL DAILY RANGE:		**193**	**261**
Station Size:	*Large*		
Geographic Location:	*City Center*		

Table 4-33: Build Alternative 6E – Split Service Parking Demand

Amtrak Passenger Service	Annual Parking Demand	Daily Parking Space Demand: Low	Daily Parking Space Demand: High
STAPLES MILL STATION		***Station Size: Large; Geographic Location: Suburban***	
ACELA	0	0	0
Regional	80,001	219	296
State Corridor	48,145	132	178
Long Distance	21,882	60	81
TOTAL DAILY RANGE:		**411**	**556**
MAIN STREET STATION		***Station Size: Medium; Geographic Location: Suburban***	
ACELA	0	0	0
Regional	10,466	29	39
State Corridor	7,252	20	27
Long Distance	0	0	0
TOTAL DAILY RANGE:		**49**	**66**

Table 4-34: Build Alternative 6F – Full Service Parking Demand

Amtrak Passenger Service	Annual Parking Demand	Daily Parking Space Demand: Low	Daily Parking Space Demand: High
STAPLES MILL STATION		***Station Size: Large; Geographic Location: Suburban***	
ACELA	0	0	0
Regional	53,030	145	196
State Corridor	34,794	95	129
Long Distance	21,882	60	81
TOTAL DAILY RANGE:		**301**	**406**
MAIN STREET STATION		***Station Size: Large; Geographic Location: Suburban***	
ACELA	0	0	0
Regional	46,689	128	173
State Corridor	25,955	71	96
Long Distance	0	0	0
TOTAL DAILY RANGE:		**199**	**269**

Table 4-35: Build Alternative 6G – Shared Service Parking Demand

Amtrak Passenger Service	Annual Parking Demand	Daily Parking Space Demand: Low	Daily Parking Space Demand: High
STAPLES MILL STATION		***Station Size: Large; Geographic Location: Suburban***	
ACELA	0	0	0
Regional	64,420	176	239
State Corridor	39,295	108	146
Long Distance	21,882	60	81
	TOTAL DAILY RANGE:	**344**	**465**
MAIN STREET STATION		***Station Size: Medium; Geographic Location: Suburban***	
ACELA	0	0	0
Regional	26,278	72	97
State Corridor	17,681	48	65
Long Distance	0	0	0
	TOTAL DAILY RANGE:	**120**	**163**

Table 4-36: Summary of Daily Parking Space Demand by Station

Station	Station Size / Type	Daily Parking Space Demand: Low	Daily Parking Space Demand: High
Alexandria	Medium / Suburban	140	190
Woodbridge	Caretaker / Suburban	35	47
Fredericksburg	Medium / Suburban	142	191
Ashland	Caretaker / Suburban	29	39
Boulevard Road	Large / Suburban	459	620
Broad Street	Large / Suburban	446	603
Staples Mill:			
Build Alternative 6A	Large / Suburban	467	632
Build Alternative 6E	Large / Suburban	411	556
Build Alternative 6F	Large / Suburban	301	406
Build Alternative 6G	Large / Suburban	344	465
Main Street:			
Build Alternative 6D	Large / City Center	193	261
Build Alternative 6E	Medium / Suburban	49	66
Build Alternative 6F	Large / Suburban	199	269
Build Alternative 6G	Medium / Suburban	120	163

As shown in Table 4-36 above, the demand does not vary by Build Alternative for the stations with a single location (Alexandria; Woodbridge; Fredericksburg; Ashland; Boulevard Road; and Broad Street). At the Staples Mill Road Station, the station sizing and type do not vary; Build Alternative 6A would require the highest daily parking space demand at 632 spaces (high demand), which is a 56% increase over the Build Alternative 6F which requires 406 spaces (high demand). Build Alternatives 6E and 6G require approximately 37% and 15% more parking, respectively, than Build Alternative 6F. At the Main Street Station, the station size and type varies by Build Alternative, which has an effect on the daily parking demand. Build Alternatives 6D and 6E, in which it is defined as a large station, would require the most daily parking (260 to 270 spaces, high demand), while Build Alternative 6E, in which Main Street is defined as a medium station, would require the least amount of parking (66 spaces, high demand).

The conceptual layouts based on these parking needs are shown in the Build Alternative figures that are presented in Chapter 2 of this report. The conceptual layouts for each station were based on the physical characteristics of the station site, the DC2RVA basis of design, and the functional requirements of Amtrak. In general, the high end of the range of the daily parking space demand was used (with rounding) when developing the conceptual parking layouts; however, for the Alexandria station, the conceptual layout reflects the existing property constraints and not the calculated parking space demand.

5 CORRIDOR-WIDE ENVIRONMENTAL CONSEQUENCES

5.1 INTRODUCTION

The anticipated DC2RVA Project effects on the transportation network is presented at the same two scales as the Affected Environment Transportation Facilities section: Regional Scale (see Chapter 4) and Corridor Scale.

This section presents the No Build and Build conditions and associated potential effects on the highway-rail crossings at the Corridor Scale. It includes descriptions of the improvements proposed at each public and private at-grade and grade-separated crossing, which varies by Build Alternative, as well as quantitative and qualitative analysis of the effects of those proposed improvements, both on vehicles using the crossings as well as on connectivity to the greater transportation network. All analyses in this section are for the permanent Build condition; for temporary construction-related effects, refer to Section 4.19 of the Draft EIS.

The Corridor Scale Environmental Consequences include the following (in order of presentation within this Chapter):

- 2025 Build improvements that are proposed at each roadway crossing of the rail corridor, presented by Build Alternative. This includes descriptions of the types of crossing treatments; a summary of the methodology used to assign a crossing improvement to each individual roadway crossing; and a summary of the proposed crossing improvement at each type of crossing (public at-grade, private at-grade, grade-separated, and new crossings).
- 2025 No Build and Build daily vehicle delay at at-grade roadway crossings. This includes analysis of the effects of the 2025 Build Rail conditions (i.e., the increased number of daily trains) at the existing at-grade crossings as well as on the crossing improvements that are proposed as part of the DC2RVA Project (i.e., the 2025 Build conditions of the roadway crossings).
- Identification of potential effects of the proposed crossing improvements (2025 Build conditions) on existing accessibility and connectivity within the roadway network. Accessibility and connectivity to both public roadways, as well as private property driveways and access, were included in this evaluation.
- Relevance of the 2025 Build conditions to existing Quiet Zones.
- The effect of the 2025 Build conditions on bicycle and pedestrian connectivity.
- Quantitative traffic operational analysis to determine potential effects of the public roadway closures (2025 Build conditions). Analysis includes levels of service along roadways and through the intersections along the diversion route(s).

The discussion on environmental consequences summarizes the potential effects that may result from the construction and operation of the DC2RVA Project. In accordance with Project planning dates for physical impacts, analyses of transportation facilities are estimated for 2025 (see Section 2.1.2). The effects presented in this chapter are based on the conceptual engineering developed for the Build Alternatives within the six areas defined for the Project (refer to Chapter 2) and summarized below:

Alternative Area	Alternative	Description	*Abbreviated Description**
Area 1: Arlington (Long Bridge Approach)	1A	Add Two Tracks on the East	*Add 2 Tracks East*
	1B	Add Two Tracks on the West	*Add 2 Tracks West*
	1C	Add One Track East and One Track West	*Add 1 Track East & West*
Area 2: Northern Virginia	2A	Add One Track/Improve Existing Track	*Add 1 Track*
Area 3: Fredericksburg (Dahlgren Spur to Crossroads)	3A	Maintain Two Tracks Through Town	*Maintain Existing*
	3B	Add One Track East of Existing	*Add 1 Track*
	3C	Add Two-Track Bypass East	*2-Track East Bypass*
Area 4: Central Virginia (Crossroads to Doswell)	4A	Add One Track/Improve Existing Track	*Add 1 Track*
Area 5: Ashland (Doswell to I-295)	5A	Maintain Two Tracks Through Town	*Maintain Existing*
	5A–Ashcake	Maintain Two Tracks Through Town (Relocate Station to Ashcake)	*Maintain Existing (New Station)*
	5B	Add One Track East of Existing	*Add 1 Track*
	5B–Ashcake	Add One Track East of Existing (Relocate Station to Ashcake)	*Add 1 Track (New Station)*
	5C	Add Two-Track West Bypass	*2-Track West Bypass*
	5C–Ashcake	Add Two-Track West Bypass (Relocate Station to Ashcake)	*2-Track West Bypass (New Station)*
	5D–Ashcake	Three Tracks Centered Through Town (Add One Track, Relocate Station to Ashcake)	*Center 3 Tracks (New Station)*
Area 6: Richmond (I-295 to Centralia)	6A	Staples Mill Road Station Only	*Staples Mill Only*
	6B–A-Line	Boulevard Station Only, A-Line	*Boulevard Rd Only (A-Line)*
	6B–S-Line	Boulevard Station Only, S-Line	*Boulevard Rd Only (S-Line)*
	6C	Broad Street Station Only	*Broad St Only*
	6D	Main Street Station Only	*Main St Only*
	6E	Split Service, Staples Mill Road/Main Street Stations	*Split Service*
	6F	Full Service, Staples Mill Road/Main Street Stations	*Full Service*
	6G	Shared Service, Staples Mill Road/Main Street Stations	*Shared Service*

*Tables within this chapter use abbreviated descriptions, as required for space constraints.

Effects associated with the physical improvements of the DC2RVA Franconia to Occoquan Project are being evaluated in a separate Categorical Exclusion document and are excluded from the analysis in this chapter. The No Build includes the DC2RVA Franconia to Occoquan Improvements Project.

5.2 BUILD ALTERNATIVE CROSSING IMPROVEMENTS

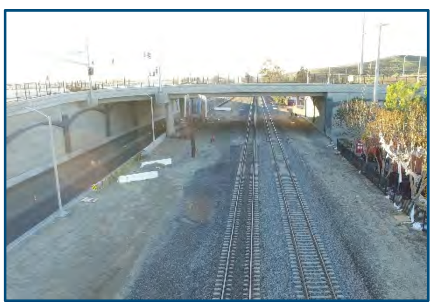
This section defines types of crossing treatments, summarizes the process to evaluate the crossings for potential improvements, and identifies the crossing improvements that are proposed at each individual roadway crossing by Build Alternative. *Refer to the At-Grade Crossing Evaluation Technical Memorandum* (*Appendix OO* of the *Alternatives Technical Report*, which is *Appendix A* of the Draft EIS) for the full evaluation process.

5.2.1 Types of Crossing Treatments Considered

The following five types of crossing treatments are included within the DC2RVA Build Alternatives; these were based on FRA guidelines, life-cycle cost efficiency, and safety needs of the geometry of parallel/intersecting crossing roadways and operating conditions within the DC2RVA corridor. As part of any Build Alternative for the DC2RVA Project, every existing or new at-grade crossing would be grade-separated, closed, or have appropriate crossing treatment that is connected into the train detection circuitry and physically impedes vehicles from accessing the tracks when a train is approaching or occupying the crossing. Virginia state code[21] restricts the creation of new at-grade crossings; this means that any new crossings of existing roadways due to the DC2RVA Project should be grade-separated, with potential roadway realignment and/or closure.

No Action

Considered at crossings where the existing crossing treatment is sufficient to accommodate the DC2RVA Project.



Grade Separation

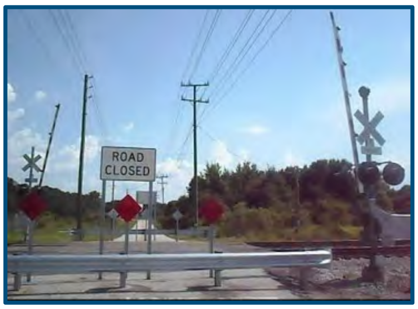
By definition, a highway-rail crossing that occurs at two different vertical levels (i.e., the roadway pavement and the railroad tracks do not intersect). Per the FHWA handbook, "the decision to grade separate at [an existing] highway-rail crossing is primarily a matter of economics" as a long-term investment. Benefits of grade-separated crossings (compared to at-grade crossings) include reduction in collisions, vehicle and rail delay, and maintenance costs.

Four-Quadrant Gates

A system of gates (entrance and exit gates on all roadway approaches) designed to provide full closure of the crossing when a train is approaching or occupying the crossing, thus eliminating the opportunity for vehicles to navigate around a single lowered gate. Design can include detection inside the gates to ensure that vehicles do not get "trapped" inside lowered gates.

Median Treatment with Gates

A system of physical improvements designed to impede the movement of vehicles into the opposing traffic lane and around the single lowered gate (two quadrant gate). Treatments include barrier wall systems, wide raised medians, and mountable raised curb systems with vertical median separators. Considerations include cost-benefit (median treatments are generally less expensive to install than four-quadrant gate systems) and absence/distance of nearby intersections and driveways.



Closure

Per the FHWA handbook, "closure of [an existing at-grade] crossing to highway traffic should always be considered as an alternative." Benefits include reduction in collisions, vehicle and rail delay, and rail maintenance costs. Considerations include elimination of redundant crossings, convenience/travel cost of vehicles using an adjacent crossing, and effects on adjacent crossings and connecting roadway network due to diversion of vehicles.

Locking Gate (private crossings only)

This term refers to a moveable barrier gate that is in engaged (i.e., closed) and only opens on demand, and would be implemented in accordance with FRA's 2009 High Speed Passenger Rail Safety Strategy guidelines.[22] The locking gate could be manual (requiring property owners to exit their vehicle to manually interact with the gate) or more automated (e.g., key card access to open and close the gate), the details of which would be determined during final design.

The example images above are representative of a typical application; they are included for illustrative purposes only.

Other site improvements (i.e., geometric and/or safety improvements) to improve overall roadway and/or railroad safety, as part of or in addition to these treatments, are not precluded from the design of any of the Project crossing treatments. It is anticipated that changes to crossing treatments that could occur during final design. based on the standards of practice at that time, would have limited effects compared to the treatment types developed and analyzed in the Draft EIS. In the unanticipated event that substantive changes are developed as part of final design efforts, the impacts of these changes would be assessed at that time.

It is important to note that the anticipated speeds of the Project corridor were a factor in the consideration of safety needs for crossing treatments. Federal designation of high speed rail corridors requires trains to achieve 110 mph where reasonably possible; however, through analysis of existing geography, environmental conditions, and operational efficiency, the DC2RVA Project established a design speed of 90 mph. Elsewhere on the overall SEHSR corridor south of Richmond, geography and operating conditions are more suitable to support speeds at 110 mph. Additionally, within the DC2RVA Project corridor, there are limiting speeds within certain areas where the trains may not be able to operate at the 90 mph maximum authorized speed for the full length between station stops, due to localized speed restrictions, track curvature, geometrical reasons and/or station proximity.

5.2.2 Methodology and Assumptions for Developing Crossing Improvements

The methodology for developing highway-rail crossing improvements as part of the Build Alternative is dependent upon the type of crossing to be improved: the process and assumptions for existing at-grade crossings, existing grade-separated crossings, and new crossings are described separately in the sub-sections below.

Existing or future year roadway capacity improvements, other than those that are directly due to actions of this project, are under the purview of VDOT and/or local governments and are excluded from the analyses contained herein. For example, if a Build condition of the DC2RVA Project consolidates two adjacent crossings, assessing if roadway improvements that are directly related to that traffic diversion are required is part of this project and would be evaluated as part of the environmental consequences. However, assessing if roadway improvements are needed due to increases in overall traffic due to regional growth (i.e., No Build conditions) is outside the purview of this project.

Additionally, the design and construction of crossings would comply with all applicable safety standards, including positive train control. Positive train control is a new system being designed to automatically stop a train before certain types of accidents occur. Specifically, positive train control, as mandated by Congress in the Rail Safety Improvement Act of 2008 (RSIA), is being designed to prevent train-to-train collisions; derailments caused by excessive speed; unauthorized incursions by trains onto sections of track where maintenance activities are taking place; and movement of a train through a track switch left in the wrong position.

5.2.2.1 Improvement Methodology, Existing At-Grade Crossings

The Build Alternative improvements at existing at-grade highway-rail crossings were developed in support of the alternatives development screening for the DC2RVA Project. The process for developing proposed improvements for each at-grade crossing is summarized below; full details are provided in the *At-Grade Crossing Evaluation Technical Memorandum*, which is *Appendix OO* of the DC2RVA *Alternatives Technical Report*.

The process developed for the DC2RVA at-grade crossing evaluation aligned with the guidelines presented in the FHWA's *Railroad-Highway Grade Crossing Handbook – Revised Second Edition* ("the handbook"), which provides guidance criteria and details physical and operational improvements for highway-rail at-grade crossings to enhance the safety and operation of both roadway and rail traffic through the crossings. The guidance is not intended to be mandatory, but sets forth best practices in developing and implementing policies, rules, and regulations between highway agencies, railroad companies, and governmental agencies. Specifically, the handbook outlines analysis methodologies for consideration of traffic control devices or other measures at every public roadway-rail at-grade crossing and sets forth 11 conditions for which public at-grade crossings "should be considered for grade separation or otherwise eliminated" if any one or more of the set thresholds are met or exceeded. The existing at-grade crossings were screened against the FHWA criteria, the results of which informed the alternatives development process as described below.

The process for identifying the at-grade crossing improvements, which were termed "proposed actions" at existing at-grade roadway public and private crossings, consisted of two steps:

1. Analyze the crossing against FHWA criteria to determine if elimination of the at-grade condition (either through grade separation or closure/consolidation) should be considered.[23] This step is applicable to public crossings only.

2. Analyze site-specific conditions of the crossing roadway area to determine if other reasons (i.e., geometrics, safety, etc.) warranted grade separation or closure, or other crossing improvements. This step is applicable to both public and private crossings. Analysis was based on planning and engineering judgment of the DRPT team. Site-specific considerations included the preliminary identification of the following[24]:

   - Traffic Data and Traffic Operations: Including crossing roadway classification and number of lanes; daily volumes; adjacent or intersecting driveways and streets (including distance from crossing); and presence of pedestrian and bicycle crossings.
   - Train Data and Rail Operations: Including daily volumes; number of tracks.
   - Safety/Geometric Deficiencies: Including roadway and/or railroad deficiencies that affect safety, such as: sight distance; crossing angle; minimum widths, clearances, or striping/signage; or horizontal and vertical alignment.
   - Major Environmental Resources: Including identification of: parks/recreation areas; schools; high priority cultural and/or historic areas; wetlands; military installations; and wetlands.
   - Engineering Considerations: Feasibility issues, such as horizontal and vertical alignment or proximity to intersection driveways and/or roadways.
   - Adjacent Property Uses: Including type and intensity/density of land uses on each side of crossing.
   - Preliminary Cost-Benefit: For locations where grade separation was considered.
   - Accessibility: Including summary of area/uses that the crossing roadway serves, and if the crossing provides sole access (i.e., no feasible alternate route any properties served).
   - Connectivity to Adjacent Crossings: Including distances to closest upstream (to the north) and downstream (to the south) crossings.
   - Special Uses at Crossing: Including use and/or access to the crossing by emergency vehicles; school buses; and public transit.

Decisions regarding whether an existing at-grade crossing should be eliminated (grade-separated or closed) or improved through the installation of new or additional crossing treatments depended on a number of factors including the FHWA crossing elimination guidance criteria as well as safety, operational, and cost considerations. To ensure that the decision-making process to identify a proposed action at each existing at-grade crossing in the DC2RVA corridor was consistent and unbiased, decision-making logic diagrams for public and private crossings (as shown in Table 5-1 and Table 5-2, respectively) were developed to provide a general analytical structure with which to identify a proposed action. The diagrams were developed to illustrate and summarize the basic logic that was used in identifying proposed actions for improvements; this logic was used to guide the process and was not intended to be rigidly prescriptive.

Table 5-1: Summary of Decision-Making Diagram, Public Crossings

Condition	Proposed Action(s) Considered
If any 1 of the 11 FHWA condition thresholds are met or exceeded in 2015 or 2025	▪ Grade Separation ▪ Closure
If an adjacent crossing is located within 1 rail mile	▪ Closure
If there are rail or roadway safety or geometric deficiencies to be mitigated	▪ Geometric Safety Improvement ▪ Grade Separation ▪ Closure
If the existing condition is gates (not four-quadrant)	▪ Median Treatment ▪ Four-Quadrant Gate
If there are existing median treatment or four-quadrant gates	▪ No Action

Table 5-2: Summary of Decision-Making Diagram, Private Crossings

Condition	Proposed Action(s) Considered
If a farm/residence or industrial crossing has feasible alternate routes	▪ Closure
If a crossing is commercial/used by the public	▪ Median Treatment ▪ Four-Quadrant Gate
If a residence/farm crossing provides sole access	▪ Locking Gate
If an industrial crossing provides sole access	▪ Four-Quadrant Gate ▪ Locking Gate
If the crossing is on a military property	▪ Four-Quadrant Gate
If the crossing is exclusively railroad access	▪ No Action

The outcome of this process was a single "proposed action" at each existing at-grade highway-rail crossing in the project corridor. These proposed actions were analyzed for the Build condition assumption of adding one additional track throughout the corridor. It was intended that the primary proposed actions resulting from this evaluation may be modified based on analyses performed at a greater level of detail or considerations identified over the course of the environmental analyses, and may be altered for other Build condition scenarios[25] based on detailed engineering analyses as well as coordination with FRA, DRPT, and other stakeholders.

5.2.2.2 Improvement Methodology, Existing Grade-Separated Crossings

It was assumed that all existing grade-separated highway crossings – both public and private – of the rail corridor would be maintained. For the build conditions, this could mean either the existing structure (either the rail structure for a roadway underpass or a roadway structure for a roadway overpass) would be widened or an additional adjacent structure would be implemented to accommodate the build conditions. It is assumed that existing operations of the crossing roadway (number and type of lanes as well as access to adjacent land uses) would be maintained during all build conditions.

5.2.2.3 Improvement Methodology, New Crossings

As previously stated, Virginia state code restricts the creation of new at-grade crossings of the rail corridor. This means that all new rail crossings of existing roadways along the bypass alignments must be either grade-separated or closed. The methodology to determine the crossing treatment at new crossings followed a similar site-specific process to Step 2 of the existing at-grade crossings, as described above in Section 5.2.2.1 with an emphasis on roadway network connectivity and accessibility to adjacent crossings and land uses.

5.2.3 Crossing Improvements at Individual Roadway Crossings by Build Alternative

This section presents the proposed crossing improvement at each highway-rail crossing, including both existing and new crossings of both public and private roadways. The source of the improvement designs is the Conceptual Engineering plans that were developed by the DRPT team to be analyzed in the Draft EIS. The Conceptual Engineering plans for the existing at-grade crossings were based on the *At-Grade Crossing Evaluation Technical Memorandum* (Appendix OO of the *Alternatives Technical Report*) analyses, as previously described; any modifications were based on the more detailed requirements of engineering versus planning documentation and are described below. Additionally, note that proposed actions in that technical memorandum were analyzed for the build condition assumption of adding one additional track throughout the corridor; the assumptions were modified as required based on the requirements of the alternative build conditions as determined by engineering judgment of the DRPT team.

The improvements at individual roadway crossings are described below in the following order:

- Public At-Grade Crossings, including existing at-grade crossings as well as new (i.e., no existing) crossings of public roadways
- Private At-Grade Crossings, including existing at-grade crossings as well as new (i.e., no existing) crossings of private roadways
- Existing Grade-Separated Crossings, including both public and private existing grade-separated crossings

Within certain Build Alternatives have identical crossing improvements for the crossing roadways; these identical alternatives were combined as appropriate in the tables and figures below to streamline the comparison of alternatives.

5.2.3.1 Crossing Improvements at Public At-Grade Crossings

This section presents the crossing improvements at the existing at-grade public crossings as well as new crossings of public roadways in the DC2RVA corridor. The crossing improvement along an individual public roadway crossing can vary by Build Alternative within an area. A summary of total type of crossing improvements at public at-grade crossings for each Build Alternative is provided in Table 5-3 below.

These crossing improvements are detailed by crossing roadway by Build Alternative in Figure 5-1 through Figure 5-13, as well as Table 5-4. All new crossings occur in the bypass alignments of the city of Fredericksburg and the town of Ashland, with the exception of Build Alternative 6C (Broad Street Station), which proposes two new at-grade crossings as part of the station improvement design.

As this data shows, most of the existing at-grade public roadways remain at-grade with the addition of four-quadrant gates or gates with median treatment as appropriate to provide a corridor with improved safety for the DC2RVA Project.

Table 5-3: Summary of Crossing Improvements at Existing Public At-Grade Crossings

Alternative Area	Alternative/Description		Crossing Improvements at Existing Crossings[1]					New[2]	Total
			Grade Separation	Crossing Closure	Four-Quadrant Gates	Median Treatment	No Action		
Arlington	1A, 1B, and 1C	Add 2 Tracks East, Add 2 Tracks West, and Add 1 Track East & West	0	0	0	0	0	0	0
Northern Virginia	2A[3]	Add 1 Track	0	1	2	0	1	0	4
Fredericksburg	3A	Maintain Existing	0	0	3	1	0	0	4
	3B	Add 1 Track	1	0	2	1	0	0	4
	3C	2-Track East Bypass	0	0	5	4	0	5	14
Central Virginia	4A	Add 1 Track	0	1	4	2	0	0	7
Ashland	5A and 5B	Maintain Existing, and Add 1 Track	2	1	7	1	0	0	11
	5A–Ashcake, 5B–Ashcake, and 5D–Ashcake	Maintain Existing (New Station), Add 1 Track (New Station), and Center 3 Tracks (New Station)	2	0	8	1	0	0	11
	5C	2-Track West Bypass	0	1	9	1	0	8	19
	5C–Ashcake	2-Track West Bypass (New Station)	0	0	10	1	0	8	19
Richmond	6A, 6B–A-Line, and 6E	Staples Mill Only, Boulevard Rd Only (A-Line), and Split Service	3	4	2	1	1	0	11
	6B–S-Line	Boulevard Rd Only (S-Line)	4	5	4	3	1	0	17
	6C	Broad St Only	3	4	2	2	1	2	14
	6D, 6F, and 6G	Main St Only, Full Service, and Shared Service	3	5	4	4	1	0	17

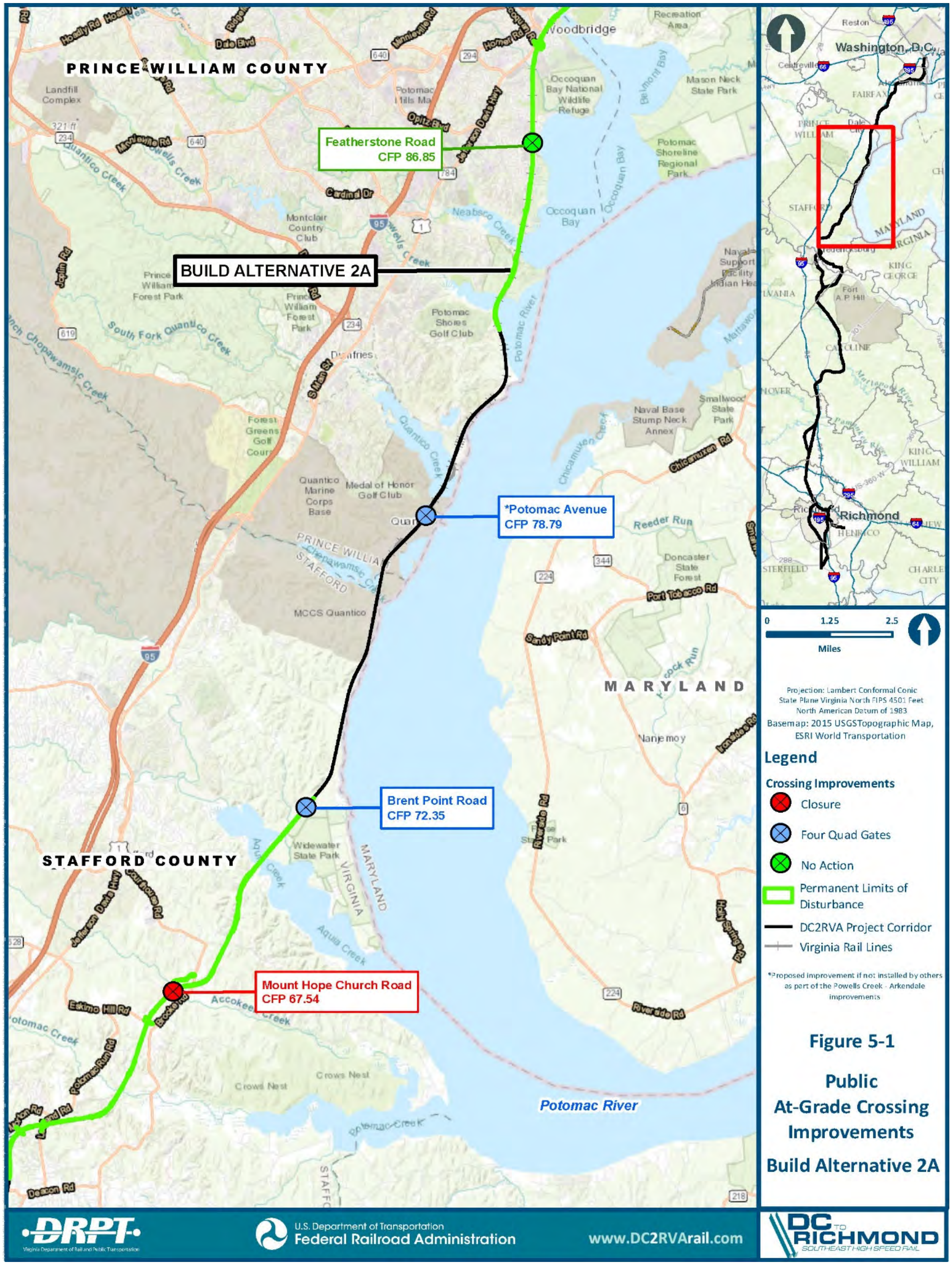
[1] "Crossing Closure" can include construction of a new roadway connector to provide access. "Median Treatment" can include raised medians (new or extension of existing raised medians) or mountable raised curbs with vertical median tubes, with gates. "No action" includes: existing crossings with existing treatment that meets the DC2RVA criteria; existing crossings that are not affected by the Build Alternative (bypass alignments only); or new crossings of public roadways that do not require an action due to property acquisition (bypass alignments).

[2] "New " are provided as a summary total of new rail crossing of public roadways for reference, and include crossings that would be grade-separated, closed or consolidated with adjacent crossings or due to property acquisitions; or realigned. The exception is for Build Alternative 6C (Broad Street Station), which includes two new at-grade public roadway crossings as part of the station improvements.

[3] Build Alternative 2A includes the proposed improvement of four-quadrant gates at Potomac Avenue, if not installed by others as part of the Powell's Creek–Arkendale improvements.

All crossings may require minor safety and/or geometric improvements related to the construction of the Build Alternative (i.e., moving existing gates to accommodate the proposed track).

This table does not include potential effects to other, non-crossing roadways that may be required as part of the Build Alternative (refer to Table 5-16).


PRINCE WILLIAM COUNTY
STAFFORD COUNTY
MARYLAND
BUILD ALTERNATIVE 2A
Featherstone Road
CFP 86.85
*Potomac Avenue
CFP 78.79
Brent Point Road
CFP 72.35
Mount Hope Church Road
CFP 67.54
Potomac River
Woodbridge
Richmond
Washington, D.C.
0 1.25 2.5
Miles
Projection: Lambert Conformal Conic
State Plane Virginia North FIPS 4501 Feet
North American Datum of 1983
Basemap: 2015 USGSTopographic Map,
ESRI World Transportation
Legend
Crossing Improvements
Closure
Four Quad Gates
No Action
Permanent Limits of Disturbance
DC2RVA Project Corridor
Virginia Rail Lines
*Proposed improvement if not installed by others as part of the Powells Creek - Arkendale improvements
Figure 5-1
Public
At-Grade Crossing
Improvements
Build Alternative 2A
DRPT
U.S. Department of Transportation
Federal Railroad Administration
www.DC2RVArail.com
DC TO RICHMOND
SOUTHEAST HIGH SPEED RAIL

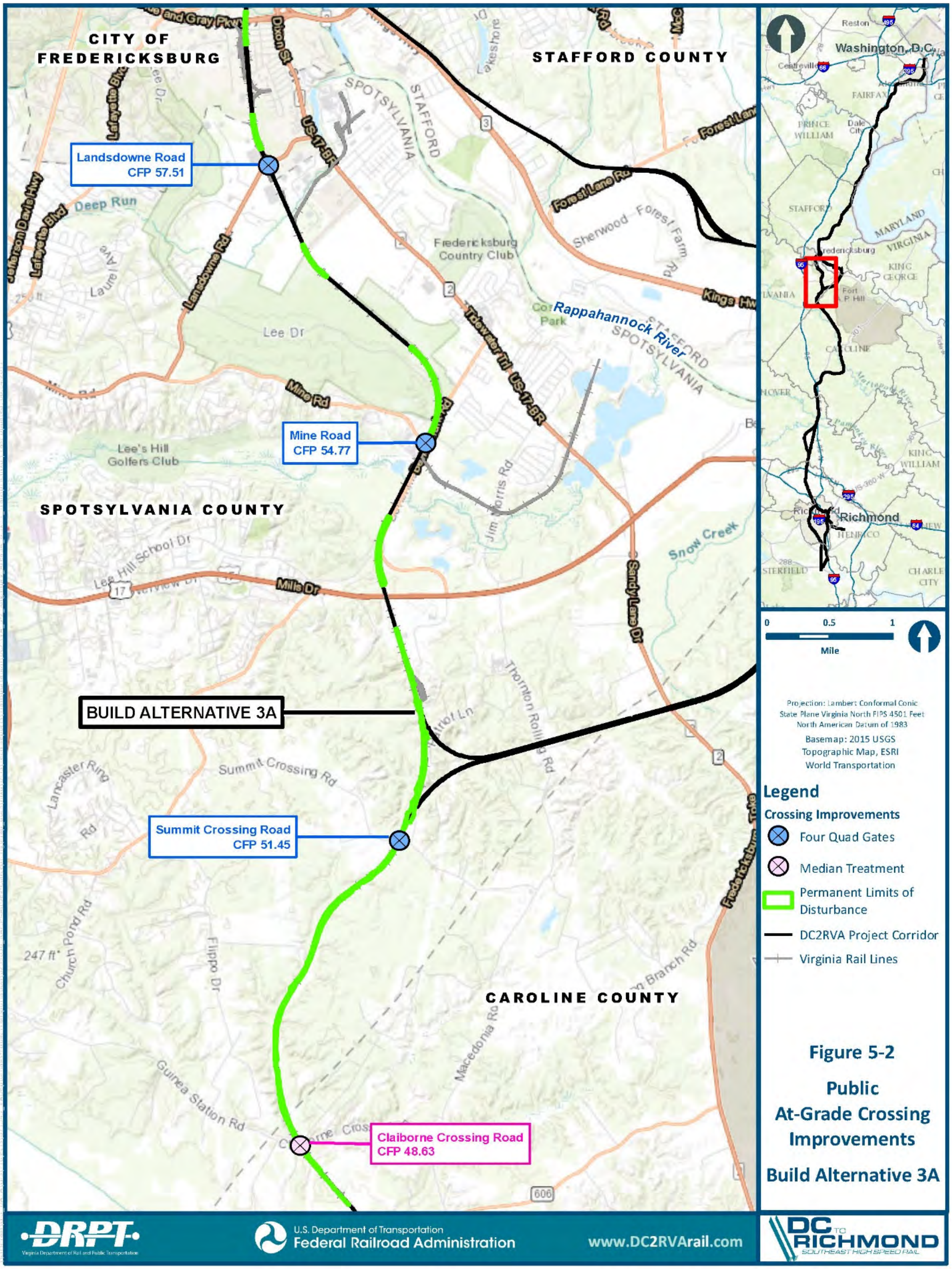


Figure 5-2
Public
At-Grade Crossing
Improvements
Build Alternative 3A

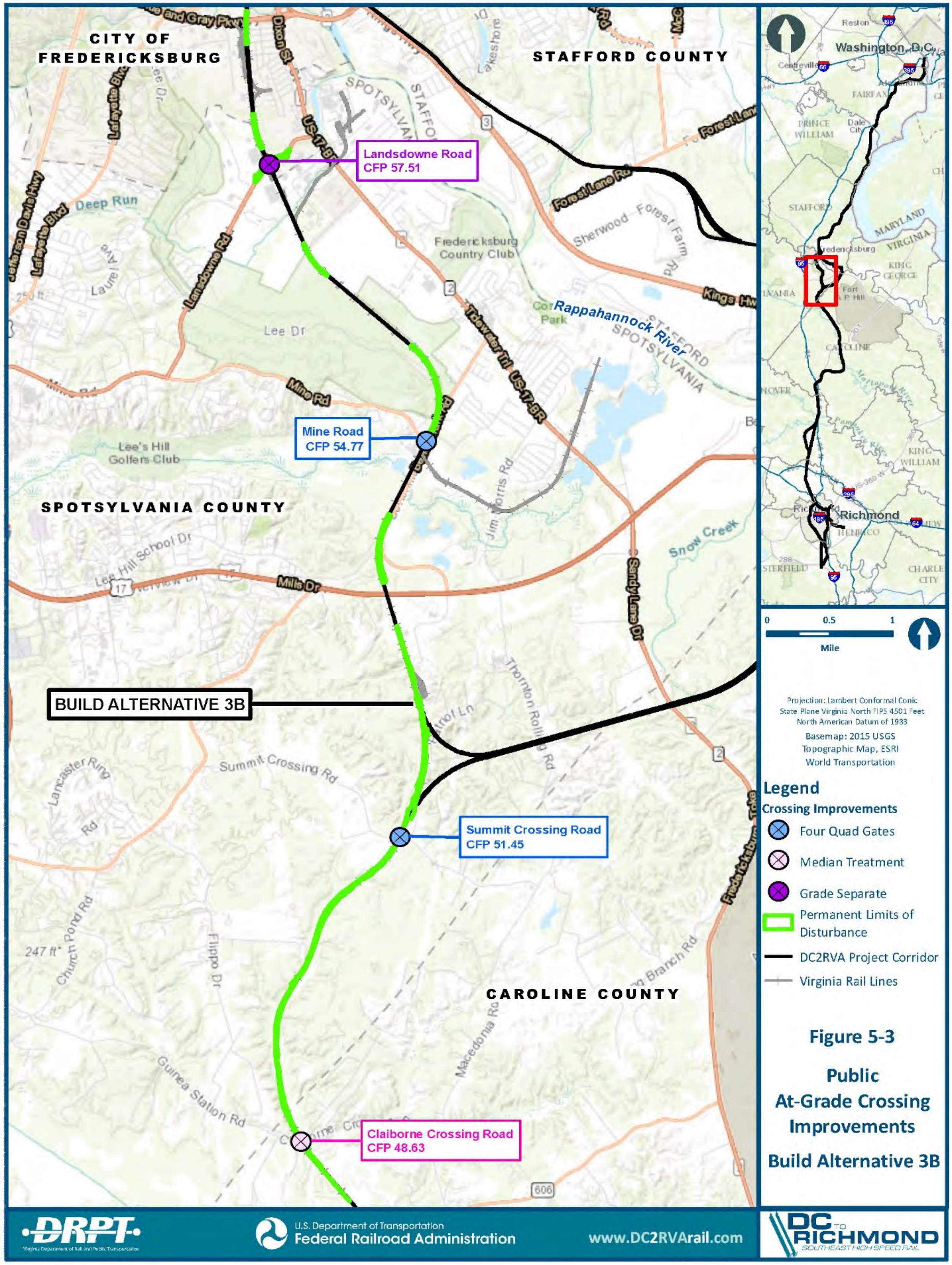
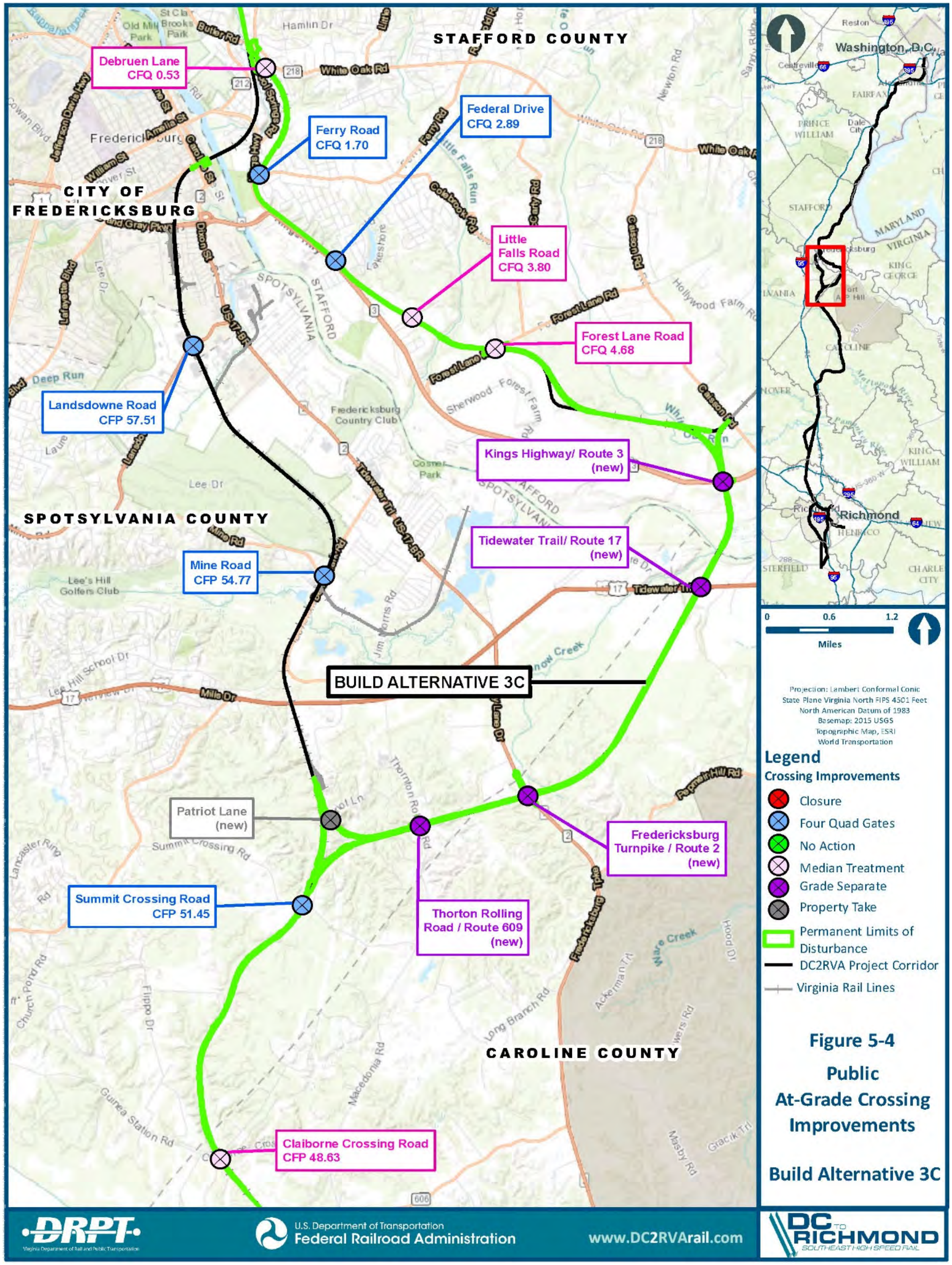


Figure 5-3
Public At-Grade Crossing Improvements
Build Alternative 3B


STAFFORD COUNTY
CITY OF FREDERICKSBURG
SPOTSYLVANIA COUNTY
CAROLINE COUNTY
Debruen Lane CFQ 0.53
Ferry Road CFQ 1.70
Federal Drive CFQ 2.89
Little Falls Road CFQ 3.80
Forest Lane Road CFQ 4.68
Landsdowne Road CFP 57.51
Kings Highway/ Route 3 (new)
Tidewater Trail/ Route 17 (new)
Mine Road CFP 54.77
BUILD ALTERNATIVE 3C
Patriot Lane (new)
Fredericksburg Turnpike / Route 2 (new)
Summit Crossing Road CFP 51.45
Thorton Rolling Road / Route 609 (new)
Claiborne Crossing Road CFP 48.63
Washington, D.C.
Richmond
0 0.6 1.2
Miles
Projection: Lambert Conformal Conic
State Plane Virginia North FIPS 4501 Feet
North American Datum of 1983
Basemap: 2015 USGS
Topographic Map, ESRI
World Transportation
Legend
Crossing Improvements
Closure
Four Quad Gates
No Action
Median Treatment
Grade Separate
Property Take
Permanent Limits of Disturbance
DC2RVA Project Corridor
Virginia Rail Lines
Figure 5-4
Public
At-Grade Crossing
Improvements
Build Alternative 3C
DRPT
U.S. Department of Transportation
Federal Railroad Administration
www.DC2RVArail.com
DC TO RICHMOND
SOUTHEAST HIGH SPEED RAIL

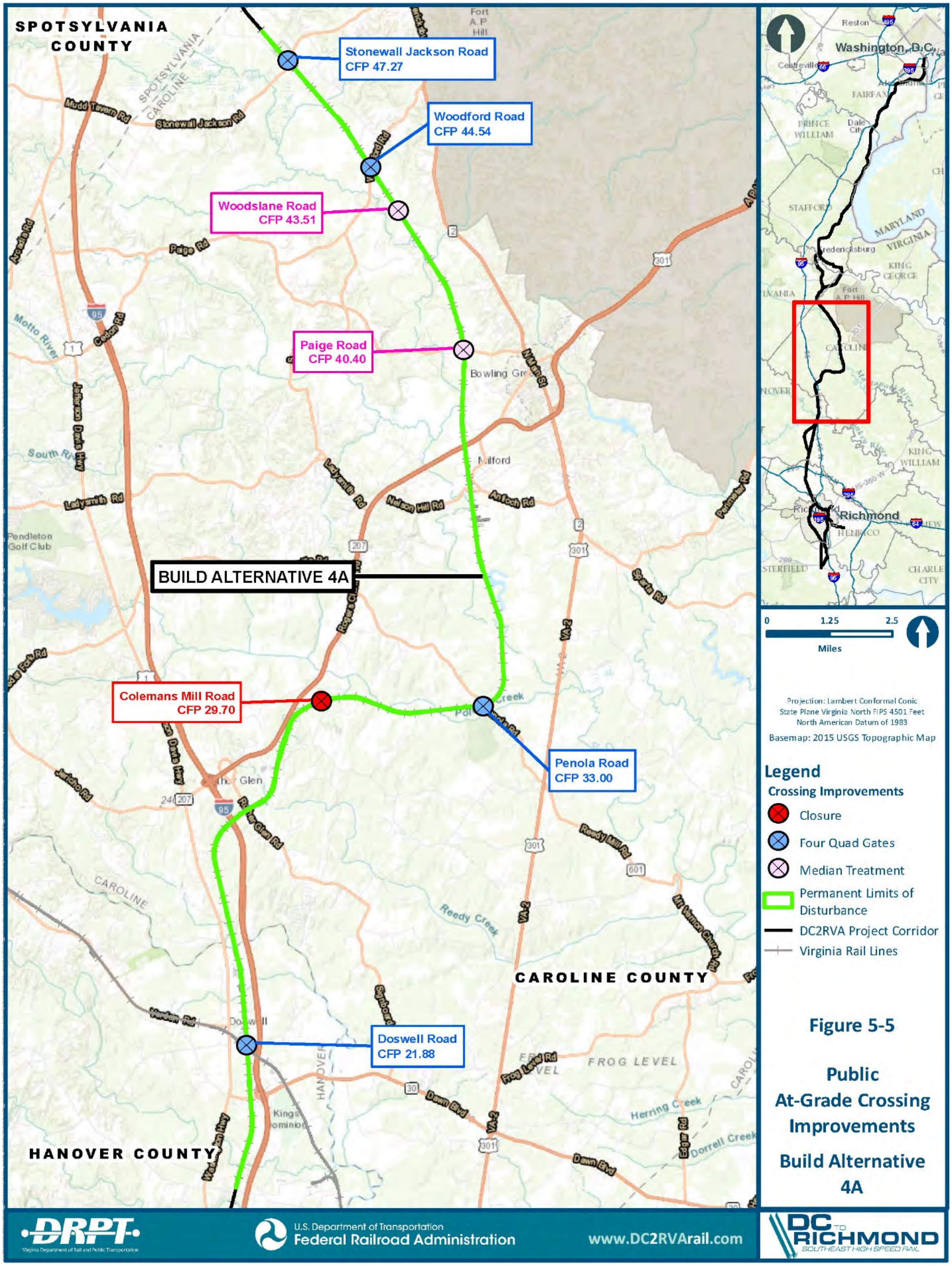
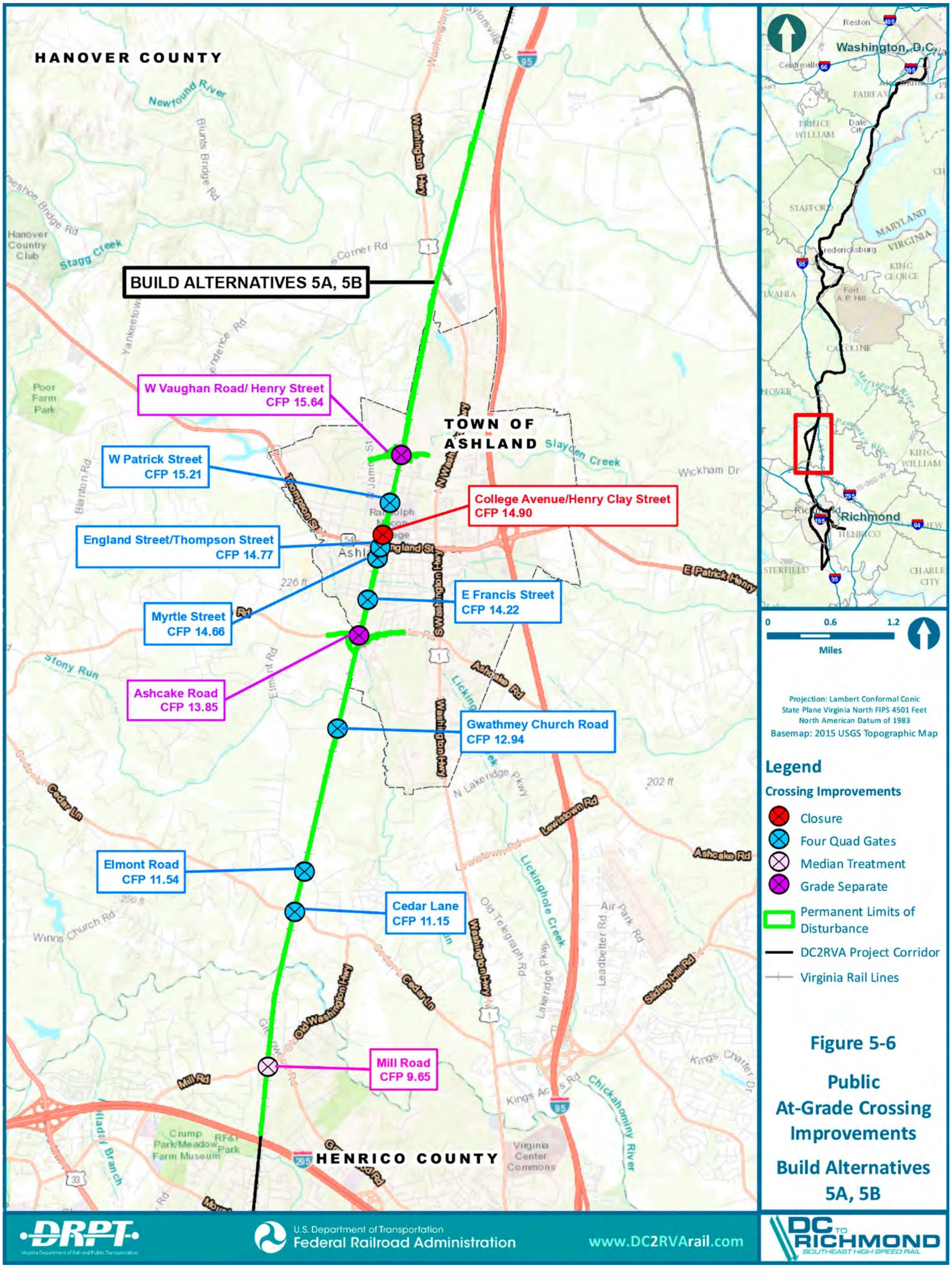


Figure 5-5

Public At-Grade Crossing Improvements

Build Alternative 4A


HANOVER COUNTY
BUILD ALTERNATIVES 5A, 5B
TOWN OF ASHLAND
HENRICO COUNTY
W Vaughan Road/ Henry Street CFP 15.64
W Patrick Street CFP 15.21
College Avenue/Henry Clay Street CFP 14.90
England Street/Thompson Street CFP 14.77
Myrtle Street CFP 14.66
E Francis Street CFP 14.22
Ashcake Road CFP 13.85
Gwathmey Church Road CFP 12.94
Elmont Road CFP 11.54
Cedar Lane CFP 11.15
Mill Road CFP 9.65
Washington, D.C.
Richmond
0 0.6 1.2
Miles
Projection: Lambert Conformal Conic
State Plane Virginia North FIPS 4501 Feet
North American Datum of 1983
Basemap: 2015 USGS Topographic Map
Legend
Crossing Improvements
Closure
Four Quad Gates
Median Treatment
Grade Separate
Permanent Limits of Disturbance
DC2RVA Project Corridor
Virginia Rail Lines
Figure 5-6
Public At-Grade Crossing Improvements
Build Alternatives 5A, 5B
DRPT
U.S. Department of Transportation Federal Railroad Administration
www.DC2RVArail.com
DC TO RICHMOND SOUTHEAST HIGH SPEED RAIL

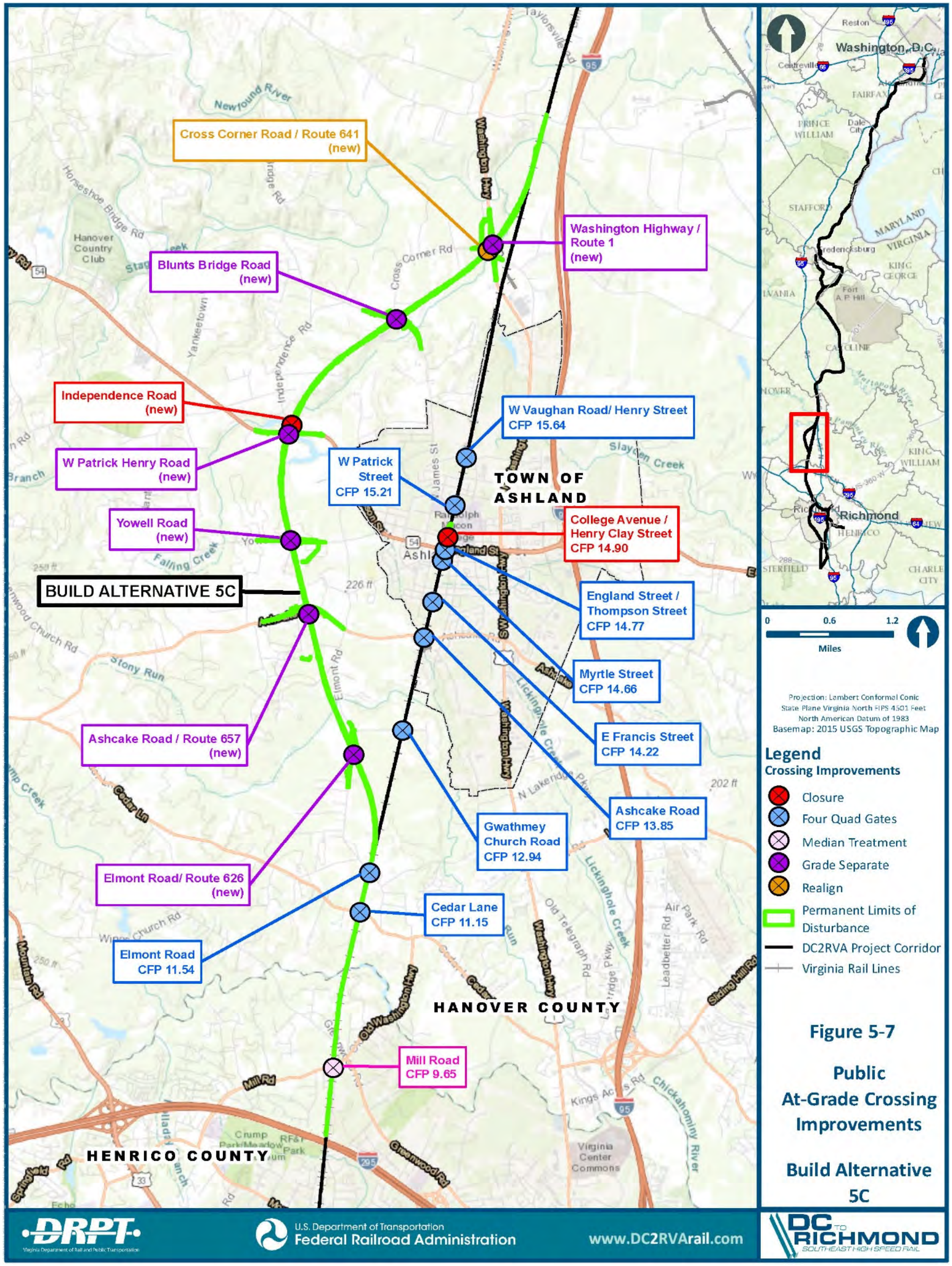
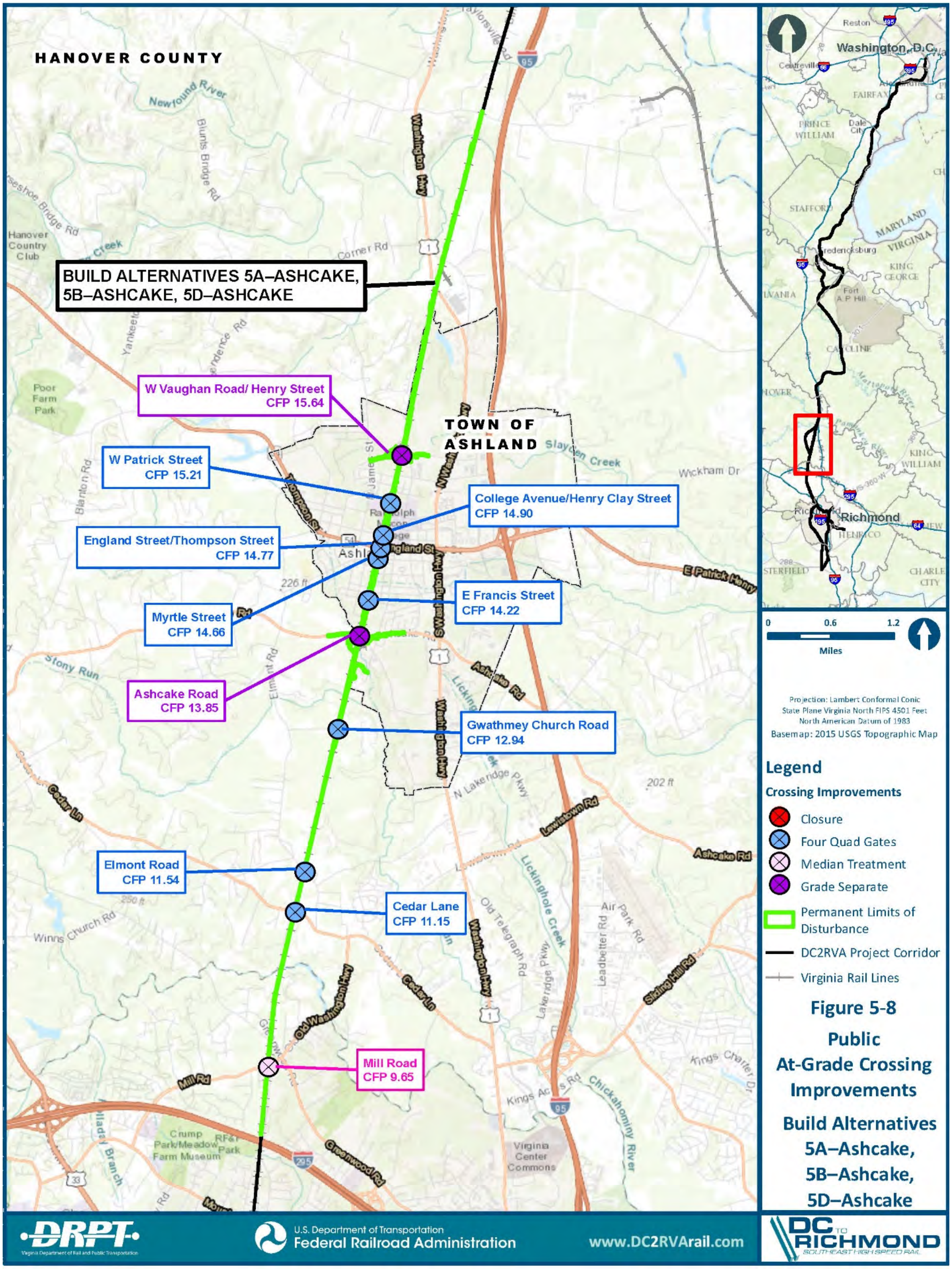


Figure 5-7

Public At-Grade Crossing Improvements

Build Alternative 5C


HANOVER COUNTY
BUILD ALTERNATIVES 5A–ASHCAKE, 5B–ASHCAKE, 5D–ASHCAKE
TOWN OF ASHLAND
W Vaughan Road/ Henry Street CFP 15.64
W Patrick Street CFP 15.21
College Avenue/Henry Clay Street CFP 14.90
England Street/Thompson Street CFP 14.77
E Francis Street CFP 14.22
Myrtle Street CFP 14.66
Ashcake Road CFP 13.85
Gwathmey Church Road CFP 12.94
Elmont Road CFP 11.54
Cedar Lane CFP 11.15
Mill Road CFP 9.65
Washington, D.C.
Richmond
0 0.6 1.2
Miles
Projection: Lambert Conformal Conic
State Plane Virginia North FIPS 4501 Feet
North American Datum of 1983
Basemap: 2015 USGS Topographic Map
Legend
Crossing Improvements
Closure
Four Quad Gates
Median Treatment
Grade Separate
Permanent Limits of Disturbance
DC2RVA Project Corridor
Virginia Rail Lines
Figure 5-8
Public At-Grade Crossing Improvements
Build Alternatives 5A–Ashcake, 5B–Ashcake, 5D–Ashcake
DRPT
U.S. Department of Transportation
Federal Railroad Administration
www.DC2RVArail.com
DC TO RICHMOND
SOUTHEAST HIGH SPEED RAIL

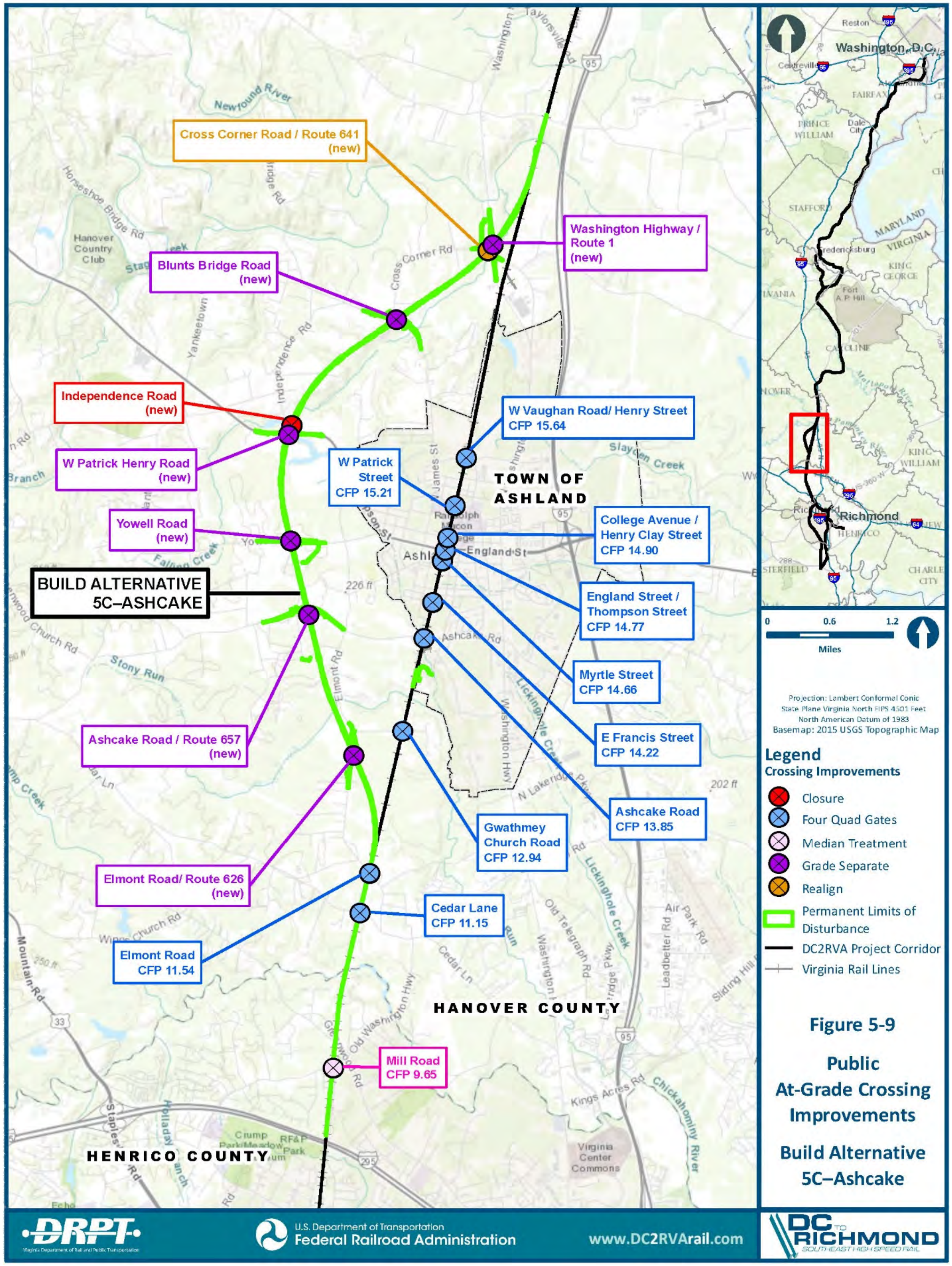


Figure 5-9
Public At-Grade Crossing Improvements
Build Alternative 5C–Ashcake

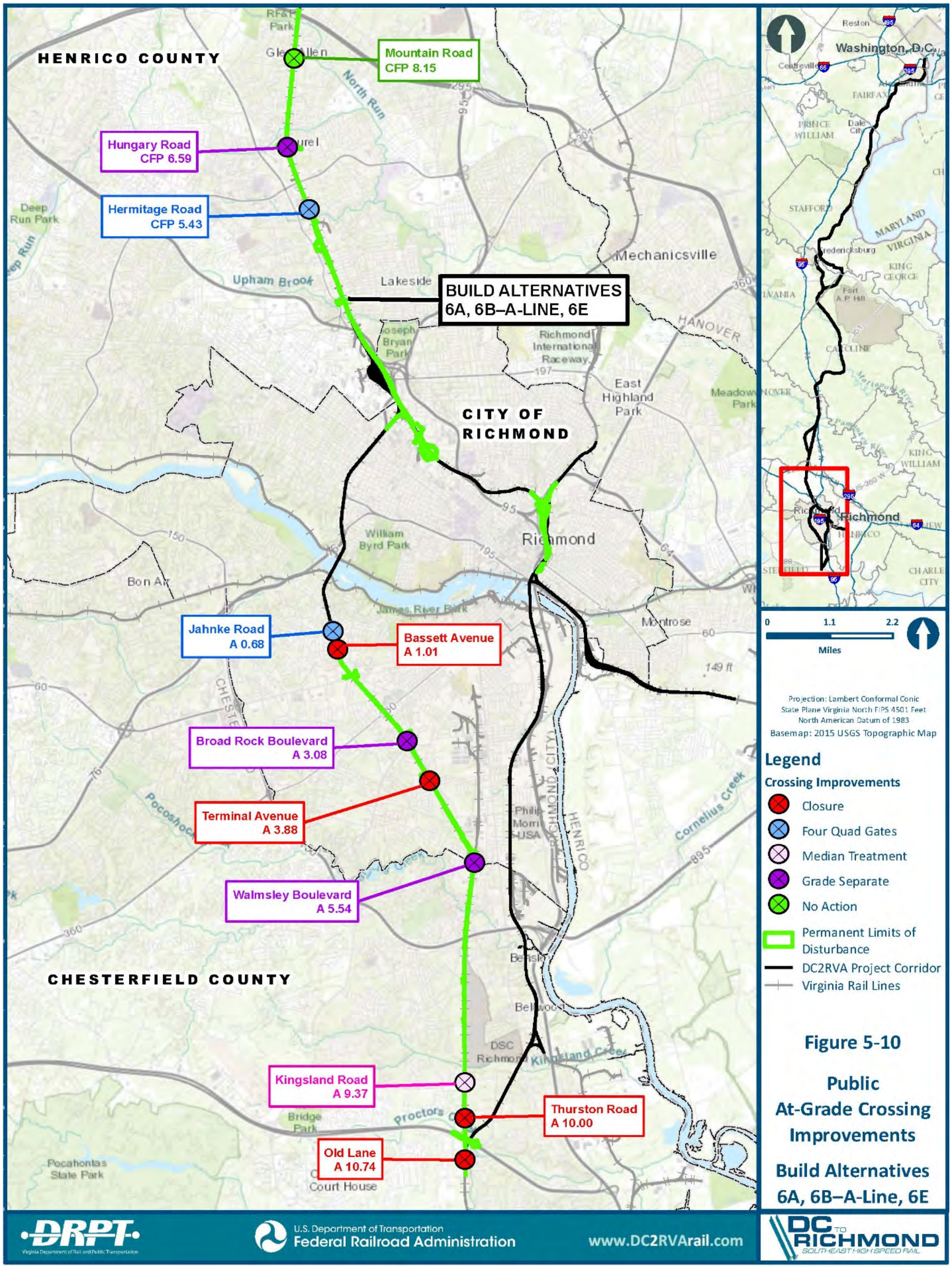


Figure 5-10

Public At-Grade Crossing Improvements

Build Alternatives 6A, 6B–A-Line, 6E

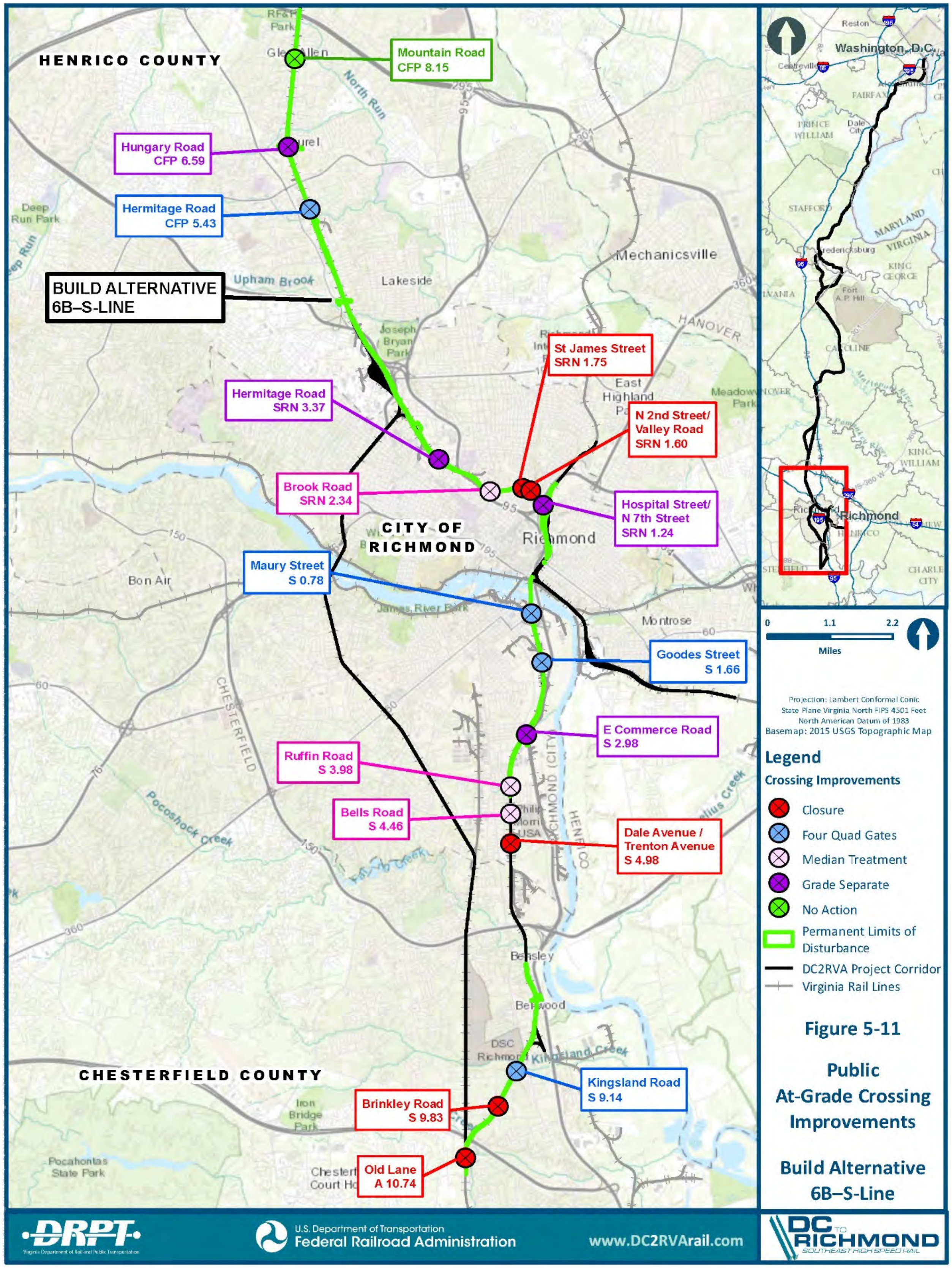
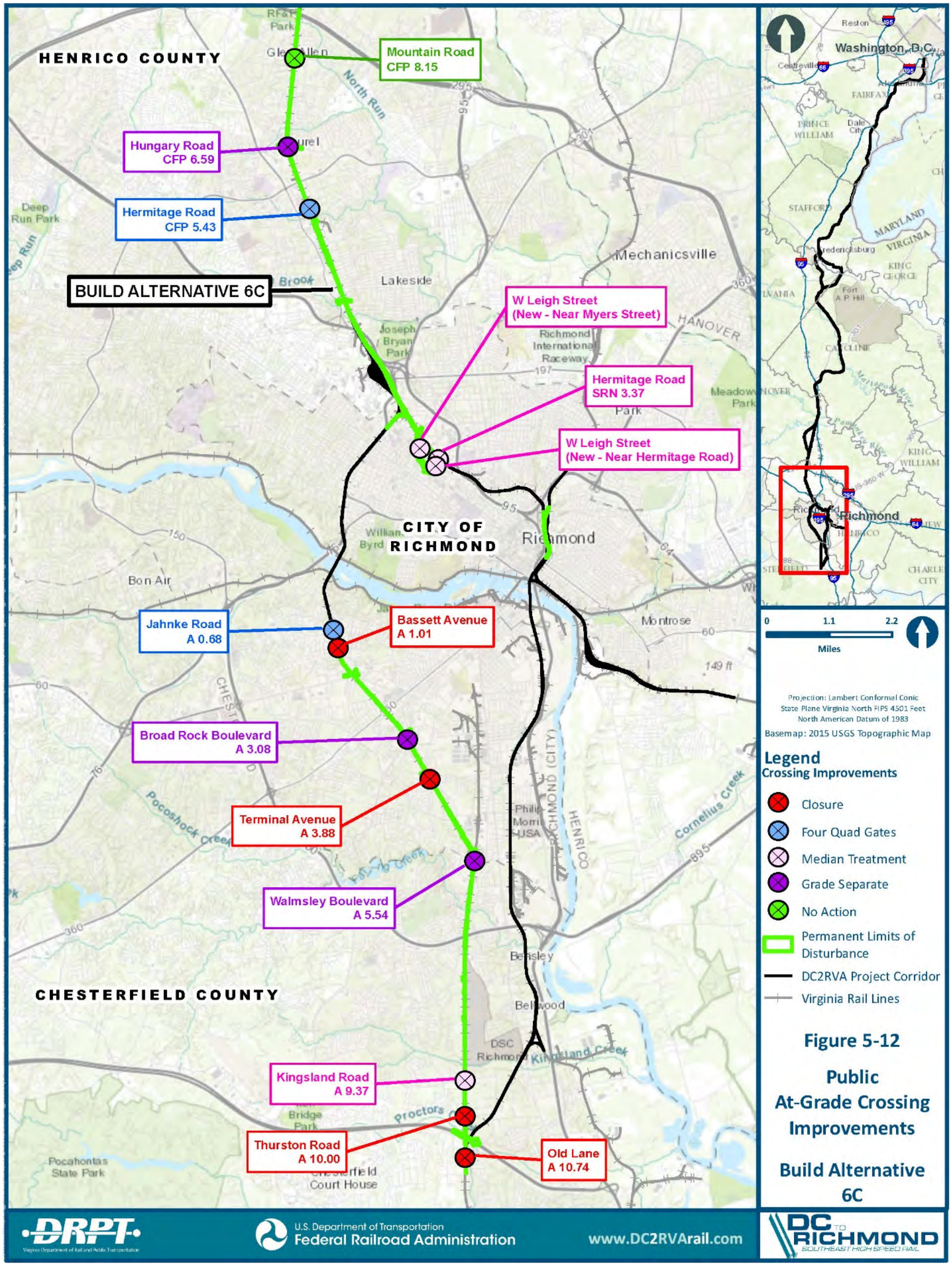


Figure 5-11
Public
At-Grade Crossing
Improvements
Build Alternative
6B–S-Line


HENRICO COUNTY
Mountain Road
CFP 8.15
Hungary Road
CFP 6.59
Hermitage Road
CFP 5.43
BUILD ALTERNATIVE 6C
W Leigh Street
(New - Near Myers Street)
Hermitage Road
SRN 3.37
W Leigh Street
(New - Near Hermitage Road)
Mechanicsville
Lakeside
HANOVER
CITY OF
RICHMOND
Richmond
Bon Air
Jahnke Road
A 0.68
Bassett Avenue
A 1.01
Broad Rock Boulevard
A 3.08
Terminal Avenue
A 3.88
Walmsley Boulevard
A 5.54
CHESTERFIELD COUNTY
Kingsland Road
A 9.37
Thurston Road
A 10.00
Old Lane
A 10.74
Washington, D.C.
Richmond
0
1.1
2.2
Miles
Projection: Lambert Conformal Conic
State Plane Virginia North FIPS 4501 Feet
North American Datum of 1983
Basemap: 2015 USGS Topographic Map
Legend
Crossing Improvements
Closure
Four Quad Gates
Median Treatment
Grade Separate
No Action
Permanent Limits of Disturbance
DC2RVA Project Corridor
Virginia Rail Lines
Figure 5-12
Public
At-Grade Crossing
Improvements
Build Alternative
6C
DRPT
U.S. Department of Transportation
Federal Railroad Administration
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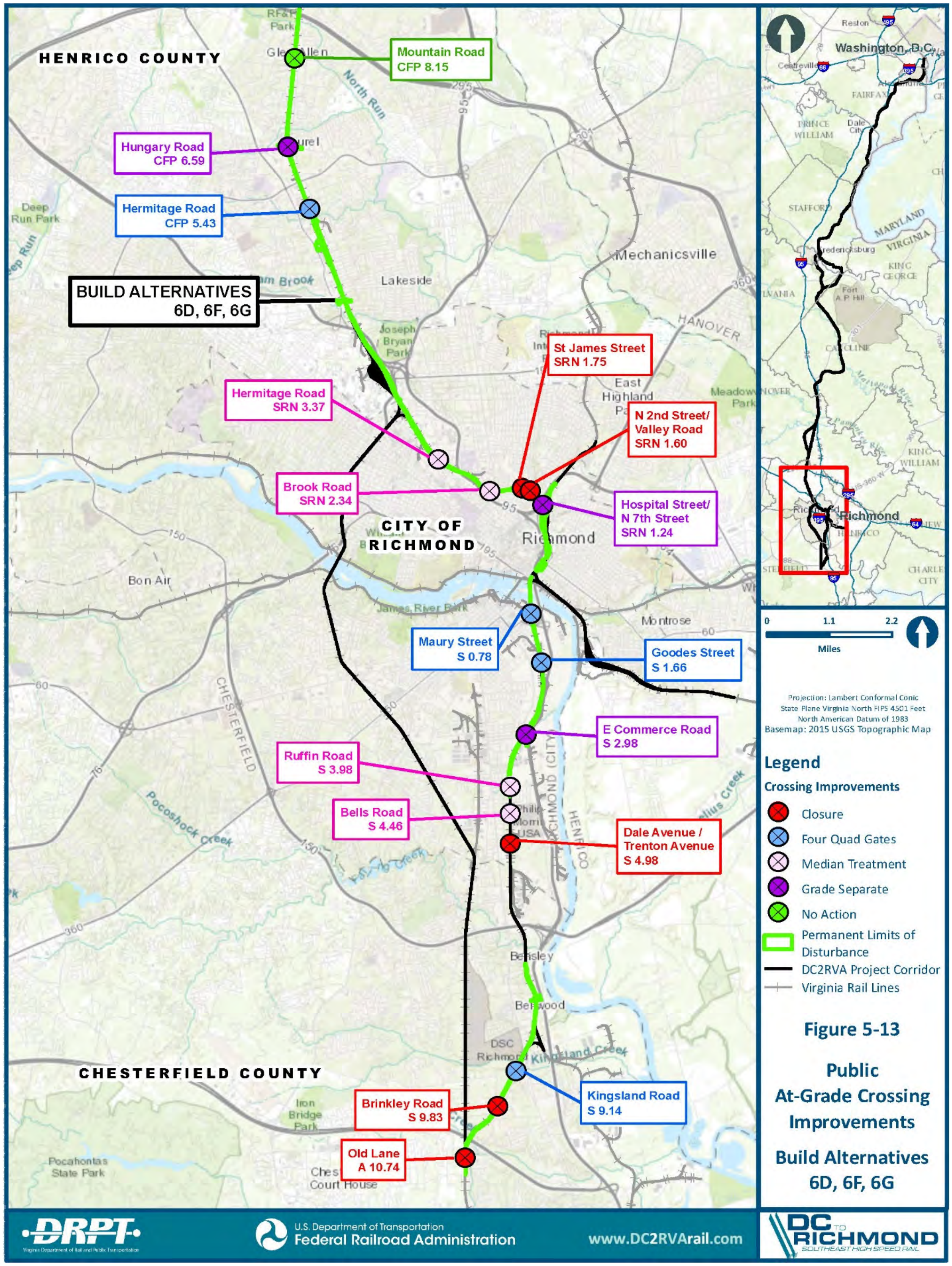

Figure 5-13

Public At-Grade Crossing Improvements

Build Alternatives 6D, 6F, 6G

Table 5-4: Crossing Improvements by Public At-Grade Crossing

Crossing Roadway Name	Mile-post	2A. Add 1 Track	3A. Maintain Existing	3B. Add 1 Track	3C. 2-Track East Bypass	4A. Add 1 Track	5A. Maintain Existing; 5B. Add 1 Track	5A–Ashcake. Maintain Existing; 5B–Ashcake. Add 1 Track; 5D–Ashcake. Center 3 Tracks (ALL - New Station)	5C. 2-Track West Bypass	5C–Ashcake. 2-Track West Bypass (New Station)	6A. Staples Mill Only; 6B–A-Line. Boulevard Rd Only (A-Line); 6E. Split Service	6B–S-Line. Boulevard Rd Only (S-Line)	6C. Broad St Only	6D. Main St Only; 6F. Full Service; 6G. Shared Service
Existing Crossings of Public Roadways														
Featherstone Road	CFP 86.85	No Action	--	--	--	--	--	--	--	--	--	--	--	--
Potomac Avenue	CFP 78.79	Four-Quad Gates	--	--	--	--	--	--	--	--	--	--	--	--
Brent Point Road	CFP 72.35	Four-Quad Gates	--	--	--	--	--	--	--	--	--	--	--	--
Mount Hope Church Road	CFP 67.54	Closure	--	--	--	--	--	--	--	--	--	--	--	--
Landsdowne Road	CFP 57.51	--	Four-Quad Gates	Grade Separate	Four-Quad Gates	--	--	--	--	--	--	--	--	--
Mine Road	CFP 54.77	--	Four-Quad Gates	Four-Quad Gates	Four-Quad Gates	--	--	--	--	--	--	--	--	--
Summit Crossing Road	CFP 51.45	--	Four-Quad Gates	Four-Quad Gates	Four-Quad Gates	--	--	--	--	--	--	--	--	--
Claiborne Crossing Road	CFP 48.63	--	Median Treatment	Median Treatment	Median Treatment	--	--	--	--	--	--	--	--	--
Stonewall Jackson Road	CFP 47.27	--	--	--	--	Four-Quad Gates	--	--	--	--	--	--	--	--
Woodford Road	CFP 44.54	--	--	--	--	Four-Quad Gates	--	--	--	--	--	--	--	--
Woodslane Road	CFP 43.51	--	--	--	--	Median Treatment	--	--	--	--	--	--	--	--
Paige Road	CFP 40.40	--	--	--	--	Median Treatment	--	--	--	--	--	--	--	--
Penola Road	CFP 33.00	--	--	--	--	Four-Quad Gates	--	--	--	--	--	--	--	--
Colemans Mill Road	CFP 29.70	--	--	--	--	Closure	--	--	--	--	--	--	--	--
Doswell Road	CFP 21.88	--	--	--	--	Four-Quad Gates	--	--	--	--	--	--	--	--
W Vaughan Road / Henry Street	CFP 15.64	--	--	--	--	--	Grade Separate	Grade Separate	Four-Quad Gates	Four-Quad Gates	--	--	--	--
W Patrick Street	CFP 15.21	--	--	--	--	--	Four-Quad Gates	Four-Quad Gates	Four-Quad Gates	Four-Quad Gates	--	--	--	--
College Avenue / Henry Clay Street	CFP 14.90	--	--	--	--	--	Closure	Four-Quad Gates	Closure	Four-Quad Gates	--	--	--	--
England Street / Thompson Street	CFP 14.77	--	--	--	--	--	Four-Quad Gates	Four-Quad Gates	Four-Quad Gates	Four-Quad Gates	--	--	--	--
Myrtle Street	CFP 14.66	--	--	--	--	--	Four-Quad Gates	Four-Quad Gates	Four-Quad Gates	Four-Quad Gates	--	--	--	--
E Francis Street	CFP 14.22	--	--	--	--	--	Four-Quad Gates	Four-Quad Gates	Four-Quad Gates	Four-Quad Gates	--	--	--	--
Ashcake Road	CFP 13.85	--	--	--	--	--	Grade Separate	Grade Separate	Four-Quad Gates	Four-Quad Gates	--	--	--	--

Table 5-4: Crossing Improvements by Public At-Grade Crossing

Crossing Roadway Name	Mile-post	2A. Add 1 Track	3A. Maintain Existing	3B. Add 1 Track	3C. 2-Track East Bypass	4A. Add 1 Track	5A. Maintain Existing; 5B. Add 1 Track	5A–Ashcake. Maintain Existing; 5B–Ashcake. Add 1 Track; 5D–Ashcake. Center 3 Tracks (ALL - New Station)	5C. 2-Track West Bypass	5C–Ashcake. 2-Track West Bypass (New Station)	6A. Staples Mill Only; 6B–A-Line. Boulevard Rd Only (A-Line); 6E. Split Service	6B–S-Line. Boulevard Rd Only (S-Line)	6C. Broad St Only	6D. Main St Only; 6F. Full Service; 6G. Shared Service
Gwathmey Church Road	CFP 12.94	--	--	--	--	--	Four-Quad Gates	Four-Quad Gates	Four-Quad Gates	Four-Quad Gates	--	--	--	--
Elmont Road	CFP 11.54	--	--	--	--	--	Four-Quad Gates	Four-Quad Gates	Four-Quad Gates	Four-Quad Gates	--	--	--	--
Cedar Lane	CFP 11.15	--	--	--	--	--	Four-Quad Gates	Four-Quad Gates	Four-Quad Gates	Four-Quad Gates	--	--	--	--
Mill Road	CFP 9.65	--	--	--	--	--	Median Treatment	Median Treatment	Median Treatment	Median Treatment	--	--	--	--
Mountain Road	CFP 8.15	--	--	--	--	--	--	--	--	--	No Action	No Action	No Action	No Action
Hungary Road	CFP 6.59	--	--	--	--	--	--	--	--	--	Grade Separate	Grade Separate	Grade Separate	Grade Separate
Hermitage Road	CFP 5.43	--	--	--	--	--	--	--	--	--	Four-Quad Gates	Four-Quad Gates	Four-Quad Gates	Four-Quad Gates
Jahnke Road	A 0.68	--	--	--	--	--	--	--	--	--	Four-Quad Gates	--	Four-Quad Gates	--
Bassett Avenue	A 1.01	--	--	--	--	--	--	--	--	--	Closure	--	Closure	--
Broad Rock Boulevard	A 3.08	--	--	--	--	--	--	--	--	--	Grade Separate	--	Grade Separate	--
Terminal Avenue	A 3.88	--	--	--	--	--	--	--	--	--	Closure	--	Closure	--
Walmsley Boulevard	A 5.54	--	--	--	--	--	--	--	--	--	Grade Separate	--	Grade Separate	--
Kingsland Road	A 9.37	--	--	--	--	--	--	--	--	--	Median Treatment	--	Median Treatment	--
Thurston Road	A 10.00	--	--	--	--	--	--	--	--	--	Closure	--	Closure	--
Old Lane (A-Line)	A 10.74	--	--	--	--	--	--	--	--	--	Closure	--	Closure	--
Hermitage Road	SRN 3.37	--	--	--	--	--	--	--	--	--	--	Grade Separate	Median Treatment	Median Treatment
Brook Road	SRN 2.34	--	--	--	--	--	--	--	--	--	--	Median Treatment	--	Median Treatment
St James Street	SRN 1.75	--	--	--	--	--	--	--	--	--	--	Closure	--	Closure
N 2nd Street / Valley Road	SRN 1.60	--	--	--	--	--	--	--	--	--	--	Closure	--	Closure
Hospital Street / N 7th Street	SRN 1.24	--	--	--	--	--	--	--	--	--	--	Grade Separate	--	Grade Separate
Maury Street	S 0.78	--	--	--	--	--	--	--	--	--	--	Four-Quad Gates	--	Four-Quad Gates
Goodes Street	S 1.66	--	--	--	--	--	--	--	--	--	--	Four-Quad Gates	--	Four-Quad Gates
E Commerce Road	S 2.98	--	--	--	--	--	--	--	--	--	--	Grade Separate	--	Grade Separate

Table 5-4: Crossing Improvements by Public At-Grade Crossing

Crossing Roadway Name	Mile-post	2A. Add 1 Track	3A. Maintain Existing	3B. Add 1 Track	3C. 2-Track East Bypass	4A. Add 1 Track	5A. Maintain Existing; 5B. Add 1 Track	5A–Ashcake. Maintain Existing; 5B–Ashcake. Add 1 Track; 5D–Ashcake. Center 3 Tracks (ALL - New Station)	5C. 2-Track West Bypass	5C–Ashcake. 2-Track West Bypass (New Station)	6A. Staples Mill Only; 6B–A-Line. Boulevard Rd Only (A-Line); 6E. Split Service	6B–S-Line. Boulevard Rd Only (S-Line)	6C. Broad St Only	6D. Main St Only; 6F. Full Service; 6G. Shared Service
Ruffin Road	S 3.98	--	--	--	--	--	--	--	--	--	--	Median Treatment	--	Median Treatment
Bells Road	S 4.46	--	--	--	--	--	--	--	--	--	--	Median Treatment	--	Median Treatment
Dale Avenue / Trenton Avenue	S 4.98	--	--	--	--	--	--	--	--	--	--	Closure	--	Closure
Kingsland Road	S 9.14	--	--	--	--	--	--	--	--	--	--	Four-Quad Gates	--	Four-Quad Gates
Brinkley Road	S 9.83	--	--	--	--	--	--	--	--	--	--	Closure	--	Closure
Old Lane (S-Line)	A 10.74	--	--	--	--	--	--	--	--	--	--	Closure	--	Closure
Debruen Lane	CFQ 0.53	--	--	--	Median Treatment	--	--	--	--	--	--	--	--	--
Ferry Road	CFQ 1.70	--	--	--	Four-Quad Gates	--	--	--	--	--	--	--	--	--
Federal Drive	CFQ 2.89	--	--	--	Four-Quad Gates	--	--	--	--	--	--	--	--	--
Little Falls Road	CFQ 3.80	--	--	--	Median Treatment	--	--	--	--	--	--	--	--	--
Forest Lane Road	CFQ 4.68	--	--	--	Median Treatment	--	--	--	--	--	--	--	--	--
New (Proposed) Crossings of Public Roadways														
W Leigh Street *(near Myers Street)*	(new)	--	--	--	--	--	--	--	--	--	--	--	Median Treatment	--
W Leigh Street *(near Hermitage Road)*	(new)	--	--	--	--	--	--	--	--	--	--	--	Median Treatment	--
Kings Highway / Route 3	(new)	--	--	--	Grade Separate	--	--	--	--	--	--	--	--	--
Tidewater Trail / Route 17	(new)	--	--	--	Grade Separate	--	--	--	--	--	--	--	--	--
Fredericksburg Turnpike / Route 2	(new)	--	--	--	Grade Separate	--	--	--	--	--	--	--	--	--
Thorton Rolling Road / Route 609	(new)	--	--	--	Grade Separate	--	--	--	--	--	--	--	--	--
Patriot Lane	(new)	--	--	--	Property Take	--	--	--	--	--	--	--	--	--
Washington Highway / Route 1	(new)	--	--	--	--	--	--	--	Grade Separate	Grade Separate	--	--	--	--
Cross Corner Rd / Route 641	(new)	--	--	--	--	--	--	--	Realign	Realign	--	--	--	--
Blunts Bridge Road	(new)	--	--	--	--	--	--	--	Grade Separate	Grade Separate	--	--	--	--

Table 5-4: Crossing Improvements by Public At-Grade Crossing

Crossing Roadway Name	Mile-post	2A. Add 1 Track	3A. Maintain Existing	3B. Add 1 Track	3C. 2-Track East Bypass	4A. Add 1 Track	5A. Maintain Existing; 5B. Add 1 Track	5A–Ashcake. Maintain Existing; 5B–Ashcake. Add 1 Track; 5D–Ashcake. Center 3 Tracks (ALL - New Station)	5C. 2-Track West Bypass	5C–Ashcake. 2-Track West Bypass (New Station)	6A. Staples Mill Only; 6B–A-Line. Boulevard Rd Only (A-Line); 6E. Split Service	6B–S-Line. Boulevard Rd Only (S-Line)	6C. Broad St Only	6D. Main St Only; 6F. Full Service; 6G. Shared Service
Independence Road	(new)	--	--	--	--	--	--	--	Closure	Closure	--	--	--	--
W Patrick Henry Road	(new)	--	--	--	--	--	--	--	Grade Separate	Grade Separate	--	--	--	--
Yowell Road	(new)	--	--	--	--	--	--	--	Grade Separate	Grade Separate	--	--	--	--
Ashcake Road / Route 657	(new)	--	--	--	--	--	--	--	Grade Separate	Grade Separate	--	--	--	--
Elmont Road / Route 626	(new)	--	--	--	--	--	--	--	Grade Separate	Grade Separate	--	--	--	--

"Crossing Closure" can include construction of a new roadway connector to provide access. "Median Treatment" can include raised medians (new or extension of existing raised medians) or mountable raised curbs with vertical median tubes, with gates. "No action" includes: existing crossings with existing treatment that meets the DC2RVA criteria; existing crossings that are not affected by the Build Alternative (bypass alignments only); or new crossings of public roadways that do not require an action due to property acquisition (bypass alignments).

Build Alternative 2A includes the proposed improvement of four-quadrant gates at Potomac Avenue, if not installed by others as part of the Powell's Creek – Arkendale improvements.

There are no existing public at-grade crossings in Alternative Area 1 Arlington.

All crossings may require minor safety and/or geometric improvements related to the construction of the Build Alternative (i.e., moving existing gates to accommodate the proposed track).

This table does not include potential effects to other, non-crossing roadways that may be required as part of the Build Alternative.

5.2.3.2 Crossing Improvements at Private At-Grade Crossings

This section presents the crossing improvements at the existing at-grade private crossings as well as new crossings (where there is no existing crossing) of private roadways in the DC2RVA corridor, which occur in the bypass alignments of the city of Fredericksburg and the town of Ashland.

A summary of total type of crossing improvement for each Build Alternative is provided in Table 5-5 below. These crossing improvements are detailed by crossing roadway in Table 5-6 as well as Figure 5-14 through Figure 5-18. Any area that is not included in these figures means that no private at-grade crossings are proposed as part of the DC2RVA Project within that area.

As the data shows, the majority of the existing private at-grade crossings are proposed to have locking gates in all Build Alternatives, unless alternate access can be provided. Four-quadrant gates are proposed at private crossing locations where site-specific safety, geometric, and/or operating conditions were determined to preclude use of locking gates. The proposed crossing improvements do not vary by crossing; the proposed improvement at a specific roadway crossing is the same across all Build Alternatives for which that roadway crossing is implemented.

Table 5-5: Summary of Crossing Improvements at Existing Private At-Grade Crossings

Alternative Area	Alternative	Description	Proposed Crossing Improvement				New Crossings[2]	Total
			Crossing Closure	Four-Quadrant Gates	Locking Gate	No Action Required[1]		
Arlington	1A, 1B, and 1C	Add 2 Tracks East, Add 2 Tracks West, and Add 1 Track East & West	0	0	0	0	0	0
Northern Virginia	2A	Add 1 Track	0	3	1	1	0	5
Fredericksburg	3A, and 3B	Maintain Existing, and Add 1 Track	0	0	0	0	0	0
	3C	2-Track East Bypass	1	0	4	0	4	9
Central Virginia	4A	Add 1 Track	0	0	10	0	0	10
Ashland	5A, 5A–Ashcake, 5B, 5B–Ashcake, and 5D–Ashcake	Maintain Existing, Maintain Existing (New Station), Add 1 Track, Add 1 Track (New Station), and Center 3 Tracks (New Station)	0	0	0	0	0	0
	5C, and 5C–Ashcake	2-Track West Bypass, and 2-Track West Bypass (New Station)	0	0	0	0	7	7
Richmond	6A, 6B–A-Line, 6C, and 6E	Staples Mill Only, Boulevard Rd Only (A-Line), Broad St Only, and Split Service	0	0	0	0	0	0
	6B–S-Line, 6D, 6F, and 6G	Boulevard Rd Only (S-Line), Main St Only, Full Service, and Shared Service	0	2	2	0	0	4

[1] "No action required" in the above table includes: existing crossings with existing treatment that meets the DC2RVA criteria; or new crossings of public roadways that do not require an action due to property acquisition or alternate access (bypass alignments).

[2] "New Crossings" in the above table are provided as a summary total for reference, and include crossings that would be closed or consolidated with adjacent crossings or due to property acquisitions; or realigned.

All crossings may require minor safety and/or geometric improvements related to the construction of the Build Alternative (i.e., moving existing gates to accommodate the proposed track.

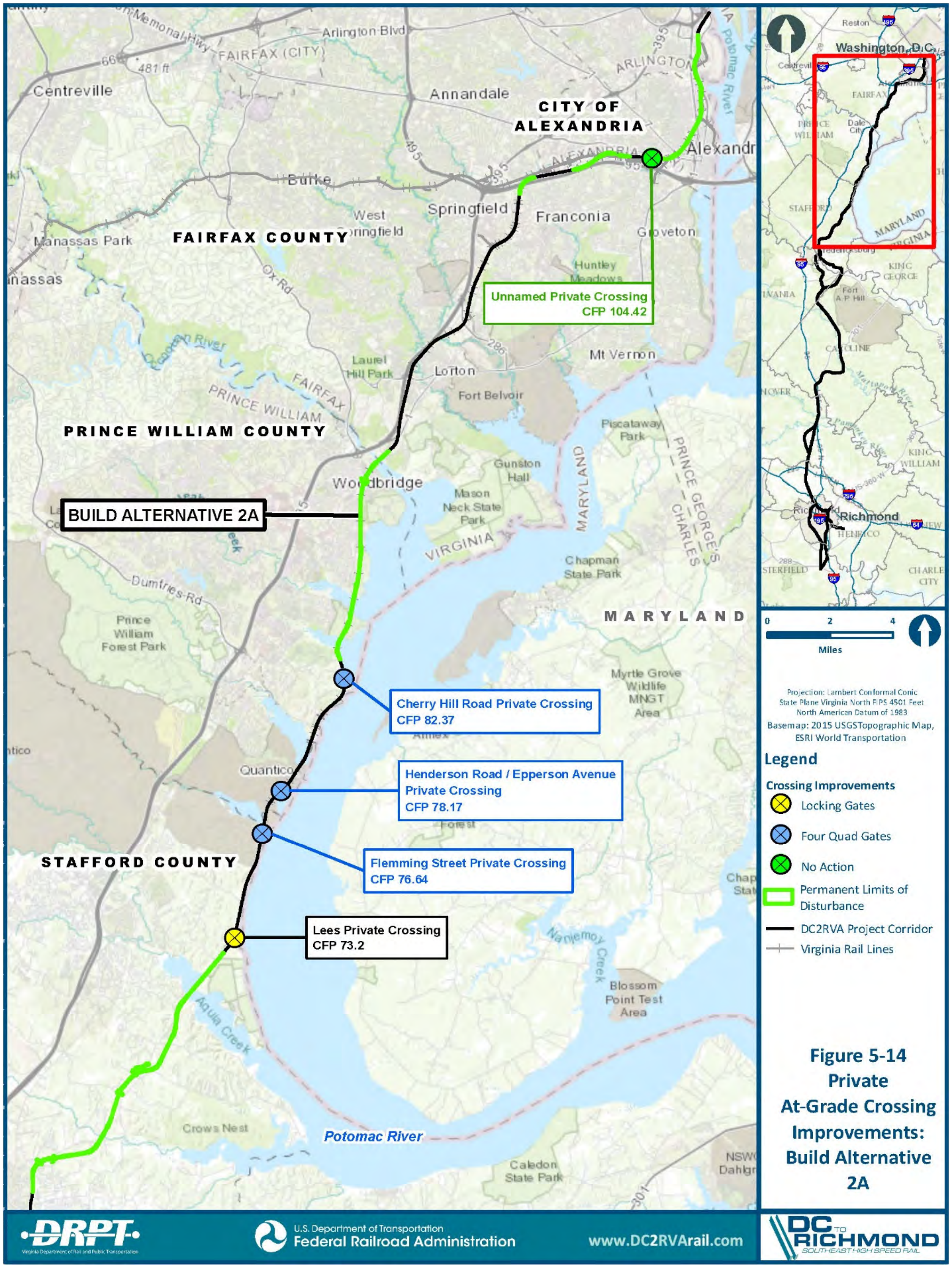

Figure 5-14 Private At-Grade Crossing Improvements: Build Alternative 2A

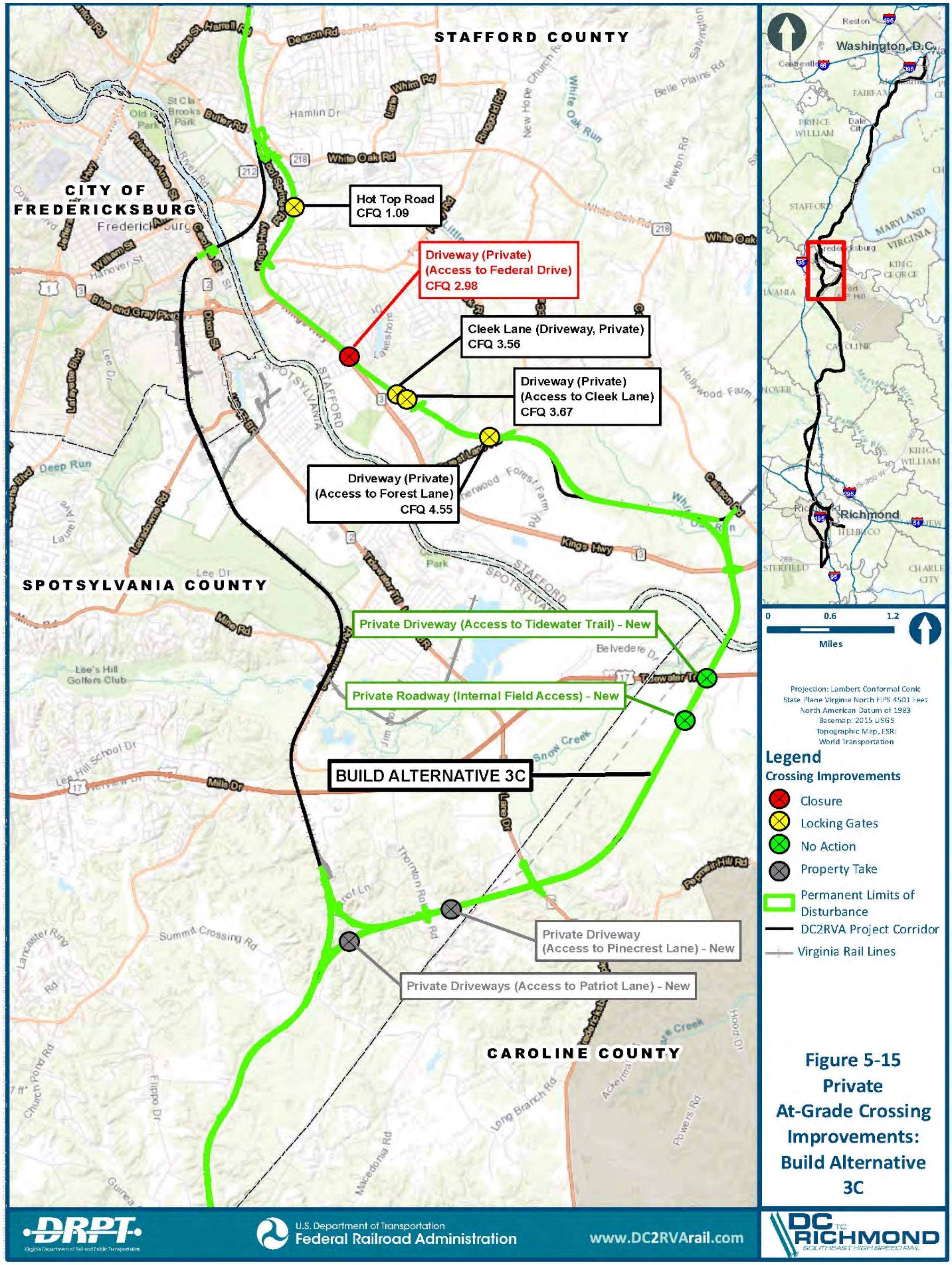

Figure 5-15 Private At-Grade Crossing Improvements: Build Alternative 3C

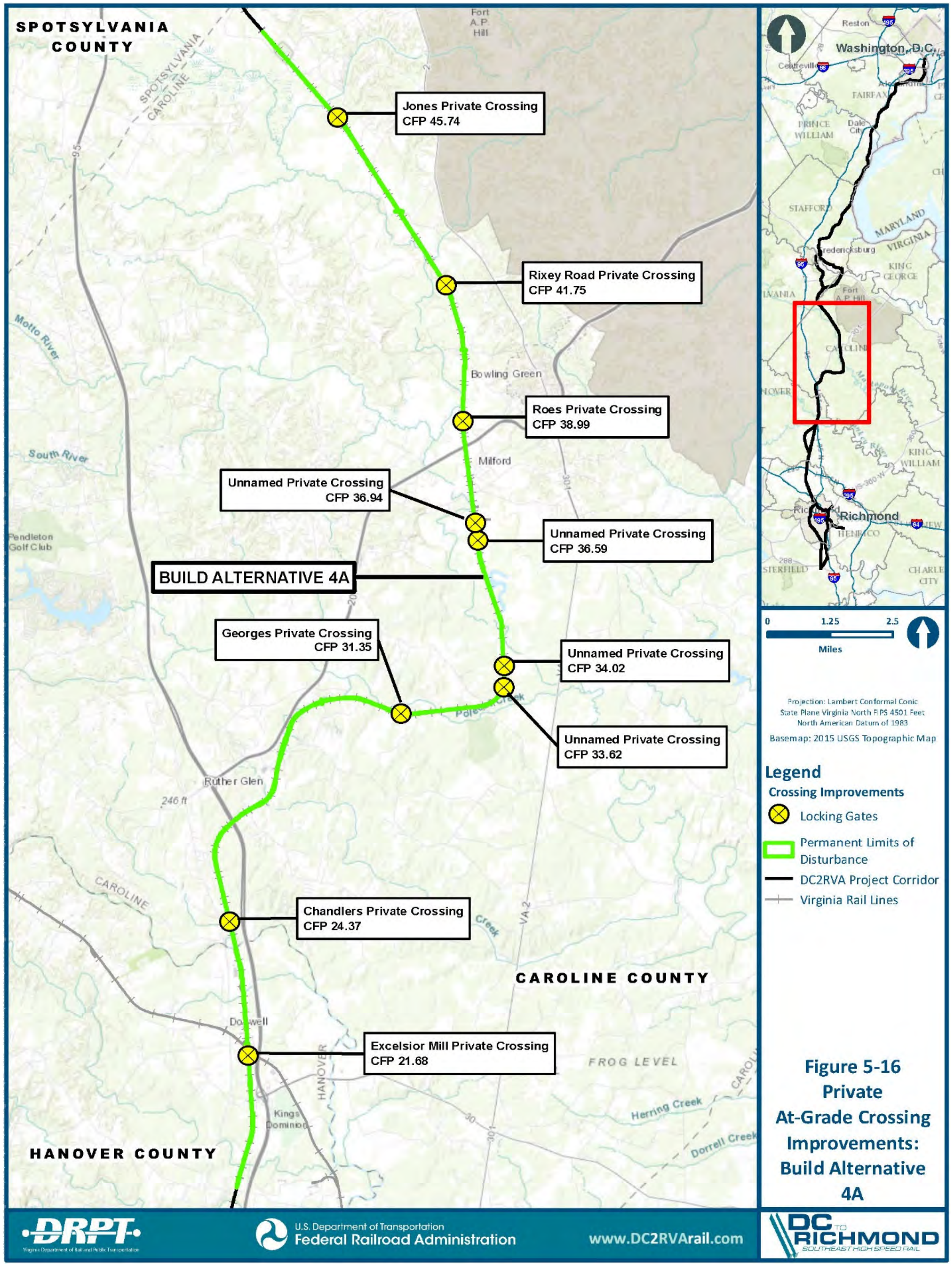

Figure 5-16
Private
At-Grade Crossing
Improvements:
Build Alternative
4A

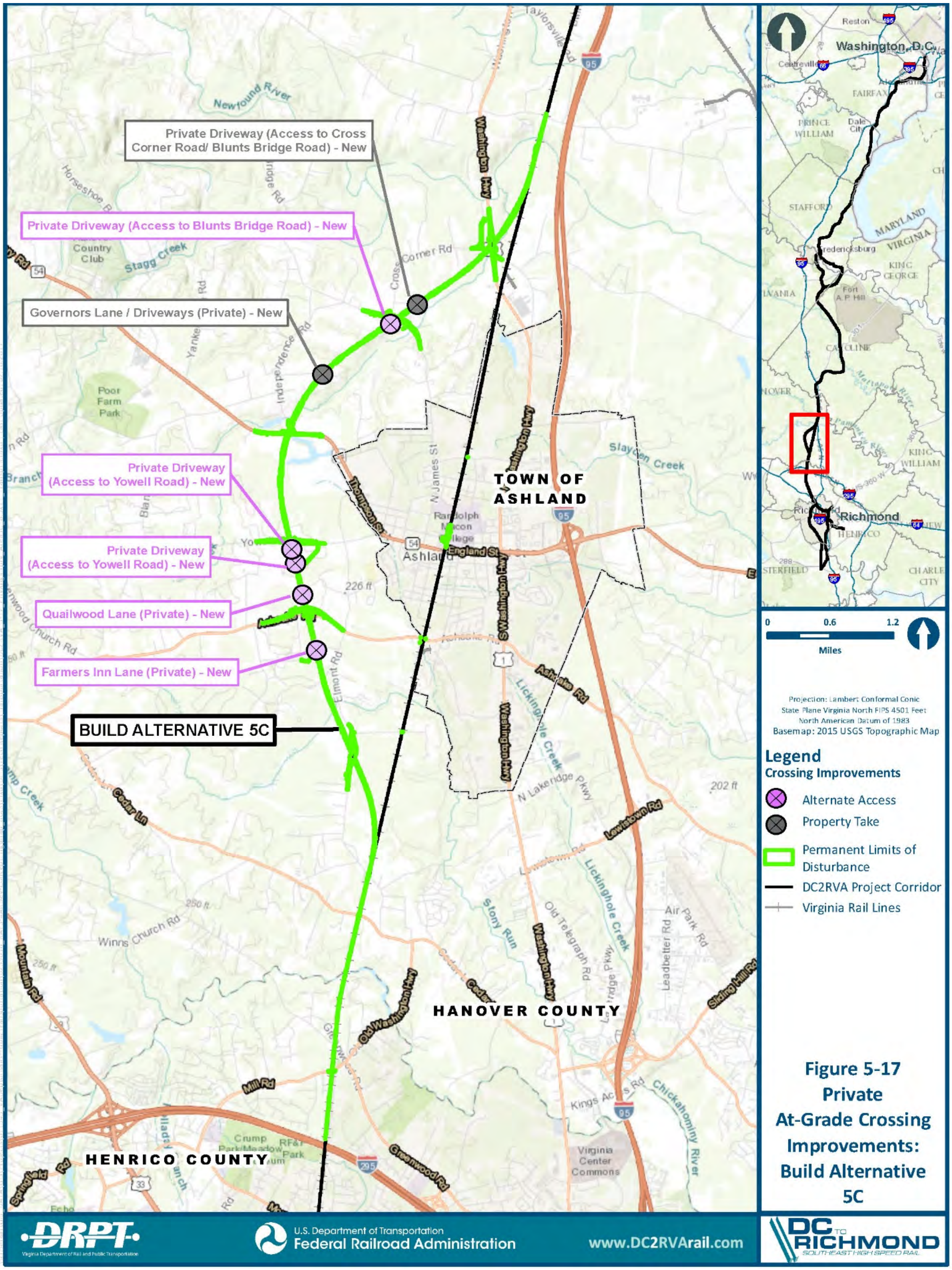

Figure 5-17 Private At-Grade Crossing Improvements: Build Alternative 5C

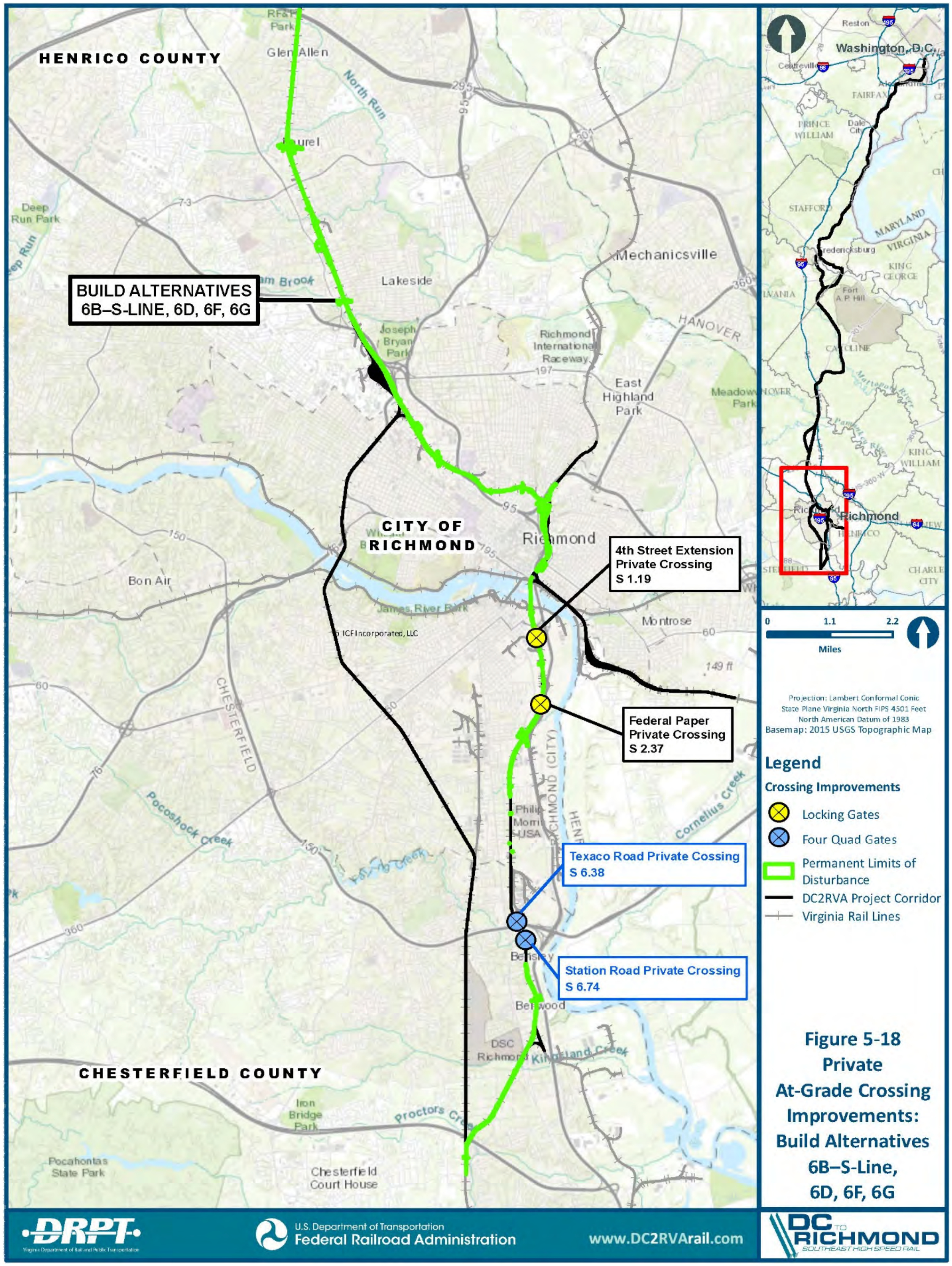

Figure 5-18 Private At-Grade Crossing Improvements: Build Alternatives 6B–S-Line, 6D, 6F, 6G

Table 5-6: Crossing Improvements by Private At-Grade Crossing

Alternative Area/Build Alternative	Crossing Roadway Name	Milepost	Jurisdiction	Crossing Improvement
Area 1	*There are no private at-grade crossings in this area.*			
Area 2: 2A. Add 1 Track	Unnamed Private Crossing	CFP 104.42	Alexandria City	No action
	Cherry Hill Road Private Crossing	CFP 82.37	Prince William County	Four-Quad Gates
	Henderson Road / Epperson Avenue Private Crossing	CFP 78.17	Prince William County	Four-Quad Gates
	Flemming Street Private Crossing	CFP 76.64	Stafford County	Four-Quad Gates
	Lees Private Crossing	CFP 73.20	Stafford County	Locking Gate
Area 3:[1] 3C. 2-Track East Bypass	Hot Top Road	CFQ 1.09	Stafford County	Locking Gate
	Driveway (Private) (Access to Federal Drive)	CFQ 2.98	Stafford County	Closure
	Cleek Lane (Driveway, Private)	CFQ 3.56	Stafford County	Locking Gate
	Driveway (Private) (Access to Cleek Lane)	CFQ 3.67	Stafford County	Locking Gate
	Driveway (Private) (Access to Forest Lane)	CFQ 4.55	Stafford County	Locking Gate
	Private Driveway (Access to Tidewater Trail)	(new)	Spotsylvania County	No action
	Private Roadway (Internal Field Access)	(new)	Caroline County	No action
	Private Driveway (Access to Pinecrest Lane)	(new)	Spotsylvania County	Property Take
	Private Driveways (Access to Patriot Lane)	(new)	Spotsylvania County	Property Take
Area 4: 4A. Add 1 Track	Jones Private Crossing	CFP 45.74	Caroline County	Locking Gate
	Rixey Road Private Crossing	CFP 41.75	Caroline County	Locking Gate
	Roes Private Crossing	CFP 38.99	Caroline County	Locking Gate
	Unnamed Private Crossing	CFP 36.94	Caroline County	Locking Gate
	Unnamed Private Crossing	CFP 36.59	Caroline County	Locking Gate
	Unnamed Private Crossing	CFP 34.02	Caroline County	Locking Gate
	Unnamed Private Crossing	CFP 33.62	Caroline County	Locking Gate
	Georges Private Crossing	CFP 31.35	Caroline County	Locking Gate
	Chandlers Private Crossing	CFP 24.37	Caroline County	Locking Gate
	Excelsior Mill Private Crossing	CFP 21.68	Hanover County	Locking Gate
Area 5:[2] 5C. 2-Track West Bypass;	Private Driveway (Access to Cross Corner Road / Blunts Bridge Road)	(new)	Hanover County	Property Take
	Private Driveway (Access to Blunts Bridge Road)	(new)	Hanover County	Alternate access

Table 5-6: Crossing Improvements by Private At-Grade Crossing

Alternative Area/Build Alternative	Crossing Roadway Name	Milepost	Jurisdiction	Crossing Improvement
5C–Ashcake. 2-Track West Bypass (New Station)	Governors Lane / Driveways (Private)	(new)	Hanover County	Property Take
	Private Driveway (Access to Yowell Road)	(new)	Hanover County	Alternate access
	Private Driveway (Access to Yowell Road)	(new)	Hanover County	Alternate access
	Quailwood Lane (Private)	(new)	Hanover County	Alternate access
	Farmers Inn Lane (Private)	(new)	Hanover County	Alternate access
Area 6:[3] 6B–S-Line. Boulevard Rd Only (S-Line); 6D. Main St Only; 6F. Full Service; 6G. Shared Service	4th Street Extension Private Crossing	S 1.19	Richmond	Locking Gate
	Federal Paper Private Crossing	S 2.37	Richmond	Locking Gate
	Texaco Road Private Crossing	S 6.38	Chesterfield County	Four-Quad Gate
	Station Road Private Crossing	S 6.74	Chesterfield County	Four-Quad Gate

[1] There are no private at-grade crossings within Build Alternatives 3A or 3B.
[2] There are no private at-grade crossings within Build Alternatives 5A, 5B, 5D–Ashcake, 5A–Ashcake, or 5B–Ashcake.
[3] There are no private at-grade crossings within for Build Alternatives 6A, 6B–A-Line, 6C, or 6E.

5.2.3.3 Crossing Improvements at Existing Grade-Separated Crossings

All existing grade-separated crossings (both public and private) in the rail corridor would be maintained as part of all Build Alternative designs. The proposed crossing improvements at the existing grade-separated crossings are one of the following:

- No action required (i.e., the existing structure is sufficient to accommodate the DC2RVA Project)
- Extend the existing structure (i.e., widen either roadway structure for roadway overpasses or rail structure for roadway underpasses)
- Build a new structure

The above three types of crossing improvements are functionally equivalent as the existing operations of the crossing roadway (i.e., the number and type of lanes) are not modified as part of the Build Alternative design.

5.2.3.4 Build Alternative Improvements, Other (Non-Crossing) Roadways

In addition to the highway-rail crossing roadways, two non-crossing public roadways that run parallel to and generally adjacent to the railroad tracks are included the Build Alternative improvements, as follows.

- The Build Alternatives that include the addition of a third track through town (Build Alternatives 5B, 5B-Ashcake, and 5D-Ashcake) require the closure of the eastern section of Railroad Avenue / Center Street between England / Thompson Street and Maiden Lane. At this location Railroad Avenue / Center Street[26] runs adjacent and parallel to the railroad tracks within the Town of Ashland. The portion of Railroad Avenue / Center Street on the eastern side of the rail corridor between England / Thompson Street and Maiden Lane conflicts with the addition of the third track. All other portions of Railroad Avenue / Center Street, on either side of the rail corridor with in the Town of Ashland, would be realigned as required, to accommodate the design of the Build conditions, and would remain open to traffic after completion of construction.
- The proposed additional track through the Richmond area conflicts with one public roadway that is located adjacent and parallel to the railroad tracks. Dalebrook Drive from Bellbluff Drive to southern terminus of Dalebrook Drive would be required to be realigned without change to existing operations as part of all Build Alternatives.

5.2.3.5 Summary of Proposed Public Roadway Closures and Grade Separations

For ease of reference, a summary of the public roadway improvements that are proposed as part of each Build Alternative are provided here. Unless specified below, all other public roadway crossings would either maintain the existing at-grade condition with crossing improvements of either four-quadrant gates or median treatment with gates, or do not require any action.

Summary Alternative Area 1 (Arlington): There are no public roadway closures or grade separations within Area 1 as part of any Build Alternative.

Summary Alternative Area 2 (Northern Virginia): There are no grade separations proposed within the single Build Alternative 2A. One closure is proposed at the Mount Hope Church Road crossing.

Summary Alternative Area 3 (Fredericksburg): As shown in Table 5-7, there are no proposed public roadway closures through Fredericksburg. One grade separation is proposed at Landsdowne Road in Build Alternative 3B only.

Table 5-7: Public Roadway Closures and Grade Separations in Fredericksburg

	3A. Maintain Existing	3B. Add 1 Track	3C. 2-Track East Bypass
Grade Separate Landsdowne Road		✓	

This table only shows the proposed improvements of grade separation and closure for public roadways.

Summary Alternative Area 4 (Central Virginia): There are no proposed grade separations within the single Build Alternative 4A. One closure is proposed at the Colemans Mill Road crossing.

Summary Alternative Area 5 (Ashland): As shown in Table 5-8, each Build Alternative in Ashland contains some combination of 4 closures and separations:

- All Build Alternatives except for the Ashland Bypass (Build Alternatives 5C and 5C-Ashcake) will require two grade separations as part of this project: the West Vaughan Road crossing and the Ashcake Road crossing.
- All Build Alternatives that include station platform improvements at the existing station location within town require one roadway crossing closure at College Avenue crossing to accommodate the platform improvements at the existing station.
- The Build Alternatives that include the addition of a third track through town (Build Alternatives 5B, 5B-Ashcake, and 5D-Ashcake) require the closure of the eastern section of Center Street / Railroad Avenue between England / Thompson Street and Maiden Lane.
- The Ashland Bypass (Build Alternatives 5C and 5C-Ashcake) will require one roadway closure at Independence Road.

Table 5-8: Public Roadway Closures and Grade Separations in Ashland

	5A. Maintain Existing	5A–Ashcake. Maintain Existing (New Station)	5B. Add 1 Track	5B–Ashcake. Add 1 Track (New Station)	5C. 2-Track West Bypass	5C–Ashcake. 2-Track West Bypass (New Station)	5D–Ashcake. Center 3 Tracks (New Station)
Grade Separate W Vaughan Crossing	✓	✓	✓	✓			✓
Grade Separate Ashcake Crossing	✓	✓	✓	✓			✓
Close College Avenue Crossing	✓		✓		✓		
Close Portion of Center Street*			✓	✓			✓

**Closed South of Center England Street to Maiden Lane, West Side of Tracks Only*

This table only shows the proposed improvements of grade separation and closure for existing public roadways.

Summary Alternative Area 6 (Richmond): As shown in Table 5-9, each Build Alternative in Richmond contains some combination of the following closures and grade separations, the need for which is driven by the at-grade crossing evaluation that was completed by DRPT as part of this project (refer to Section 5.2.2 above):

- All Build Alternatives grade separate Hungary Road near Staples Mill Road Station and close Old Lane near the junction of the CSXT A-Line and S-Line at Centralia.
- All Build Alternatives that use the A-Line close Bassett Avenue, Terminal Avenue, and Thurston Road, and grade separate Broad Rock Boulevard and Walmsley Boulevard.
- All Build Alternatives that use the S-Line close St James Street, N 2nd Street / Valley Road, Dale / Trenton Avenue, and Brinkley Road, and grade separate Hospital Street and E Commerce Drive.
- Build Alternative 6B–S-Line grade separates the S-Line crossing of Hermitage Road, which is proposed for safety considerations due to proximity to Boulevard Road Station.

Table 5-9: Public Roadway Closures and Grade Separations in Richmond

	6A. Staples Mill Only	6B–A-Line. Boulevard Rd Only (A-Line)	6B–S-Line. Boulevard Rd Only (S-Line)	6C. Broad St Only	6D. Main St Only	6E. Split Service	6F. Full Service	6G. Shared Service
Grade Separate Hungary Road	✓	✓	✓	✓	✓	✓	✓	✓
Close Bassett Avenue	✓	✓		✓		✓		
Grade Separate Broad Rock Boulevard	✓	✓		✓		✓		
Close Terminal Avenue	✓	✓		✓		✓		
Grade Separate Walmsley Boulevard	✓	✓		✓		✓		
Close Thurston Road	✓	✓		✓		✓		
Close Old Lane	✓	✓	✓	✓	✓	✓	✓	✓
Grade Separate Hermitage Road (S-Line Crossing)			✓					
Close St James Street			✓		✓		✓	✓
Close N 2nd Street / Valley Road			✓		✓		✓	✓
Grade Separate Hospital Street			✓		✓		✓	✓
Grade Separate E Commerce Road			✓		✓		✓	✓
Close Dale / Trenton Avenue			✓		✓		✓	✓
Close Brinkley Road			✓		✓		✓	✓

This table only shows the proposed improvements of grade separation and closure for existing public roadways.

5.3 BUILD ALTERNATIVE EFFECTS ON TRANSPORTATION NETWORK

This section identifies potential effects that the proposed Build Alternatives would have on the overall transportation network. The purpose of this analysis is to qualitatively identify locations where existing accessibility and connectivity of the roadway network may be affected by the DC2RVA Project as compared to the No Build condition. These locations will be moved forward for further quantitative analysis (refer to Section 5.4.).

5.3.1 Methodology for Determining Effects of Crossing Improvements on Transportation Network

The effects from the DC2RVA Project on existing roadway network accessibility and connectivity were visually identified using the Conceptual Engineering design for each roadway crossing as developed by the DRPT team for this project on aerial mapping imagery. The purpose of this analysis was to identify which elements of the proposed Build Alternative designs would have an effect on the existing transportation network, thus requiring further traffic operations analysis. The following assumptions were used during this identification process:

- Accessibility and connectivity to public roadways and private property driveways and access were considered.
- The identification was conducted per highway-rail crossing; however, both the crossing roadway and adjacent connecting roadway network within the limits of disturbance were evaluated, including non-crossing roadways that are adjacent to the rail corridor as well as roadways that are adjacent to station improvements.
- The determination of "No effect” is defined as follows:
  - No increases or decreases to carrying capacity of public roadways.
  - All existing movements, number of lanes, and configuration of lanes on the crossing roadway are maintained (i.e., a realigned intersection can qualify as “no effect”).
  - All existing parcel access would be maintained, unless the design requires a full property acquisition, for which a determination of “no effect” to the transportation network would be made.
- “No effect” does not preclude minor changes to location of any access points within the same property, if needed to facilitate design and construction of the project. For properties with existing access to the crossing roadway, if at least one access to that property area is maintained, the “no effect” is considered feasible.
- For purposes of this evaluation, the crossing condition of the No Build is assumed to be equivalent to the existing condition.

The “no effect” identification at the locations described in this section is intended to indicate that the effects of the proposed DC2RVA actions would not reduce roadway operations as compared to the No Build alternative. Additionally, the two new W Leigh Street at-grade crossings (near Myers Street and near Hermitage Road) are identified as having “no effect” to the connectivity of the transportation network as all existing movements are maintained in the design. This is not intended to indicate that there would be no effects to vehicles if a new crossing is implemented; refer to Section 5.5 for the daily vehicle delay analysis.

5.3.2 Network Effects of Improvements at Public At-Grade Crossings (including Adjacent Public Roadways)

Table 5-10 below presents the project effects on the transportation network that was identified at each public at-grade crossing in the corridor for each Build Alternative; the table includes new proposed crossings of public roadways as well as non-crossing roadways that are adjacent to the corridor that were affected. For ease of reference, the proposed improvements that were identified as having a potential effect on existing roadway connectivity and accessibility are highlighted in gray text within the table.

5.3.2.1 Closure Effects on Transportation Network

The crossing improvements that are anticipated to have the greatest effect on the existing accessibility and connectivity of the transportation network are related to either closures of existing public at-grade highway-rail crossings or closures of public roadways located adjacent and parallel to the railroad tracks that are required due to other improvements. Closing an existing traffic movement requires a permanent detour of vehicular traffic. This permanent detour not only affects the vehicles that are making the detour, but also, to some degree, the traffic operations and vehicles along the alternate route. The effects of this diverted traffic, therefore, warrants further analysis.

There are 14 public roadway closures within the different Build Alternatives that were identified as having a potential effect and, therefore, warranted further analysis are summarized below:

- Mount Hope Church Road crossing, Stafford County: Build Alternative 2A
- Colemans Mill Road crossing, Caroline County: Build Alternative 4A
- College Avenue / Henry Clay Road crossing, Town of Ashland: Build Alternatives 5A, 5B, and 5C
- Railroad Avenue / Center Street between England Street and Maiden Lane, Town of Ashland: Build Alternatives 5B, 5B–Ashcake, and 5D–Ashcake
- Independence Road intersection with W Patrick Henry Road, Hanover County: Build Alternatives 5C and 5C–Ashcake
- Bassett Avenue crossing, City of Richmond: Build Alternatives 6A, 6B–A-Line, 6C, and 6E
- Terminal Avenue crossing, City of Richmond: Build Alternatives 6A, 6B–A-Line, 6C, and 6E
- Thurston Road crossing, Chesterfield County: Build Alternatives 6A, 6B–A-Line, 6C, and 6E
- Brinkley Road crossing, Chesterfield County: Build Alternatives 6B–S-Line, 6D, 6F, and 6G
- Old Lane crossing, Chesterfield County: All Richmond Area Build Alternatives
- Ownby Lane intersection with Hermitage Road, City of Richmond: Build Alternative 6B–S-Line
- St James Street crossing, City of Richmond: Build Alternatives 6B–S-Line, 6D, 6F, and 6G

- N 2nd Street/Valley Road crossing, City of Richmond: Build Alternatives 6B–S-Line, 6D, 6F, and 6G
- Dale Avenue/Trenton Avenue crossing, City of Richmond: Build Alternatives 6B–S-Line, 6D, 6F, and G

The closure locations are included on Figures 5-1 through 5-13. Refer to Section 5.4 for details on the closure diversion analysis that was completed for each location.

5.3.2.2 Grade Separation and Crossing Treatment Effects on Transportation Network

After review of all highway-rail crossings, the proposed crossing improvements of grade separation and crossing treatment improvements (a more general category under which median treatment and four-quadrant gates can be categorized) are expected to have minimal effect on existing accessibility and connectivity of the transportation network as part of any Build Alternative of the DC2RVA Project. The designs of all proposed grade separations and crossing treatment improvements of existing at-grade crossings maintain the existing functional characteristics of the crossing roadway, including number and type of roadway lanes. Improvements associated with the Build Alternatives sought to address potential adverse effects on traffic circulation through implementation of grade separations.

Table 5-10: Build Alternative Effects on the Transportation Network: Public At-Grade Crossings

Crossing Roadway	Existing, No Build		Proposed Action / Effect on Transportation Network		
ARLINGTON (LONG BRIDGE APPROACH) (Area 1)					
There are no public at-grade crossings in this area.					
NORTHERN VIRGINIA (Area 2)					
		Build Alternative:	**2A. Add 1 Track**		
Featherstone Road	Four-Quadrant Gates	*Action:*	No action		
		Effect:	No roadway effect		
Potomac Avenue	Non-Quad Gates	*Action:*	Install Four-Quadrant Gates with pedestrian protection *(if not part of Arkendale to Powell's Creek project)*		
		Effect:	No roadway effect		
Brent Point Road	Non-Quad Gates	*Action:*	Install Four-Quadrant Gates		
		Effect:	No roadway effect		
Mount Hope Church Road	Non-Quad Gates	*Action:*	Close Crossing; Construct connecting roadway to Andrew Chapel / Brooke Road		
		Effect:	**Traffic Detour Required**		
FREDERICKSBURG AREA (Area 3)					
		Build Alternative:	**3A. Maintain Existing**	**3B. Add 1 Track**	**3C. 2-Track East Bypass**
Landsdowne Road	Non-Quad Gates	*Action:*	Install Four-Quadrant Gates	Grade Separate Crossing	Install Four-Quadrant Gates
		Effect:	No roadway effect	Roadway Overpass; No roadway effect	No roadway effect
Mine Road	Non-Quad Gates	*Action:*	Install Four-Quadrant Gates	Install Four-Quadrant Gates	Install Four-Quadrant Gates
		Effect:	No roadway effect	No roadway effect	No roadway effect
Summit Crossing Road	Non-Quad Gates	*Action:*	Install Four-Quadrant Gates	Install Four-Quadrant Gates	Install Four-Quadrant Gates
		Effect:	No roadway effect	No roadway effect	No roadway effect
Claiborne Crossing Road	Non-Quad Gates	*Action:*	Install Median Treatment	Install Median Treatment	Install Median Treatment
		Effect:	No roadway effect	No roadway effect	No roadway effect
Debruen Lane	Non-Quad Gates	*Action:*	*Not Applicable*	*Not Applicable*	Install Median Treatment
		Effect:			No roadway effect
Ferry Road	Non-Quad Gates	*Action:*	*Not Applicable*	*Not Applicable*	Install Four-Quadrant Gates with Intersection Realignment
		Effect:			No roadway effect
Federal Drive	Non-Quad Gates	*Action:*	*Not Applicable*	*Not Applicable*	Install Four-Quadrant Gates
		Effect:			No roadway effect
Little Falls Road	Flashing Signal	*Action:*	*Not Applicable*	*Not Applicable*	Install Gates with Median Treatment
		Effect:			No roadway effect

Table 5-10: Build Alternative Effects on the Transportation Network: Public At-Grade Crossings

Crossing Roadway	Existing, No Build	Proposed Action / Effect on Transportation Network			
Forest Lane Road	Flashing Signal	*Action:*	*Not Applicable*	*Not Applicable*	Install Gates with Median Treatment
		Effect:			No roadway effect
Kings Highway / Route 3	No Existing Crossing	*Action:*	*Not Applicable*	*Not Applicable*	Grade Separate (required per VA Code)
		Effect:			Roadway Overpass; No roadway effect
Tidewater Trail / Route 17	No Existing Crossing	*Action:*	*Not Applicable*	*Not Applicable*	Grade Separate (required per VA Code)
		Effect:			Roadway Underpass; No roadway effect
Fredericksburg Turnpike / Route 2	No Existing Crossing	*Action:*	*Not Applicable*	*Not Applicable*	Grade Separate (required per VA Code)
		Effect:			Roadway Overpass; No roadway effect
Thorton Rolling Road / Route 609	No Existing Crossing	*Action:*	*Not Applicable*	*Not Applicable*	Grade Separate (required per VA Code)
		Effect:			Roadway Overpass; No roadway effect
Patriot Lane	No Existing Crossing	*Action:*	*Not Applicable*	*Not Applicable*	Cul-de-sac roadway (Property Take)
		Effect:			No roadway effect
CENTRAL VIRGINIA (Area 4)					
		Build Alternative:	**4A. Add 1 Track**		
Stonewall Jackson Road	Non-Quad Gates	*Action:*	Install Four-Quadrant Gates		
		Effect:	No roadway effect		
Woodford Road	Non-Quad Gates	*Action:*	Install Four-Quadrant Gates		
		Effect:	No roadway effect		
Woodslane Road	Non-Quad Gates	*Action:*	Install Median Treatment		
		Effect:	No roadway effect		
Paige Road	Non-Quad Gates	*Action:*	Install Median Treatment		
		Effect:	No roadway effect		
Penola Road	Non-Quad Gates	*Action:*	Install Four-Quadrant Gates		
		Effect:	No roadway effect		
Colemans Mill Road	Non-Quad Gates	*Action:*	Close Crossing (Consolidate with Dry Bridge Road Crossing)		
		Effect:	**Traffic Detour Required**		
Doswell Road	Non-Quad Gates	*Action:*	Install Four-Quadrant Gates		
		Effect:	No roadway effect		

Table 5-10: Build Alternative Effects on the Transportation Network: Public At-Grade Crossings

Crossing Roadway	Existing, No Build		Proposed Action / Effect on Transportation Network						
ASHLAND AREA (Area 5)									
		Build Alternative:	**5A. Maintain Existing**	**5A–Ashcake. Maintain Existing (New Station)**	**5B. Add 1 Track**	**5B–Ashcake. Add 1 Track (New Station)**	**5C. 2-Track West Bypass**	**5C–Ashcake. 2-Track West Bypass (New Station)**	**5D–Ashcake. Center 3 Tracks (New Station)**
W Vaughan Road / Henry Street	Non-Quad Gates	*Action:*	Grade Separate Crossing	Grade Separate Crossing	Grade Separate Crossing	Grade Separate Crossing	Install Four-Quadrant Gates	Install Four-Quadrant Gates	Grade Separate Crossing
		Effect:	Roadway Overpass; No roadway effect	Roadway Overpass; No roadway effect	Roadway Overpass; No roadway effect	Roadway Overpass; No roadway effect	No roadway effect	No roadway effect	Roadway Overpass; No roadway effect
W Patrick Street	Non-Quad Gates	*Action:*	Install Four-Quadrant Gates	Install Four-Quadrant Gates	Install Four-Quadrant Gates	Install Four-Quadrant Gates	Install Four-Quadrant Gates	Install Four-Quadrant Gates	Install Four-Quadrant Gates
		Effect:	No roadway effect	No roadway effect	No roadway effect	No roadway effect	No roadway effect	No roadway effect	No roadway effect
College Avenue / Henry Clay Street	Non-Quad Gates	*Action:*	Close Crossing (Station Platform Improvements)	Install Four-Quadrant Gates	Close Crossing (Station Platform Improvements)	Install Four-Quadrant Gates	Close Crossing (Station Platform Improvements)	Install Four-Quadrant Gates	Install Four-Quadrant Gates
		Effect:	**Traffic Detour Required**	No roadway effect	**Traffic Detour Required**	No roadway effect	**Traffic Detour Required**	No roadway effect	No roadway effect
England Street / Thompson Street	Non-Quad Gates	*Action:*	Install Four-Quadrant Gates	Install Four-Quadrant Gates	Install Four-Quadrant Gates	Install Four-Quadrant Gates	Install Four-Quadrant Gates	Install Four-Quadrant Gates	Install Four-Quadrant Gates
		Effect:	No roadway effect	No roadway effect	No roadway effect	No roadway effect	No roadway effect	No roadway effect	No roadway effect
Myrtle Street	Non-Quad Gates	*Action:*	Install Four-Quadrant Gates	Install Four-Quadrant Gates	Install Four-Quadrant Gates	Install Four-Quadrant Gates	Install Four-Quadrant Gates	Install Four-Quadrant Gates	Install Four-Quadrant Gates
		Effect:	No roadway effect	No roadway effect	No roadway effect	No roadway effect	No roadway effect	No roadway effect	No roadway effect
E Francis Street	Non-Quad Gates	*Action:*	Install Four-Quadrant Gates	Install Four-Quadrant Gates	Install Four-Quadrant Gates	Install Four-Quadrant Gates	Install Four-Quadrant Gates	Install Four-Quadrant Gates	Install Four-Quadrant Gates
		Effect:	No roadway effect	No roadway effect	No roadway effect	No roadway effect	No roadway effect	No roadway effect	No roadway effect
Ashcake Road	Non-Quad Gates	*Action:*	Grade Separate Crossing	Grade Separate Crossing	Grade Separate Crossing	Grade Separate Crossing	Install Four-Quadrant Gates	Install Four-Quadrant Gates	Grade Separate Crossing
		Effect:	Roadway Overpass; No roadway effect	Roadway Overpass; No roadway effect	Roadway Overpass; No roadway effect	Roadway Overpass; No roadway effect	No roadway effect	No roadway effect	Roadway Overpass; No roadway effect
Non-Crossing Roadway: Center Street (east side), England St to Maiden Lane		*Action:*	*Not Applicable*	*Not Applicable*	Close Crossing (Conflicts with 3rd track require closure)	Close Crossing (Conflicts with 3rd track require closure)	*Not Applicable*	*Not Applicable*	Close Crossing (Conflicts with 3rd track require closure)
		Effect:			**Traffic Detour Required**	**Traffic Detour Required**			**Traffic Detour Required**
Gwathmey Church Road	Non-Quad Gates	*Action:*	Install Four-Quadrant Gates	Install Four-Quadrant Gates	Install Four-Quadrant Gates	Install Four-Quadrant Gates	Install Four-Quadrant Gates	Install Four-Quadrant Gates	Install Four-Quadrant Gates
		Effect:	No roadway effect	No roadway effect	No roadway effect	No roadway effect	No roadway effect	No roadway effect	No roadway effect
Elmont Road	Non-Quad Gates	*Action:*	Install Four-Quadrant Gates	Install Four-Quadrant Gates	Install Four-Quadrant Gates	Install Four-Quadrant Gates	Install Four-Quadrant Gates	Install Four-Quadrant Gates	Install Four-Quadrant Gates
		Effect:	No roadway effect	No roadway effect	No roadway effect	No roadway effect	No roadway effect	No roadway effect	No roadway effect
Cedar Lane	Non-Quad Gates	*Action:*	Install Four-Quadrant Gates	Install Four-Quadrant Gates	Install Four-Quadrant Gates	Install Four-Quadrant Gates	Install Four-Quadrant Gates	Install Four-Quadrant Gates	Install Four-Quadrant Gates
		Effect:	No roadway effect	No roadway effect	No roadway effect	No roadway effect	No roadway effect	No roadway effect	No roadway effect
Mill Road	Non-Quad Gates	*Action:*	Install Median Treatment	Install Median Treatment	Install Median Treatment	Install Median Treatment	Install Median Treatment	Install Four-Quadrant Gates	Install Median Treatment
		Effect:	No roadway effect	No roadway effect	No roadway effect	No roadway effect	No roadway effect	No roadway effect	No roadway effect
Washington Highway / Route 1	No Existing Crossing	*Action:*	*Not Applicable*	*Not Applicable*	*Not Applicable*	*Not Applicable*	Grade Separate	*Not Applicable*	*Not Applicable*
		Effect:					Roadway Overpass; No roadway effect		

Table 5-10: Build Alternative Effects on the Transportation Network: Public At-Grade Crossings

Crossing Roadway	Existing, No Build	Proposed Action / Effect on Transportation Network								
Cross Corner Road / Route 641	No Existing Crossing	*Action:*	*Not Applicable*	*Not Applicable*	*Not Applicable*	*Not Applicable*	Realign Roadway	*Not Applicable*	*Not Applicable*	
		Effect:					Existing operations maintained; No roadway effect			
Blunts Bridge Road	No Existing Crossing	*Action:*	*Not Applicable*	*Not Applicable*	*Not Applicable*	*Not Applicable*	Grade Separate	*Not Applicable*	*Not Applicable*	
		Effect:					Roadway Overpass; No roadway effect			
Independence Road	No Existing Crossing	*Action:*	*Not Applicable*	*Not Applicable*	*Not Applicable*	*Not Applicable*	Closure/Alternate Access	*Not Applicable*	*Not Applicable*	
		Effect:					**Traffic Detour Required**			
W Patrick Henry Road	No Existing Crossing	*Action:*	*Not Applicable*	*Not Applicable*	*Not Applicable*	*Not Applicable*	Grade Separate	*Not Applicable*	*Not Applicable*	
		Effect:					Roadway Overpass; No roadway effect			
Yowell Road	No Existing Crossing	*Action:*	*Not Applicable*	*Not Applicable*	*Not Applicable*	*Not Applicable*	Grade Separate	*Not Applicable*	*Not Applicable*	
		Effect:					Roadway Overpass; No roadway effect			
Ashcake Road / Route 657	No Existing Crossing	*Action:*	*Not Applicable*	*Not Applicable*	*Not Applicable*	*Not Applicable*	Grade Separate	*Not Applicable*	*Not Applicable*	
		Effect:					Roadway Overpass on Alternate Alignment; No roadway effect			
Elmont Road / Route 626	No Existing Crossing	*Action:*	*Not Applicable*	*Not Applicable*	*Not Applicable*	*Not Applicable*	Grade Separate	*Not Applicable*	*Not Applicable*	
		Effect:					Roadway Overpass with Access Road; No roadway effect			
RICHMOND AREA (Area 6)										
		Build Alternative:	**6A. Staples Mill Only**	**6B–A-Line. Boulevard Rd Only**	**6B–S-Line. Boulevard Rd Only**	**6C. Broad St Only**	**6D. Main St Only**	**6E. Split Service**	**6F. Full Service**	**6G. Shared Service**
Mountain Road	Four-Quad Gates	*Action:*	No action	No action	No action	No action	No action	No action	No action	No action
		Effect:	No roadway effect	No roadway effect	No roadway effect	No roadway effect	No roadway effect	No roadway effect	No roadway effect	No roadway effect
Hungary Road	Non-Quad Gates	*Action:*	Grade Separate Crossing	Grade Separate Crossing	Grade Separate Crossing	Grade Separate Crossing	Grade Separate Crossing	Grade Separate Crossing	Grade Separate Crossing	Grade Separate Crossing
		Effect:	Roadway Overpass w/ alternate access to residences; No roadway effect	Roadway Overpass w/ alternate access to residences; No roadway effect	Roadway Overpass w/ alternate access to residences; No roadway effect	Roadway Overpass w/ alternate access to residences; No roadway effect	Roadway Overpass w/ alternate access to residences; No roadway effect	Roadway Overpass w/ alternate access to residences; No roadway effect	Roadway Overpass w/ alternate access to residences; No roadway effect	Roadway Overpass w/ alternate access to residences; No roadway effect
Hermitage Road	Non-Quad Gates	*Action:*	Install Four-Quadrant Gates	Install Four-Quadrant Gates	Install Four-Quadrant Gates	Install Four-Quadrant Gates	Install Four-Quadrant Gates	Install Four-Quadrant Gates	Install Four-Quadrant Gates	Install Four-Quadrant Gates
		Effect:	No roadway effect	No roadway effect	No roadway effect	No roadway effect	No roadway effect	No roadway effect	No roadway effect	No roadway effect
Jahnke Road	Non-Quad Gates	*Action:*	Install Four-Quadrant Gates	Install Four-Quadrant Gates	*Not Applicable*	Install Four-Quadrant Gates	*Not Applicable*	Install Four-Quadrant Gates	*Not Applicable*	*Not Applicable*
		Effect:	No roadway effect	No roadway effect		No roadway effect		No roadway effect		
Bassett Avenue	Non-Quad Gates	*Action:*	Close Crossing	Close Crossing	*Not Applicable*	Close Crossing	*Not Applicable*	Close Crossing	*Not Applicable*	*Not Applicable*
		Effect:	**Traffic Detour Required**	**Traffic Detour Required**		**Traffic Detour Required**		**Traffic Detour Required**		

Table 5-10: Build Alternative Effects on the Transportation Network: Public At-Grade Crossings

Crossing Roadway	Existing, No Build	Proposed Action / Effect on Transportation Network								
Broad Rock Boulevard	Non-Quad Gates	*Action:*	Grade Separate Crossing	Grade Separate Crossing	*Not Applicable*	Grade Separate Crossing	*Not Applicable*	Grade Separate Crossing	*Not Applicable*	*Not Applicable*
		Effect:	Roadway Overpass; Realign intersection with E Belt Blvd; No roadway effect	Roadway Overpass; Realign intersection with E Belt Blvd; No roadway effect		Roadway Overpass; Realign intersection with E Belt Blvd; No roadway effect		Roadway Overpass; Realign intersection with E Belt Blvd; No roadway effect		
Terminal Avenue	Non-Quad Gates	*Action:*	Close Crossing with improvements to access signalized intersection with Hopkins Rd	Close Crossing with improvements to access signalized intersection with Hopkins Rd	*Not Applicable*	Close Crossing with improvements to access signalized intersection with Hopkins Rd	*Not Applicable*	Close Crossing with improvements to access signalized intersection with Hopkins Rd	*Not Applicable*	*Not Applicable*
		Effect:	**Traffic Detour Required**	**Traffic Detour Required**		**Traffic Detour Required**		**Traffic Detour Required**		
Walmsley Boulevard	Non-Quad Gates	*Action:*	Grade Separate Crossing	Grade Separate Crossing	*Not Applicable*	Grade Separate Crossing	*Not Applicable*	Grade Separate Crossing	*Not Applicable*	*Not Applicable*
		Effect:	Railroad Overpass; No roadway effect	Railroad Overpass; No roadway effect		Railroad Overpass; No roadway effect		Railroad Overpass; No roadway effect		
Kingsland Road	Non-Quad Gates	*Action:*	Install Median Treatment	Install Median Treatment	*Not Applicable*	Install Median Treatment	*Not Applicable*	Install Median Treatment	*Not Applicable*	*Not Applicable*
		Effect:	Access maintained; No roadway effect	Access maintained; No roadway effect		Access maintained; No roadway effect		Access maintained; No roadway effect		
Thurston Road	Non-Quad Gates	*Action:*	Close Crossing	Close Crossing	*Not Applicable*	Close Crossing	*Not Applicable*	Close Crossing	*Not Applicable*	*Not Applicable*
		Effect:	**Traffic Detour Required**	**Traffic Detour Required**		**Traffic Detour Required**		**Traffic Detour Required**		
Old Lane	Non-Quad Gates	*Action:*	Close Crossing	Close Crossing	Close Crossing	Close Crossing	Close Crossing	Close Crossing	Close Crossing	Close Crossing
		Effect:	**Traffic Detour Required**	**Traffic Detour Required**	**Traffic Detour Required**	**Traffic Detour Required**	**Traffic Detour Required**	**Traffic Detour Required**	**Traffic Detour Required**	**Traffic Detour Required**
Hermitage Road	Non-Quad Gates	*Action:*	*Not Applicable*	*Not Applicable*	Grade Separate Crossing	Install additional median	Install additional median	*Not Applicable*	Install additional median	Install additional median
		Effect:			**Roadway Overpass with median separation; Ownby Ln Traffic Detour Required**	No roadway effect	No roadway effect		No roadway effect	No roadway effect
Brooke Road	Non-Quad Gates	*Action:*	*Not Applicable*	*Not Applicable*	Install additional median treatment	*Not Applicable*	Install additional median treatment	*Not Applicable*	Install additional median treatment	Install additional median treatment
		Effect:			No roadway effect		No roadway effect		No roadway effect	No roadway effect
St James Street	Non-Quad Gates	*Action:*	*Not Applicable*	*Not Applicable*	Close Crossing; Install grade-separated pedestrian crossing	*Not Applicable*	Close Crossing; Install grade-separated pedestrian crossing	*Not Applicable*	Close Crossing; Install grade-separated pedestrian crossing	Close Crossing; Install grade-separated pedestrian crossing
		Effect:			**Traffic Detour Required**		**Traffic Detour Required**		**Traffic Detour Required**	**Traffic Detour Required**
N 2nd Street / Valley Road	Non-Quad Gates	*Action:*	*Not Applicable*	*Not Applicable*	Close Crossing	*Not Applicable*	Close Crossing	*Not Applicable*	Close Crossing	Close Crossing
		Effect:			**Traffic Detour Required**		**Traffic Detour Required**		**Traffic Detour Required**	**Traffic Detour Required**
Hospital Street / N 7th Street	Non-Quad Gates	*Action:*	*Not Applicable*	*Not Applicable*	Grade Separate with intersection realignment	*Not Applicable*	Grade Separate with intersection realignment	*Not Applicable*	Grade Separate with intersection realignment	Grade Separate with intersection realignment
		Effect:			Roadway Overpass; No roadway effect		Roadway Overpass; No roadway effect		Roadway Overpass; No roadway effect	Roadway Overpass; No roadway effect
Maury Street	Non-Quad Gates	*Action:*	*Not Applicable*	*Not Applicable*	Install Four-Quadrant Gates	*Not Applicable*	Install Four-Quadrant Gates	*Not Applicable*	Install Four-Quadrant Gates	Install Four-Quadrant Gates
		Effect:			No roadway effect		No roadway effect		No roadway effect	No roadway effect

Table 5-10: Build Alternative Effects on the Transportation Network: Public At-Grade Crossings

Crossing Roadway	Existing, No Build	Proposed Action / Effect on Transportation Network								
Goodes Street	Non-Quad Gates	*Action:*	*Not Applicable*	*Not Applicable*	Install Four-Quadrant Gates	*Not Applicable*	Install Four-Quadrant Gates with roadway realignment	*Not Applicable*	Install Four-Quadrant Gates with roadway realignment	Install Four-Quadrant Gates with roadway realignment
		Effect:			No roadway effect		No roadway effect		No roadway effect	No roadway effect
E Commerce Road	Non-Quad Gates	*Action:*	*Not Applicable*	*Not Applicable*	Grade Separate Crossing	*Not Applicable*	Grade Separate Crossing	*Not Applicable*	Grade Separate Crossing	Grade Separate Crossing
		Effect:			Realigned Roadway Overpass; No roadway effect		Realigned Roadway Overpass; No roadway effect		Realigned Roadway Overpass; No roadway effect	Realigned Roadway Overpass; No roadway effect
Ruffin Road	Non-Quad Gates	*Action:*	*Not Applicable*	*Not Applicable*	Install Median Treatment	*Not Applicable*	Install Median Treatment	*Not Applicable*	Install Median Treatment	Install Median Treatment
		Effect:			No roadway effect		No roadway effect		No roadway effect	No roadway effect
Bells Road	Non-Quad Gates	*Action:*	*Not Applicable*	*Not Applicable*	Install additional median treatment	*Not Applicable*	Install additional median treatment	*Not Applicable*	Install additional median treatment	Install additional median treatment
		Effect:			No roadway effect		No roadway effect		No roadway effect	No roadway effect
Dale Avenue / Trenton Avenue	Non-Quad Gates	*Action:*	*Not Applicable*	*Not Applicable*	Close Crossing	*Not Applicable*	Close Crossing	*Not Applicable*	Close Crossing	Close Crossing
		Effect:			**Traffic Detour Required**		**Traffic Detour Required**		**Traffic Detour Required**	**Traffic Detour Required**
Non-Crossing Roadway: Dalebrook Drive		*Action:*	Realigned to accommodate track	Realigned to accommodate track	*Not Applicable*	Realigned to accommodate track	*Not Applicable*	Realigned to accommodate track	*Not Applicable*	*Not Applicable*
		Effect:	No roadway effect	No roadway effect		No roadway effect		No roadway effect		
Kingsland Road	Non-Quad Gates	*Action:*	*Not Applicable*	*Not Applicable*	Install Four-Quadrant Gates	*Not Applicable*	Install Four-Quadrant Gates	*Not Applicable*	Install Four-Quadrant Gates	Install Four-Quadrant Gates
		Effect:			No roadway effect		No roadway effect		No roadway effect	No roadway effect
Brinkley Road	Non-Quad Gates	*Action:*	*Not Applicable*	*Not Applicable*	Close Crossing	*Not Applicable*	Close Crossing	*Not Applicable*	Close Crossing	Close Crossing
		Effect:			**Traffic Detour Required**		**Traffic Detour Required**		**Traffic Detour Required**	**Traffic Detour Required**
New Crossing: W Leigh Street (near Myers Street)		*Action:*	*Not Applicable*	*Not Applicable*	*Not Applicable*	Install Median Treatment	*Not Applicable*	*Not Applicable*	*Not Applicable*	*Not Applicable*
		Effect:				New At-Grade Crossing				
New Crossing: W Leigh Street (near Hermitage Road)		*Action:*	*Not Applicable*	*Not Applicable*	*Not Applicable*	Install Median Treatment	*Not Applicable*	*Not Applicable*	*Not Applicable*	*Not Applicable*
		Effect:				New At-Grade Crossing				

"No effect" does not preclude minor changes to location of any access points within the same property, if needed to facilitate design and construction of the project. For properties with existing access to the crossing roadway, if at least one access to that property area is maintained, the "no effect" is considered feasible.

5.3.3 Network Effects of Improvements at Private At-Grade Crossings

Table 5-11 below presents the effect on the transportation network that was identified for each proposed action at each private at-grade crossing in the corridor, by Build Alternative; the table includes new proposed crossings of private roadways.

After review of all private at-grade highway-rail crossings, DRPT does not anticipate that any of the private crossing improvements included as an element of any DC2RVA Build Alternative would have an effect on the overall connectivity and accessibility of the transportation network and therefore do not warrant further detailed traffic operations analysis.

This outcome is supported by the fact that these crossings are all private and are, by definition, exclusive of the public roadway network. However, regardless of the private classification, the crossing improvements at all private at-grade crossing locations were designed to maintain existing accessibility and connectivity to the private land parcels. All Build Alternatives, as part of the DC2RVA Project, maintain private property access, with the exception of where full property acquisitions are required by the design.

The "no effect" identification at these locations is intended to indicate that there is no effect on overall transportation network connectivity and accessibility, and does not preclude minor localized effects such as modifications to specific parcel access due to design or construction of the gates or slight increases in delay experienced by the vehicles accessing the private crossing.

Table 5-11: Build Alternative Effects on the Transportation Network: Private At-Grade Crossings

Crossing	Rail Line	Existing, No Build	Proposed Action/Effect on Transportation Network			
ARLINGTON (LONG BRIDGE APPROACH) (Area 1)						
There are no private at-grade crossings in this area.						
NORTHERN VIRGINIA (Area 2)						
			Build Alternative:	**2A. Add 1 Track**		
Unnamed Private Crossing (Railroad Access)	RF&P	None	*Action:*	No action (*for use by/ under purview of CSX)*		
			Effect:	No effect		
Cherry Hill Road Private Crossing	RF&P	Flashing Signal with Gates	*Action:*	Install Four-Quadrant Gates		
			Effect:	No effect		
Henderson Road / Epperson Avenue Crossing (Quantico)	RF&P	Flashing Signal with Gates	*Action:*	Install Four-Quadrant Gates		
			Effect:	No effect		
Flemming Street Crossing (Quantico)	RF&P	Flashing Signal with Gates	*Action:*	Install Four-Quadrant Gates		
			Effect:	No effect		
Lees Private Crossing	RF&P	Passive (Ropes)	*Action:*	Install Locking Gate		
			Effect:	No effect		
FREDERICKSBURG AREA (Area 3)						
			Build Alternative:	**3A. Maintain Existing**	**3B. Add 1 Track**	**3C. 2-Track East Bypass**
Hot Top Road	FBP	Passive (Gate, Stop Signs)	*Action:*	*Not Applicable*	*Not Applicable*	Install Locking Gate
			Effect:			No effect
Driveway, Access to Federal Drive	FBP	Passive (Stop Signs)	*Action:*	*Not Applicable*	*Not Applicable*	Crossing Closure
			Effect:			Property has alternate access; No effect
Cleek Lane, Private Driveway	FBP	None	*Action:*	*Not Applicable*	*Not Applicable*	Install Locking Gate
			Effect:			No effect
Driveway, Access to Cleek Lane	FBP	None	*Action:*	*Not Applicable*	*Not Applicable*	Install Locking Gate
			Effect:			No effect
Driveway, Access to Forest Lane Road	FBP	Passive (Stop Signs)	*Action:*	*Not Applicable*	*Not Applicable*	Install Locking Gate
			Effect:			No effect
Driveway, Access to Tidewater Trail	FBP	No Existing Crossing	*Action:*	*Not Applicable*	*Not Applicable*	No action required
			Effect:			Property has alternate access; No effect
Private Roadway, Internal Field Access	FBP	No Existing Crossing	*Action:*	*Not Applicable*	*Not Applicable*	No action required
			Effect:			Property take/alternate internal access; No effect
Driveway, Access to Pinecrest Lane	FBP	No Existing Crossing	*Action:*	*Not Applicable*	*Not Applicable*	No action required (property acquisition)
			Effect:			No effect

Table 5-11: Build Alternative Effects on the Transportation Network: Private At-Grade Crossings

Crossing	Rail Line	Existing, No Build	Proposed Action/Effect on Transportation Network							
Private Driveways (Access to Patriot Lane)	FBP	No Existing Crossing	*Action:*	*Not Applicable*	*Not Applicable*	No action required (property acquisition)				
			Effect:			No effect				
CENTRAL VIRGINIA (Area 4)										
			Build Alternative:	**4A. Add 1 Track**						
Jones Private Crossing	RF&P	None	*Action:*	Install Locking Gate						
			Effect:	No effect						
Rixey Road Private Crossing	RF&P	None	*Action:*	Install Locking Gate						
			Effect:	No effect						
Roes Private Crossing	RF&P	None	*Action:*	Install Locking Gate						
			Effect:	No effect						
Unnamed Private Crossing (Industrial Drive Access)	RF&P	None	*Action:*	Install Locking Gate						
			Effect:	No effect						
Unnamed Private Crossing (Alexandra Lane)	RF&P	None	*Action:*	Install Locking Gate						
			Effect:	No effect						
Unnamed Private Crossing (Field Access)	RF&P	None	*Action:*	Install Locking Gate						
			Effect:	No effect						
Unnamed Private Crossing (Field Access)	RF&P	None	*Action:*	Install Locking Gate						
			Effect:	No effect						
Georges Private Crossing (Field Access)	RF&P	None	*Action:*	Install Locking Gate						
			Effect:	No effect						
Chandlers Private Crossing (Field Access)	RF&P	None	*Action:*	Install Locking Gate						
			Effect:	No effect						
Excelsior Mill Private Crossing	RF&P	None	*Action:*	Install Locking Gate						
			Effect:	No effect						
ASHLAND AREA (Area 5)										
			Build Alternative:	**5A. Maintain Existing**	**5A–Ashcake. Maintain Existing (New Station)**	**5B. Add 1 Track**	**5B–Ashcake. Add 1 Track (New Station)**	**5C. 2-Track West Bypass**	**5C–Ashcake. 2-Track West Bypass (New Station)**	**5D–Ashcake. Center 3 Tracks (New Station)**
Driveway, Access to Cross Corner Road / Blunts Bridge Road	ABP	No Existing Crossing	*Action:*	*Not Applicable*	*Not Applicable*	*Not Applicable*	*Not Applicable*	No action required (property acquisition)	No action required (property acquisition)	*Not Applicable*
			Effect:					No effect	No effect	
Driveway off Blunts Bridge Road (Private)	ABP	No Existing Crossing	*Action:*	*Not Applicable*	*Not Applicable*	*Not Applicable*	*Not Applicable*	Provide alternate access to property	Provide alternate access to property	*Not Applicable*
			Effect:					No effect	No effect	
Governors Lane / Driveways (Private)	ABP	No Existing Crossing	*Action:*	*Not Applicable*	*Not Applicable*	*Not Applicable*	*Not Applicable*	No action required (property acquisition)	No action required (property acquisition)	*Not Applicable*
			Effect:					No effect	No effect	
Private Driveway (Access to Yowell Road)	ABP	No Existing Crossing	*Action:*	*Not Applicable*	*Not Applicable*	*Not Applicable*	*Not Applicable*	Provide alternate access to property	Provide alternate access to property	*Not Applicable*
			Effect:					No effect	No effect	

Table 5-11: Build Alternative Effects on the Transportation Network: Private At-Grade Crossings

Crossing	Rail Line	Existing, No Build	Proposed Action/Effect on Transportation Network								
Private Driveway (Access to Yowell Road)	ABP	No Existing Crossing	*Action:*	*Not Applicable*	*Not Applicable*	*Not Applicable*	*Not Applicable*	Provide alternate access to property	Provide alternate access to property	*Not Applicable*	
			Effect:					No effect	No effect		
Quailwood Lane (Private)	ABP	No Existing Crossing	*Action:*	*Not Applicable*	*Not Applicable*	*Not Applicable*	*Not Applicable*	Provide alternate access to property	Provide alternate access to property	*Not Applicable*	
			Effect:					No effect	No effect		
Farmers Inn Lane (Private)	ABP	No Existing Crossing	*Action:*	*Not Applicable*	*Not Applicable*	*Not Applicable*	*Not Applicable*	Provide alternate access to property	Provide alternate access to property	*Not Applicable*	
			Effect:					No effect	No effect		
RICHMOND AREA (Area 6)											
Build Alternative:				**6A. Staples Mill Only**	**6B–A-Line. Boulevard Rd Only (A-Line)**	**6B–S-Line. Boulevard Rd Only (S-Line)**	**6C. Broad St Only**	**6D. Main St Only**	**6E. Split Service**	**6F. Full Service**	**6G. Shared Service**
4th Street Extension Private Crossing	S-Line	Flashing Signal with Gates	*Action:*	*Not Applicable*	*Not Applicable*	Install Locking Gate	*Not Applicable*	Install Locking Gate	*Not Applicable*	Install Locking Gate	Install Locking Gate
			Effect:			No effect		No effect		No effect	No effect
Federal Paper Private Crossing	S-Line	None	*Action:*	*Not Applicable*	*Not Applicable*	Install Locking Gate	*Not Applicable*	Install Locking Gate	*Not Applicable*	Install Locking Gate	Install Locking Gate
			Effect:			No effect		No effect		No effect	No effect
Texaco Road Private Crossing	S-Line	Passive	*Action:*	*Not Applicable*	*Not Applicable*	Install Four-Quadrant Gate	*Not Applicable*	Install Four-Quadrant Gate	*Not Applicable*	Install Four-Quadrant Gate	Install Four-Quadrant Gate
			Effect:			No effect		No effect		No effect	No effect
Station Road Private Crossing	S-Line	Passive	*Action:*	*Not Applicable*	*Not Applicable*	Install Four-Quadrant Gate	*Not Applicable*	Install Four-Quadrant Gate	*Not Applicable*	Install Four-Quadrant Gate	Install Four-Quadrant Gate
			Effect:			No effect		No effect		No effect	No effect

"No effect" does not preclude minor changes to location of any access points within the same property, if needed to facilitate design and construction of the project. For properties with existing access to the crossing roadway, if at least one access to that property area is maintained, the "no effect" is considered feasible.

5.3.4 Network Effects of Improvements at Grade-Separated Crossings

The effects on the transportation network that were identified for the proposed action at each public and private grade-separated crossing are presented in Table 5-12 and Table 5-13, respectively, for each Build Alternative. These tables represent the transportation network effects of any proposed crossing improvement to existing public and private grade-separated crossings; any new grade-separated crossings of existing at-grade facilities that are proposed as part of this project are summarized in Section 5.3.2 above.

After review of all private grade-separated highway-rail crossings, DRPT does not anticipate any of the proposed modifications to existing grade-separated crossings would have an effect on the overall connectivity and accessibility of the transportation network for any Build Alternative of the DC2RVA Project. The crossing modifications, if required, at existing grade-separated crossings included two types: extension of the existing crossing structure or construction of a new separate parallel grade-separated crossing structure. All modifications were designed to maintain existing functional characteristics of the crossing roadway, including number and type of roadway lanes, as part of each Build Alternative. Therefore, the proposed actions of the existing grade-separated public and private crossings do not warrant further detailed traffic operations analysis.

Table 5-12: Build Alternative Effects on the Transportation Network: Public Grade-Separated Crossings

Crossing	Rail Line	Existing, No Build	Proposed Action/Effect on Transportation Network			
ARLINGTON (LONG BRIDGE APPROACH) (Area 1)						
Build Alternative:				**1A. Add 2 Tracks East**	**1B. Add 2 Tracks West**	**1C. Add 1 Track East & West**
George Washington Memorial Parkway	RF&P	Roadway Underpass	*Action:*	Widen existing rail structure over roadway	Widen existing rail structure over roadway	Widen existing rail structure over roadway
			Effect:	No effect	No effect	No effect
NORTHERN VIRGINIA (Area 2)						
Build Alternative:				**2A. Add 1 Track**		
VA 233 / Airport Access	RF&P	Roadway Overpass	*Action:*	No action required (existing structure could accommodate improvements)		
			Effect:	No effect		
Route 1 / N Henry Street	RF&P	Roadway Overpass	*Action:*	No action required (existing structure could accommodate improvements)		
			Effect:	No effect		
E Braddock Road	RF&P	Roadway Underpass	*Action:*	No action required (existing structure could accommodate improvements)		
			Effect:	No effect		
Commonwealth Avenue / Daingerfield Road	RF&P	Roadway Underpass	*Action:*	No action required (existing structure could accommodate improvements)		
			Effect:	No effect		
King Street	RF&P	Roadway Underpass	*Action:*	No action required (existing structure could accommodate improvements)		
			Effect:	No effect		
Duke Street	RF&P	Roadway Overpass	*Action:*	No action required (existing structure could accommodate improvements)		
			Effect:	No effect		
Telegraph Road	RF&P	Roadway Overpass	*Action:*	No action required (existing structure could accommodate improvements)		
			Effect:	No effect		

Table 5-12: Build Alternative Effects on the Transportation Network: Public Grade-Separated Crossings

Crossing	Rail Line	Existing, No Build	Proposed Action/Effect on Transportation Network	
Eisenhower Avenue	RF&P	Roadway Underpass	*Action:*	No action required (existing structure could accommodate improvements)
			Effect:	No effect
Eisenhower Avenue Connector	RF&P	Roadway Underpass	*Action:*	No action required (existing structure could accommodate improvements)
			Effect:	No effect
S Van Dorn Street	RF&P	Roadway Underpass	*Action:*	No action required (existing structure could accommodate improvements)
			Effect:	No effect
I-95/ I-495	RF&P	Roadway Overpass	*Action:*	No action required (existing structure could accommodate improvements)
			Effect:	No effect
Franconia Road	RF&P	Roadway Overpass	*Action:*	No action required (existing structure could accommodate improvements)
			Effect:	No effect
Franconia - Springfield Parkway	RF&P	Roadway Overpass	*Action:*	No action required (existing structure could accommodate improvements)
			Effect:	No effect
Newington Road	RF&P	Roadway Underpass	*Action:*	Widen existing rail structure over roadway
			Effect:	No effect
Backlick Road	RF&P	Roadway Overpass	*Action:*	Widen existing roadway structure; Realign intersection with Fairfax County Parkway
			Effect:	No effect
Fairfax County Parkway	RF&P	Roadway Overpass	*Action:*	No action required (existing structure could accommodate improvements)
			Effect:	No effect
Pohick Road	RF&P	Roadway Overpass	*Action:*	No action required (existing structure could accommodate improvements)
			Effect:	No effect

Table 5-12: Build Alternative Effects on the Transportation Network: Public Grade-Separated Crossings

Crossing	Rail Line	Existing, No Build	Proposed Action/Effect on Transportation Network	
Lorton Road	RF&P	Roadway Underpass	*Action:*	Widen existing rail structure over roadway
			Effect:	No effect
Jefferson Davis Highway	RF&P	Roadway Underpass	*Action:*	Widen existing rail structure over roadway
			Effect:	No effect
Furnace Road	RF&P	Roadway Underpass	*Action:*	Widen existing rail structure over roadway
			Effect:	No effect
Railroad Avenue	RF&P	Roadway Overpass	*Action:*	*Crossing removed since existing conditions inventory*
			Effect:	*No effect*
Dawson Beach Road	RF&P	Roadway Overpass	*Action:*	Widen existing roadway structure; Realign intersection with Express Drive
			Effect:	No effect
Daniel K Ludwig Drive / Powells Creek	RF&P	Roadway Underpass	*Action:*	Widen existing rail structure over roadway
			Effect:	No effect
Possum Point Road	RF&P	Roadway Overpass	*Action:*	No action required (existing structure could accommodate improvements)
			Effect:	No effect
Courthouse Road	RF&P	Roadway Overpass	*Action:*	No action required (existing structure could accommodate improvements)
			Effect:	No effect
Andrew Chapel Road	RF&P	Roadway Underpass	*Action:*	Construct new rail structure over roadway
			Effect:	No effect
Eskimo Hill Road	RF&P	Roadway Overpass	*Action:*	Widen existing roadway structure; Realign intersection with Montague Loop
			Effect:	No effect
Leeland Road	RF&P	Roadway Overpass	*Action:*	Widen existing roadway structure
			Effect:	No effect
Primmer House Road	RF&P	Roadway Overpass	*Action:*	Widen existing roadway structure
			Effect:	No effect

Table 5-12: Build Alternative Effects on the Transportation Network: Public Grade-Separated Crossings

Crossing	**Rail Line**	**Existing, No Build**	**Proposed Action/Effect on Transportation Network**			
FREDERICKSBURG AREA (Area 3)						
Build Alternative:				**3A. Maintain Existing**	**3B. Add 1 Track**	**3C. 2-Track East Bypass**
Harrell Road	RF&P	Roadway Underpass	*Action:*	No action required (existing structure could accommodate improvements)	Widen existing rail structure over roadway	Widen existing rail structure over roadway
			Effect:	No effect	No effect	No effect
Butler Road / White Oak Road	RF&P	Roadway Overpass	*Action:*	No action required (existing structure could accommodate improvements)	Widen existing roadway structure	No action required (existing structure could accommodate improvements)
			Effect:	No effect	No effect	No effect
Kings Highway	RF&P	Roadway Overpass	*Action:*	No action required (existing structure could accommodate improvements)	Widen existing roadway structure	No action required (existing structure could accommodate improvements)
			Effect:	No effect	No effect	No effect
Naomi Road	RF&P	Roadway Underpass	*Action:*	No action required (existing structure could accommodate improvements)	Widen existing rail structure over roadway	No action required (existing structure could accommodate improvements)
			Effect:	No effect	No effect	No effect
Sophia Street	RF&P	Roadway Underpass	*Action:*	No action required (existing structure could accommodate improvements)	Widen existing rail structure over roadway	No action required (existing structure could accommodate improvements)
			Effect:	No effect	No effect	No effect
Caroline Street	RF&P	Roadway Underpass	*Action:*	No action required (existing structure could accommodate improvements)	Widen existing rail structure over roadway	No action required (existing structure could accommodate improvements)
			Effect:	No effect	No effect	No effect
Princess Anne Street	RF&P	Roadway Underpass	*Action:*	No action required (existing structure could accommodate improvements)	Widen existing rail structure over roadway	No action required (existing structure could accommodate improvements)
			Effect:	No effect	No effect	No effect
Charles Street	RF&P	Roadway Underpass	*Action:*	No action required (existing structure could accommodate improvements)	Widen existing rail structure over roadway	No action required (existing structure could accommodate improvements)
			Effect:	No effect	No effect	No effect
Blue and Gray Parkway	RF&P	Roadway Overpass	*Action:*	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)
			Effect:	No effect	No effect	No effect

Table 5-12: Build Alternative Effects on the Transportation Network: Public Grade-Separated Crossings

Crossing	Rail Line	Existing, No Build	Proposed Action/Effect on Transportation Network			
Mills Drive	RF&P	Roadway Overpass	*Action:*	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)
			Effect:	No effect	No effect	No effect
Cool Springs Road	FBP	Roadway Overpass	*Action:*	No action required (existing structure could accommodate improvements)	Widen existing roadway structure	Widen existing rail structure over roadway
			Effect:	No effect	No effect	No effect
CENTRAL VIRGINIA (Area 4)						
Build Alternative:				**4A. Add 1 Track**		
Route 207	RF&P	Roadway Overpass	*Action:*	No action required (existing structure could accommodate improvements)		
			Effect:	No effect		
Nelson Hill Road	RF&P	Roadway Overpass	*Action:*	No action required (existing structure could accommodate improvements)		
			Effect:	No effect		
Dry Bridge Road	RF&P	Roadway Overpass	*Action:*	No action required (existing structure could accommodate improvements)		
			Effect:	No effect		
Ruther Glen Road	RF&P	Roadway Overpass	*Action:*	No action required (existing structure could accommodate improvements)		
			Effect:	No effect		
Interstate 95	RF&P	Roadway Overpass	*Action:*	No action required (existing structure could accommodate improvements)		
			Effect:	No effect		
Kings Dominion Boulevard	RF&P	Roadway Overpass	*Action:*	No action required (existing structure could accommodate improvements)		
			Effect:	No effect		
Taylorsville Road	RF&P	Roadway Underpass	*Action:*	Widen existing rail structure over roadway		
			Effect:	No effect		

Table 5-12: Build Alternative Effects on the Transportation Network: Public Grade-Separated Crossings

Crossing	Rail Line	Existing, No Build	Proposed Action/Effect on Transportation Network								
ASHLAND AREA (Area 5)											
Build Alternative:				**5A. Maintain Existing**	**5A–Ashcake. Maintain Existing (New Station)**	**5B. Add 1 Track**	**5B–Ashcake. Add 1 Track (New Station)**	**5C. 2-Track West Bypass**	**5C–Ashcake. 2-Track West Bypass (New Station)**	**5D–Ashcake. Center 3 Tracks (New Station)**	
Old Ridge Road	RF&P	Roadway Overpass	*Action:*	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	
			Effect:	No effect	No effect	No effect	No effect	No effect	No effect	No effect	
Elletts Crossing Road	RF&P	Roadway Underpass	*Action:*	Widen existing rail structure over roadway	Widen existing rail structure over roadway	Widen existing rail structure over roadway	Widen existing rail structure over roadway	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	Widen existing rail structure over roadway	
			Effect:	No effect	No effect	No effect	No effect	No effect	No effect	No effect	
US Route 1	RF&P	Roadway Overpass	*Action:*	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	
			Effect:	No effect	No effect	No effect	No effect	No effect	No effect	No effect	
Greenwood Road	RF&P	Roadway Overpass	*Action:*	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	
			Effect:	No effect	No effect	No effect	No effect	No effect	No effect	No effect	
I-295 (Northbound Lanes Only)	RF&P	Roadway Overpass	*Action:*	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	
			Effect:	No effect	No effect	No effect	No effect	No effect	No effect	No effect	
RICHMOND AREA (Area 6)											
Build Alternative:				**6A. Staples Mill Only**	**6B–A-Line. Boulevard Rd Only (A-Line)**	**6B–S-Line. Boulevard Rd Only (S-Line)**	**6C. Broad St Only**	**6D. Main St Only**	**6E. Split Service**	**6F. Full Service**	**6G. Shared Service**
I-295 (Southbound Lanes Only)	RF&P	Roadway Overpass	*Action:*	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)
			Effect:	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
E Parham Road	RF&P	Roadway Overpass	*Action:*	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)
			Effect:	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Hilliard Road	RF&P	Roadway Overpass	*Action:*	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)
			Effect:	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect

Table 5-12: Build Alternative Effects on the Transportation Network: Public Grade-Separated Crossings

Crossing	Rail Line	Existing, No Build	Proposed Action/Effect on Transportation Network								
Dumbarton Road	RF&P	Roadway Overpass	*Action:*	No action required (existing structure could accommodate improvements)	Widen existing roadway structure	Widen existing roadway structure	Widen existing roadway structure	Widen existing roadway structure	No action required (existing structure could accommodate improvements)	Widen existing roadway structure	Widen existing roadway structure
			Effect:	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Interstate 64	RF&P	Roadway Overpass	*Action:*	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)
			Effect:	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Interstate 195	RF&P	Roadway Overpass	*Action:*	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)
			Effect:	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Westwood Avenue / Saunders Avenue	RF&P	Roadway Overpass	*Action:*	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)
			Effect:	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
I-195 Northbound	A-Line	Roadway Overpass	*Action:*	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	*Not applicable*
			Effect:	No effect	No effect		No effect		No effect		
W Broad Street	A-Line	Roadway Overpass	*Action:*	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	*Not applicable*
			Effect:	No effect	No effect		No effect		No effect		
Monument Avenue	A-Line	Roadway Overpass	*Action:*	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	*Not applicable*
			Effect:	No effect	No effect		No effect		No effect		
Patterson Avenue	A-Line	Roadway Overpass	*Action:*	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	*Not applicable*
			Effect:	No effect	No effect		No effect		No effect		
Grove Avenue	A-Line	Roadway Overpass	*Action:*	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	*Not applicable*
			Effect:	No effect	No effect		No effect		No effect		
W Cary Street	A-Line	Roadway Overpass	*Action:*	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	*Not applicable*
			Effect:	No effect	No effect		No effect		No effect		

Table 5-12: Build Alternative Effects on the Transportation Network: Public Grade-Separated Crossings

Crossing	Rail Line	Existing, No Build	Proposed Action/Effect on Transportation Network								
I-195 Southbound	A-Line	Roadway Overpass	*Action:*	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	*Not applicable*
			Effect:	No effect	No effect		No effect		No effect		
Douglasdale Road	A-Line	Roadway Overpass	*Action:*	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	*Not applicable*
			Effect:	No effect	No effect		No effect		No effect		
Powhite Parkway Southbound	A-Line	Roadway Underpass	*Action:*	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	*Not applicable*
			Effect:	No effect	No effect		No effect		No effect		
Powhite Parkway Northbound	A-Line	Roadway Underpass	*Action:*	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	*Not applicable*
			Effect:	No effect	No effect		No effect		No effect		
Riverside Drive	A-Line	Roadway Underpass	*Action:*	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	*Not applicable*
			Effect:	No effect	No effect		No effect		No effect		
Forest Hill Avenue	A-Line	Roadway Overpass	*Action:*	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	*Not applicable*
			Effect:	No effect	No effect		No effect		No effect		
Midlothian Turnpike	A-Line	Roadway Overpass	*Action:*	Widen existing roadway structure	Widen existing roadway structure	*Not applicable*	Widen existing roadway structure	*Not applicable*	Widen existing roadway structure	*Not applicable*	*Not applicable*
			Effect:	No effect	No effect		No effect		No effect		
Hull Street Road	A-Line	Roadway Overpass	*Action:*	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	*Not applicable*
			Effect:	No effect	No effect		No effect		No effect		
Hopkins Road	A-Line	Roadway Overpass	*Action:*	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	*Not applicable*
			Effect:	No effect	No effect		No effect		No effect		
Warwick Road	A-Line	Roadway Overpass	*Action:*	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	*Not applicable*
			Effect:	No effect	No effect		No effect		No effect		

Table 5-12: Build Alternative Effects on the Transportation Network: Public Grade-Separated Crossings

Crossing	Rail Line	Existing, No Build	Proposed Action/Effect on Transportation Network								
Castlewood Road / Cardwell Road	A-Line	Roadway Overpass	*Action:*	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	*Not applicable*
			Effect:	No effect	No effect		No effect		No effect		
Cogbill Road	A-Line	Roadway Underpass	*Action:*	Widen existing rail structure over roadway	Widen existing rail structure over roadway	*Not applicable*	Widen existing rail structure over roadway	*Not applicable*	Widen existing rail structure over roadway	*Not applicable*	*Not applicable*
			Effect:	No effect	No effect		No effect		No effect		
Chippenham Parkway	A-Line	Roadway Overpass	*Action:*	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	*Not applicable*
			Effect:	No effect	No effect		No effect		No effect		
S Beulah Road / Dundas Road	A-Line	Roadway Overpass	*Action:*	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	*Not applicable*
			Effect:	No effect	No effect		No effect		No effect		
Route 288 Northbound	A-Line	Roadway Overpass	*Action:*	Widen existing roadway structure	Widen existing roadway structure	*Not applicable*	Widen existing roadway structure	*Not applicable*	Widen existing roadway structure	*Not applicable*	*Not applicable*
			Effect:	No effect	No effect		No effect		No effect		
Route 288 Southbound	A-Line	Roadway Overpass	*Action:*	Widen existing roadway structure	Widen existing roadway structure	*Not applicable*	Widen existing roadway structure	*Not applicable*	Widen existing roadway structure	*Not applicable*	*Not applicable*
			Effect:	No effect	No effect		No effect		No effect		
North Boulevard	S-Line	Roadway Overpass	*Action:*	*Not applicable*	Widen existing structure	No action required (existing structure could accommodate improvements)	Widen existing structure	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)
			Effect:		No effect	No effect	No effect	No effect		No effect	No effect
I-64 / I-95	S-Line	Roadway Overpass	*Action:*	*Not applicable*	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)
			Effect:			No effect		No effect		No effect	No effect
N Lombardy Street	S-Line	Roadway Overpass	*Action:*	*Not applicable*	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)
			Effect:			No effect		No effect		No effect	No effect
N Belvidere Street	S-Line	Roadway Overpass	*Action:*	*Not applicable*	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)
			Effect:			No effect		No effect		No effect	No effect
Chamberlayne Parkway	S-Line	Roadway Overpass	*Action:*	*Not applicable*	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)
			Effect:			No effect		No effect		No effect	No effect

Table 5-12: Build Alternative Effects on the Transportation Network: Public Grade-Separated Crossings

Crossing	Rail Line	Existing, No Build	Proposed Action/Effect on Transportation Network								
N 1st Street	S-Line	Roadway Overpass	*Action:*	*Not applicable*	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)
			Effect:			No effect		No effect		No effect	No effect
N 5th Street	S-Line	Roadway Overpass	*Action:*	*Not applicable*	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)
			Effect:			No effect		No effect		No effect	No effect
Interstate 64	S-Line	Roadway Overpass	*Action:*	*Not applicable*	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)
			Effect:			No effect		No effect		No effect	No effect
Leigh Street	S-Line	Roadway Overpass	*Action:*	*Not applicable*	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)
			Effect:			No effect		No effect		No effect	No effect
I-95 Off Ramp to 17th Street	S-Line	Roadway Overpass	*Action:*	*Not applicable*	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)
			Effect:			No effect		No effect		No effect	No effect
E Marshall Street	S-Line	Roadway Underpass	*Action:*	*Not applicable*	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)
			Effect:			No effect		No effect		No effect	No effect
E Broad Street	S-Line	Roadway Underpass	*Action:*	*Not applicable*	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	Widen existing rail structure over roadway	*Not applicable*	Widen existing rail structure over roadway	Widen existing rail structure over roadway
			Effect:			No effect		No effect		No effect	No effect
E Main Street	S-Line	Roadway Underpass	*Action:*	*Not applicable*	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)
			Effect:			No effect		No effect		No effect	No effect
Interstate 95	S-Line	Roadway Overpass	*Action:*	*Not applicable*	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)
			Effect:			No effect		No effect		No effect	No effect
E Cary Street	S-Line	Roadway Underpass	*Action:*	*Not applicable*	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)
			Effect:			No effect		No effect		No effect	No effect

Table 5-12: Build Alternative Effects on the Transportation Network: Public Grade-Separated Crossings

Crossing	Rail Line	Existing, No Build	Proposed Action/Effect on Transportation Network								
Dock Street	S-Line	Roadway Underpass	*Action:*	*Not applicable*	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)
			Effect:			No effect		No effect		No effect	No effect
Ramps between I-195 and I-95	S-Line	Roadway Overpass	*Action:*	*Not applicable*	*Not applicable*	Widen existing rail structure	*Not applicable*	Widen existing rail structure	*Not applicable*	Widen existing rail structure	Widen existing rail structure
			Effect:			No effect		No effect		No effect	No effect
Byrd Street	S-Line	Roadway Underpass	*Action:*	*Not applicable*	*Not applicable*	Widen existing rail structure	*Not applicable*	Widen existing rail structure	*Not applicable*	Widen existing rail structure	Widen existing rail structure
			Effect:			No effect		No effect		No effect	No effect
I-95 / Maury Street Ramp	S-Line	Roadway Overpass	*Action:*	*Not applicable*	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)
			Effect:			No effect		No effect		No effect	No effect
Chippenham Parkway	S-Line	Roadway Overpass	*Action:*	*Not applicable*	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)
			Effect:			No effect		No effect		No effect	No effect
Elliham Avenue	S-Line	Roadway Overpass	*Action:*	*Not applicable*	*Not applicable*	Widen existing roadway structure	*Not applicable*	Widen existing roadway structure	*Not applicable*	Widen existing roadway structure	Widen existing roadway structure
			Effect:			No effect		No effect		No effect	No effect
Jefferson Davis Highway / Route 1	S-Line	Roadway Overpass	*Action:*	*Not applicable*	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	*Not applicable*	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)
			Effect:			No effect		No effect		No effect	No effect
Route 288 Northbound	S-Line	Roadway Overpass	*Action:*	Widen existing roadway structure	Widen existing roadway structure	No action required (existing structure could accommodate improvements)	Widen existing roadway structure	No action required *(existing structure)*	Widen existing roadway structure	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)
			Effect:	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect
Route 288 Southbound	S-Line	Roadway Overpass	*Action:*	Widen existing roadway structure	Widen existing roadway structure	No action required (existing structure could accommodate improvements)	Widen existing roadway structure	No action required *(existing structure)*	Widen existing roadway structure	No action required (existing structure could accommodate improvements)	No action required (existing structure could accommodate improvements)
			Effect:	No effect	No effect	No effect	No effect	No effect	No effect	No effect	No effect

"Widen existing structure" with no effect assumes that access to private properties is maintained in design and/or properties are taken as part of improvements.

Table 5-13: Build Alternative Effects on the Transportation Network: Private Grade-Separated Crossings

Crossing	Rail Line	Existing, No Build	Proposed Action/Effect on Transportation Network	
ARLINGTON (LONG BRIDGE APPROACH) (Area 1)				
There are no private grade-separated crossings in this area.				
NORTHERN VIRGINIA (Area 2)				
			Build Alternative:	**2A. Add 1 Track**
Parking Access Private Crossing	RF&P	Roadway Underpass	*Action:*	No action required (existing structure could accommodate improvements)
			Effect:	No effect
Unnamed Private Crossing (Fairfax County)	RF&P	Roadway Underpass	*Action:*	Extend existing rail structure (culvert)
			Effect:	No effect
Marina Way / Occoquan River Private Crossing	RF&P	Roadway Underpass	*Action:*	Extend existing rail structure (bridge over Occoquan River)
			Effect:	No effect
Martin Street Private Crossing (Quantico)	RF&P	Roadway Underpass	*Action:*	No action required (existing structure could accommodate improvements)
			Effect:	No effect
Bauer Road Private Crossing (Quantico)	RF&P	Roadway Underpass	*Action:*	No action required (existing structure could accommodate improvements)
			Effect:	No effect
Wrights Private Crossing	RF&P	Roadway Underpass	*Action:*	Extend existing rail structure (culvert)
			Effect:	No effect
Unnamed Private Crossing (Widewater Road)	RF&P	Roadway Underpass	*Action:*	Extend existing rail structure (culvert)
			Effect:	No effect
Unnamed Private Crossing / Aquia Creek	RF&P	Roadway Underpass	*Action:*	Extend existing rail structure (bridge over Aquia Creek)
			Effect:	No effect
Leeland Road Private Crossing	RF&P	Roadway Underpass	*Action:*	Extend existing rail structure (over creek)
			Effect:	No effect

Table 5-13: Build Alternative Effects on the Transportation Network: Private Grade-Separated Crossings

Crossing	Rail Line	Existing, No Build	Proposed Action/Effect on Transportation Network								
FREDERICKSBURG AREA ALTERNATIVES (Area 3)											
			Build Alternative:	**3A. Maintain Existing**	**3B. Add 1 Track**	**3C. 2-Track East Bypass**					
Unnamed Private Crossing (White Oak Road)	RF&P	Roadway Underpass	*Action:*	No action required (existing structure could accommodate)	Extend existing rail structure	No action required (existing structure could accommodate)					
			Effect:	No effect	No effect	No effect					
Eagle Drive Access Private Crossing	RF&P	Roadway Underpass	*Action:*	No action required (existing structure could accommodate)	Crossing (culvert) assumed to be maintained with improvements	No action required (existing structure could accommodate)					
			Effect:	No effect	No effect	No effect					
CENTRAL VIRGINIA (Area 4)											
			Build Alternative:	**4A. Add 1 Track**							
Unnamed Private Crossing (Harvest Garden)	RF&P	Roadway Underpass	*Action:*	Extend existing rail structure over roadway							
			Effect:	No effect							
ASHLAND AREA (Area 5)											
There are no private grade-separated crossings in this area.											
RICHMOND AREA (Area 6)											
			Build Alternative:	**6A. Staples Mill Only**	**6B–A-Line. Boulevard Rd Only (A-Line)**	**6B–S-Line. Boulevard Rd Station (S-Line)**	**6C. Broad St Only**	**6D. Main St Only**	**6E. Split Service**	**6F. Full Service**	**6G. Shared Service**
Manchester Road Private Crossing	S-Line	Roadway Underpass	*Action:*	*Not Applicable*	*Not Applicable*	Extend rail structure (James River)	*Not Applicable*	Extend rail structure (James River)	*Not Applicable*	Extend rail structure (James River)	Extend rail structure (James River)
			Effect:			No effect		No effect		No effect	No effect
Unnamed Private Crossing (4th Street)	S-Line	Roadway Underpass	*Action:*	*Not Applicable*	*Not Applicable*	No action required (existing structure could accommodate)	*Not Applicable*	No action required (existing structure could accommodate)	*Not Applicable*	No action required (existing structure could accommodate)	No action required (existing structure could accommodate)
			Effect:			No effect		No effect		No effect	No effect
Cogbill Road Private Crossing	S-Line	Roadway Underpass	*Action:*	*Not Applicable*	*Not Applicable*	No action required (existing structure could accommodate)	*Not Applicable*	No action required (existing structure could accommodate)	*Not Applicable*	No action required (existing structure could accommodate)	No action required (existing structure could accommodate)
			Effect:			No effect		No effect		No effect	No effect
Marina Drive Private Crossing	S-Line	Roadway Underpass	*Action:*	*Not Applicable*	*Not Applicable*	No action required (existing structure could accommodate)	*Not Applicable*	No action required (existing structure could accommodate)	*Not Applicable*	No action required (existing structure could accommodate)	No action required (existing structure could accommodate)
			Effect:			No effect		No effect		No effect	No effect

5.3.5 Relevance of Build Alternatives on Quiet Zones (Public At-Grade Crossings)

As discussed in Section 3, a Quiet Zone is a section of rail line that contains one or more consecutive at-grade public crossings at which locomotive horns are not routinely sounded. The Federal Highway Administration (FHWA) handbook[27] on highway-rail crossings defines highway-rail Supplemental and Alternative Safety Measures (SSMs) as engineering improvements that compensate for the absence of the train horn safety requirement at at-grade crossings. SSMs include the following:

- Closure of a highway-rail at-grade crossing. *Closure of an at-grade crossing indicates in this instance closure of the at-grade condition, which would include both grade-separation of the crossing or permanently closing the crossing to vehicular traffic.*
- Four-quadrant gates.
- Gates with traffic channelization arrangements (e.g., non-mountable curb or mountable curb with delineators).

In accordance with the FHWA handbook, if SSMs are "employed at every highway-rail grade crossing in the quiet zone, they automatically qualify the quiet zone (subject to reporting requirements)". The DC2RVA Build Alternatives include SSMs all public existing at-grade crossings. Therefore, because the proposed actions for existing at-grade highway-rail crossings for the DC2RVA Project fully align with the definition of SSMs, this project would not negatively affect the ability of local public authorities to obtain Quiet Zones within their jurisdictions. Because local jurisdictions must initiate and manage the process for implementing Quiet Zones, the noise reduction benefits that derive from removing the requirement for trains to routinely sound horns are dependent on locality actions; the DC2RVA Project would support local jurisdictions should they seek to establish Quiet Zones. FRA Office of Safety authorizes quiet zones on a site-specific basis, which are voluntary by the operating railroad.

Furthermore, DRPT does not anticipate that the DC2RVA Project will adversely affect the existing Quiet Zone designations as safety improvements that qualify as SSMs are proposed at all existing public at-grade crossings, including those with existing Quiet Zone designations that are based on the "grandfather" provision in the regulations, as follows:

- <u>Featherstone Road, Prince William County</u>. The existing condition of this crossing is four-quadrant gates, which is an SSM. The proposed action of the DC2RVA Project at Featherstone Road is no action, which would therefore have no effect on the existing Quiet Zone designation at this location.
- <u>West Patrick Street, Town of Ashland</u>. The proposed action of the DC2RVA Project at the West Patrick Street crossing is four-quadrant gates for all Build Alternatives. Since the proposed action under all conditions is an SSM, there would be no negative effect on the existing Quiet Zone designation at this location
- <u>College Avenue / Henry Clay Street</u>. The proposed action of the DC2RVA Project at the College Avenue / Henry Clay Street crossing is permanent crossing closure in all Build Alternatives that maintain the existing station location within the Town of Ashland, and four-quadrant gates for all Build Alternatives that propose an alternate station location south of Ashcake Road. For closure, the effect on the existing Quiet Zone designation is not necessary as at-grade crossing condition of vehicular traffic would be permanently

removed. For addition of four-quadrant gates, the proposed action is an SSM. Therefore, under all Build conditions, there would be no negative effect on the existing Quiet Zone designation at this location.

- England Street / Thompson Street. The proposed action of the DC2RVA Project at the England Street / Thompson Street crossing is four-quadrant gates for all Build Alternatives. Since the proposed action under all conditions is an SSM, there would be no negative effect on the existing Quiet Zone designation at this location.
- Myrtle Street. The proposed action of the DC2RVA Project at the Myrtle Street crossing is four-quadrant gates for all Build Alternatives. Since the proposed action under all conditions is an SSM, there would be no negative effect on the existing Quiet Zone designation at this location.
- East Francis Street. The proposed action of the DC2RVA Project at the East Francis Street crossing is four-quadrant gates for all Build Alternatives. Since the proposed action under all conditions is an SSM, there would be no negative effect on the existing Quiet Zone designation at this location.

5.3.6 Bicycle and Pedestrian Connectivity

All existing bicycle and pedestrian facilities would be maintained (provided in kind) as part of all DC2RVA Build Alternatives and would be designed to current safety standards. This includes the existing at-grade pedestrian crossings through the Town of Ashland. The 11 at-grade pedestrian crossings in Ashland consist of 3-foot-wide walkways at top of rail, with steps at each end. The pedestrian crossings do not have any train warning protection (e.g., no flashing lights or gates). In addition, the current at-grade pedestrian crossings do not meet *Americans with Disabilities Act* (ADA) requirements. Most of the pedestrian crossings also lack a designated crosswalk leading across Center Street/Railroad Avenue. DC2RVA Build Alternatives that add a track through town would extend existing pedestrian crossings across the new track alignment, as necessary. Opportunities for additional bicycle and pedestrian accessibility improvements, including updates to ADA facilities, would be incorporated during final design in coordination with FRA after the Draft EIS.

The Build Alternatives 6D, 6F, and 6G (Richmond area) at the existing public roadway crossing of St James Street, which is proposed to be closed as part of these conditions, include construction of a new grade-separated pedestrian crossing structure to maintain non-vehicular accessibility.

5.4 CLOSURE DIVERSION ANALYSIS (TRAFFIC OPERATIONS)

Roadway closures can affect more than the closed roadway itself. Closing an existing traffic movement requires vehicles to divert to a different route. This not only affects the vehicles that are diverting, but it also affects the traffic operations and vehicles along the diversion to some degree. This section summarizes the diversion analysis that was conducted on the 14 roadways that were identified in Section 5.3 as requiring further traffic operations analysis to determine the potential effects that the Build Alternative roadway closures would have on the transportation network.

5.4.1 Introduction/Purpose

The analysis of potential diversions and their effects on the transportation network was performed at a level of detail commensurate with the size and varied conditions of the Project's geographic scale, and with the relatively low traffic volumes on the majority of roadways that were identified to be closed. The analysis identified the level of traffic that would need to be diverted as well as the most reasonable diversion routes based on travel times on competing routes. The potential traffic operations effects of the quantified diversions were then assessed at a planning level.

The Build Alternative improvements considered in these localized crossing analyses are either closures of existing public at-grade highway-rail crossings or closures of public roadways located adjacent to the railroad tracks that are required due to engineering of other improvements, as summarized in Table 5-14 below. Of the fourteen roadways, thirteen are existing facilities that are being closed and one is a new crossing of a public roadway on the Ashland bypass alignment.

Table 5-14: Summary of Existing and 2025 No Build Data for Diversion Analysis

Alternative Area[1]	Roadway Name	Build Alternative	Existing/ New	Roadway Type	Milepost	Daily Volumes[2]	
						2015	2025 No Build
Northern Virginia	Mount Hope Church Road	2A	Existing	Crossing	CFP 67.54	214	256
Central Virginia	Colemans Mill Road	4A	Existing	Crossing	CFP 29.70	449	537
Ashland[3]	College Avenue / Henry Clay Road	5A, 5B, and 5C	Existing	Crossing	CFP 14.90	1,326	1,586
	Railroad Avenue / Center Street	5B, 5B–Ashcake, and 5D–Ashcake	Existing	Adjacent	N/A	1,000	1,200
	Independence Road	5C and 5C–Ashcake	New	Crossing	New	949	1,135
Richmond	Bassett Avenue	6A, 6B–A-Line, 6C, 6E	Existing	Crossing	A 1.01	1,399	1,674
	Terminal Avenue	6A, 6B–A-Line, 6C, 6E	Existing	Crossing	A 3.88	683	817
	Thurston Road	6A, 6B–A-Line, 6C, 6E	Existing	Crossing	A 10.00	459	549
	Brinkley Road	6B–S-Line, 6D, 6F, 6G	Existing	Crossing	S 9.83	1,836	2,196
	Old Lane	All Build Alternatives	Existing	Crossing	A 10.74	4,896	5,856
	Ownby Lane	6B–S-Line	Existing	Adjacent	N/A	N/A	N/A
	St James Street	6B–S-Line, 6D, 6F, 6G	Existing	Crossing	SRN 1.75	1,000	1,196
	N 2nd St / Valley Rd	6B–S-Line, 6D, 6F, 6G	Existing	Crossing	SRN 1.60	2,142	2,562
	Dale Ave / Trenton Ave	6B–S-Line, 6D, 6F, 6G	Existing	Crossing	S 4.98	0	0

[1] No closure diversion analysis in Alternative Areas 1 or 3.

[2] The source for all traffic volumes for transportation analyses is the VDOT GIS online database for Annual Average Daily Traffic with Vehicle Classification for 2014 (accessed January 2016). ADT grown to future years; refer to Chapter 4. Note that the Dale Avenue / Trenton Avenue crossing is not open to public traffic in existing conditions.

[3] Within Ashland, Build Alternative 5A–Ashcake do not include any closures of public roadways.

5.4.2 Methodology

The analysis used to assess the potential effects of closing a grade crossing requires several steps to analyze the multiple components of trip making associated with traffic on the crossing road itself, alternative crossing roads, and the network of roads that connect the two. All of the vehicles currently using each crossing that would potentially be closed would divert to other roadways and crossings. The first step in the analysis process, therefore, was to identify plausible alternative routes that these vehicles would take and to then quantify the number of vehicles that would take each of these plausible routes. The second step is to assess the operational effects of the increased traffic on the roadways that make up each of the plausible alternative routes.

Note that the 2015 traffic volumes were rounded for the purposes of this future year analysis.

Step 1: Identification and Quantification of Traffic Diversions

The following key assumptions were used in the traffic diversion analysis (for purposes of this discussion, the crossing that would potentially be closed based on implementation of one or more of the Build Alternatives is termed the "closure crossing"):

- All closures as part of the DC2RVA Build Alternatives are considered crossing consolidations which means that, while all network connectivity and access is maintained, travel routes would change based on the fact that all existing vehicular traffic on the closure crossing would shift to using the closest adjacent roadway crossing. For purposes of the analysis, it is assumed that vehicles diverted from the closure crossing would make use of the closest adjacent crossing(s) using the shortest path.
- Diversions on both sides of the closure crossing (i.e., east and west of the tracks) were included, as well as both upstream and downstream adjacent crossings, as applicable.
- The diversion analysis was conducted separately for each roadway closure. This is important for crossings such as Thurston Road and Brinkley Road in Chesterfield County that, while located on different rail lines, would use similar roadways for potential detours; however, these closures were analyzed separately because they do not occur in the same Build Alternative. The exception to this is for the roadways that are proposed to be concurrently closed (i.e., within the same Build Alternative) in the Town of Ashland.

Estimates of traffic using the roadway network were made using the following process:

1. Traffic volumes using each closure crossing were determined using VDOT's estimates of daily traffic data for 2014. For select locations where new traffic counts were performed[28], the data from the 2016 traffic counts were used instead. All traffic volumes were adjusted to reflect a common year of 2015.
2. Travel patterns (where motorists are coming from and going to) within an analysis area[29] were estimated based on No Build conditions (crossing remains open to traffic) using a simplified process as follows[30]:
   - Estimates of where traffic at the closure crossing is coming from was based on the relative volume of roads "upstream" of the crossing. For example, if two roads connect to the closure crossing and the daily traffic volume on Road "A" is twice that on Road "B", it was assumed that two out of every three vehicles at the crossing came from Road "A" with the remainder coming from Road "B". A similar but mirror process

was used for the "downstream" end of the crossing to determine the amount of traffic using the crossing that would end up at the potential destination roads.

- For trips generated by land uses within the analysis area of the closure crossing, a generalized trip generation process was used to determine the relative number of trips generated within the analysis area. Because the controlling factor with respect to total trips is the amount of traffic at the closure crossing, this process provided the ability to assess locations within the analysis area that are likely to produce relatively more of the trips using the closure crossing and, similarly, locations within the analysis area that are likely to produce fewer of the trips using the closure crossing.

The results of this simplified process were generalized estimates of where trips using the closed crossing are likely to start and end their trips (in relative terms within the analysis area). In most cases, the start and/or end of the trips are simply where the road crosses the edge of the analysis area as almost no trips would be short enough to take place entirely within the analysis area. Estimating where trips using the closed crossing start and end (relative to the analysis area) then provided information to determine which alternative crossing a motorist was most likely to use and to add the appropriate number of vehicles to the alternative crossing location and to the roads that connect to the alternative crossing. For locations where there is only one logical alternative to the closed crossing, the level of analysis is greatly simplified.

The process described above provided an estimate of traffic on the roads that connect to the closure crossings under No Build conditions. An estimate of travel paths under Build conditions was then made by routing traffic to the roadway segments that connect to the alternative crossings (the "detour route"). The result was daily traffic estimates of traffic volumes on the roadways that make up these detour routes[31].

Methodology Used for Ashland. Because detoured traffic from each of the closure crossings in Ashland is anticipated to use the same set of adjacent crossings, it was necessary for the detour analysis to address the closures in combination. Therefore, within the Town of Ashland, a small traffic assignment model was developed to analyze the closure diversions. This model incorporates the same logic as the analyses performed at other crossings (shortest distance paths, diversions on both sides of the railroad tracks, etc.) but also automates calculations of total traffic on all roadway segments through the use of a computerized model (using the Cube Voyager software). The advantage of using a computerized model within the grid street system in a more urbanized area is that it enables the consideration of a greater number of detour routes. In addition, within the Town of Ashland, the Build Alternatives have one of three have identical roadway closures:

- Ashland, Close College Avenue Crossing:
  - Build Alternative 5A
  - Build Alternative 5C
- Ashland, Close Center Street (South of England Street to Maiden Lane):
  - Build Alternative 5D–Ashcake
  - Build Alternative 5B–Ashcake
- Ashland, Close College Avenue Crossing and Close Center Street (South of England Street to Maiden Lane):
  - Build Alternative 5B

Accordingly, three sets of Ashland diversion analyses were conducted and are presented within the closure diversion results in this section. The closure of Independence Road along the bypass alignment was analyzed separately as it is not located within the same vicinity as the above.

Step 2: Traffic Operations Analysis

The second step of the analysis process was to assess the operational effects of the increased traffic on the roadways that make up each of the detour routes. The input to this step is the daily traffic estimates as described above for both No Build and Build conditions. A generalized planning approach was used to identify the operational effects of the detours for both roadway segments and intersections.

Operations Analysis on Roadway Segments. For roadway segments, lookup tables based on the Highway Capacity Manual[32] and the Transit Capacity and Quality of Service Manual33 (as compiled by the Florida Department of Transportation, Systems Planning Office) were used to identify Level of Service (LOS) values. The lookup values are included in the Quality/ Level of Service Handbook published on the Florida Department of Transportation website[34].

The roadway segment LOS was determined by comparing the daily volumes for each condition (existing, No Build, and Build) against general thresholds for daily capacity in the *Quality/ Level of Service Handbook* tables. Specific inputs and other considerations for this analysis include:

- The *Quality/ Level of Service Handbook* has thresholds for urban and rural areas. For this analysis, the following roadways were categorized as urban: Bassett Avenue and St James Street in Richmond, and all roadways within the Ashland area. All other locations analyzed for potential crossing closures were categorized as rural.
- The *Quality/ Level of Service Handbook* tables also account for the following facility-specific characteristics which were verified from aerial imagery:
  - Interrupted or Uninterrupted flow. Flow was characterized based on type of traffic control device(s) along the facility; signal controlled intersections on the facility were considered interrupted flow.
  - Speed Limit (urban only). The average speed limit along the facility (two-way).
  - Number of lanes. The total number of through lanes (two-way).

Operations Analysis on at Intersections. For the analysis of intersections, the Critical Lane Volume (CLV) methodology was used. The CLV method is a proven industry method for determining whether or not an intersection has sufficient capacity; it uses planning-level data to identify the extent to which existing or planned traffic volumes going through an intersection correspond to the overall capacity. Unlike Highway Capacity Manual (HCM) methodologies[35] which assess operations for each lane group/approach before aggregating to the overall intersection, CLV analysis develops an overall critical lane volume and compares it to a critical volume representing the capacity of the intersection. The value of CLV analysis is that it is largely independent of many variables that are either unknown or in flux; these include specific intersection control (signal vs. stop sign), signal phasing and timing, lane widths and turn bay lengths, etc. Since these details are often not appropriate or available for long-range planning efforts, including environmental impact analyses, CLV is a useful tool for these types of efforts as it focuses on identifying geometric needs (number of lanes) over the long term as opposed to focusing on details such as signal timing, phasing, turn bay lengths, etc. Multiple agencies, including Maryland State Highway Administration and Montgomery County, Maryland Department of Transportation use CLV for long-range planning because of its focus on overall capacity and the fact that it obviates the need for analysts to make assumptions on intersection details that are simply not known for many projects that are long-range in nature and/or in the planning stages.

The CLV methodology requires estimates for each turning movement at the intersection for the peak traffic hour. The initial step in developing these peak hour turning movement volumes was to estimate turns on a daily basis for the No Build conditions. These daily turning movements were estimated using initial assumptions for turning percentages for each leg of an intersection (40 percent through, 20 percent left, 20 percent right) and then, through an iterative balancing process, these percentages were modified to reflect the volumes on each leg of the intersection. The daily turn movements were then converted into single peak hour turn volumes using an assumed ratio of peak to daily traffic of 0.10. For sparsely populated rural areas, the directional split on roadways was assumed to be 51%/49% while the directional split in suburban areas was assumed to be 60%/40%.

The steps in the previous paragraph describe the process for estimating peak hour turning movement volumes for the No Build conditions. Because traffic being detoured based on crossing closures in the Build conditions would affect intersection on the detour routes only on certain legs and for certain movements, the increase in traffic at intersections resulting from a crossing closure was separately added to the No Build turning movement estimates for the specific movements that would be changed based on the Build condition.

For the DC2RVA Project, different CLV thresholds were established for rural, suburban, and urban intersections to capture the design and operating conditions that affect intersection capacity. For these analyses, the following classifications were used:

- Rural: Mount Hope Church Road; Colemans Mill Road; and Independence Road
- Suburban: Bassett Avenue; Thurston Road; Brinkley Road; and Old Lane
- Urban: All Ashland area intersections; and St James Street in downtown Richmond

Additionally, DRPT considered three threshold criteria: the outcome of the CLV method for these analyses is a simple "under capacity", "near capacity", or "over capacity" determination, the latter which identifies intersections that may be approaching but not yet exceeding capacity. The intersection capacity analyses are intended to correlate to Level of Service (LOS) in the following general terms:

- Under capacity represents LOS A /B conditions
- Near capacity represents LOS C /D conditions
- Over capacity represents LOS E /F conditions

While the intersection capacity results presented within this technical report use the under/near/over capacity terminology, the associated results within the Draft EIS report the associated LOS conditions, as defined above, for consistency with the roadway results.

Table 5-15 summarizes the thresholds identified and applied for the DC2RVA planning analyses:

Table 5-15: Critical Lane Volume Thresholds (DC2RVA Project)

Capacity Level		Rural	Suburban	Urban
Under	From	0	0	0

Table 5-15: Critical Lane Volume Thresholds (DC2RVA Project)

Capacity Level		Rural	Suburban	Urban
	To	1,150	1,230	1,530
Near	From	1,151	1,231	1,531
	To	1,350	1,450	1,800
Over	Greater than	1,350	1,450	1,800

Assumptions:
"Under" is 85% of threshold, "near" is 85% to 100% of threshold.
Sources for derivation of DC2RVA thresholds:

- Rural, suburban, urban: Interpolated from thresholds used by Montgomery County, Maryland *http://www.montgomeryplanning.org/transportation/latr_guidelines/documents/LATR-TPARGuidelinesFINAL.pdf*
- Under/near/over ratios: Signalized Intersections: Informational Guide, Federal Highway Administration, Publication FHWA-HRT-04-091, *https://www.fhwa.dot.gov/publications/research/safety/04091/04091.pdf*

5.4.3 Results by Closure Location

The results of these two evaluations as described above are presented below by each closure location. Two tables are presented for each closure:

- A table that summarizes the existing (2015) and future 2025 No Build and Build daily traffic[36] and associated LOS for each roadway along the diversion route.
- A table that summarizes the existing and future No Build and Build intersection capacity. The total volume (Total Vol) and the critical lane volume (CLV) are included.

Stick diagrams that show the closure, diversion network, and 2025 No Build and Build volumes (vehicles per day, VPD) are presented within each section.

CLOSURE DIVERSION ANALYSIS RESULTS: MOUNT HOPE CHURCH ROAD, STAFFORD COUNTY

The existing at-grade crossing of Mount Hope Church Road is proposed to be closed as part of Build Alternative 2A. The closure of this crossing would include construction of a new road northeast of the rail line; this connector road would generally parallel the railroad tracks to connect Mount Hope Church Road and Andrew Chapel Road (VA 629). The Andrew Chapel Road crossing, which is grade-separated, is located approximately one half-mile to the northeast of Mount Hope Church Road. The Mount Hope Church Road crossing is projected to carry approximately 300 VPD for 2025 No Build conditions. For 2025 Build conditions, the vehicles currently using the Mount Hope Church Road crossing would use the proposed connector road to connect to destinations accessed by Andrew Chapel Road and Brooke Road, as shown in Figure 5-19 below.

The diversion analysis indicates a minimal effect on the total traffic using the Andrew Chapel Road crossing over the course of a day. This is because the new connector road creates a shift in travel patterns and certain vehicle trips would no longer need to use a crossing under Build conditions (i.e., there is not a one-to-one “replacement” of No Build Mount Hope Church Road crossings to new Andrew Chapel Road crossings); this is evident in the decreased trips on Brooke Road in Build conditions. Table 5-16 summarizes the predicted shift in traffic volumes and associated effects on roadway LOS in the adjacent roadway network due to the crossing consolidation. The diversion analysis results indicate that the closure of the Mount Hope Church

Road crossing would have minimal effect on the LOS of the adjacent roadways. All roadways are projected to operate at LOS A or B in 2015 and both 2025 No Build and Build conditions.

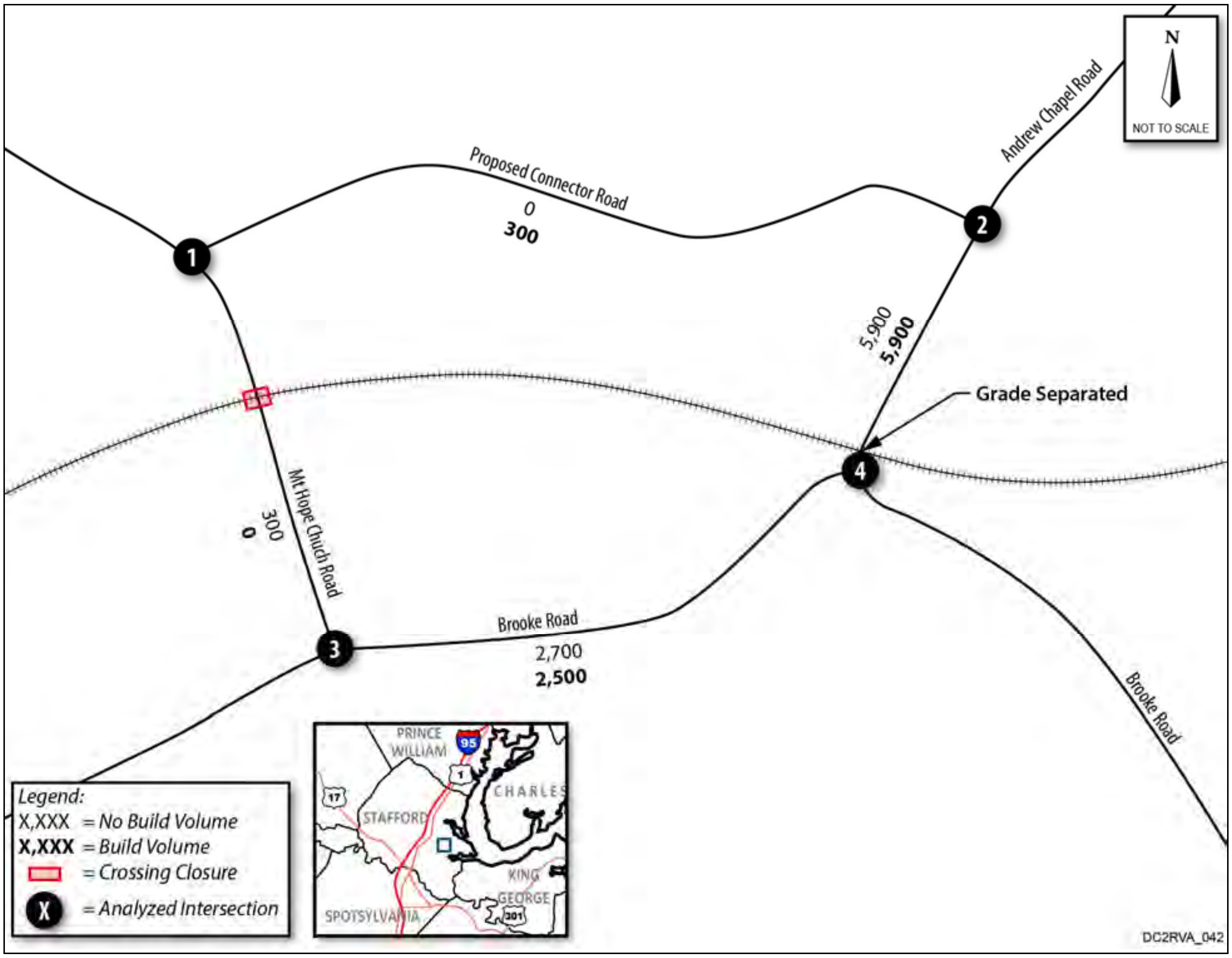

Figure 5-19: Closure Diversion 2025 Volumes, Mount Hope Church Road, Build Alternative 2A

Table 5-16: Diversion Route Roadway Analysis: Mount Hope Church Road

Roadway	Limits		2015		2025			
					No Build		Build	
			ADT	LOS	ADT	LOS	ADT	LOS
Proposed Connector Road	Mount Hope Church Road	Andrew Chapel Road	0	-	0	-	300	A
Andrew Chapel Road	Proposed Connector Road	Brooke Road	4,900	B	5,900	B	5,900	B
Brooke Road	Mount Hope Church Road	Andrew Chapel Road	2,200	A	2,700	A	2,500	A
Mount Hope Church Road	Proposed Connector Road	Brooke Road	200	A	300	A	0	-

Table 5-17 summarizes the relative capacities of the intersections along the diversion route. The analysis indicates that the closure would have minimal effect on intersection capacity near Mount Hope Church Road; 2015 and both 2025 No Build and Build intersections are projected to operate under capacity (generally equivalent to LOS A/B).

Table 5-17: Intersection Capacity Analysis: Mount Hope Church Road

Intersection	Map Key *(Figure 5-19)*	2015			2025						
					No Build			Build			CLV Diff
		Total Vol	CLV / *Capacity*		Total Vol	CLV / *Capacity*		Total Vol	CLV / *Capacity*		
Proposed New Road and Mt. Hope Church Rd	1	22	13	*Under*	27	16	*Under*	27	27	*Under*	41%
Proposed New Road and Andrew Chapel Rd	2	532	319	*Under*	640	384	*Under*	653	403	*Under*	5%
Brooke Rd and Mt. Hope Church Rd	3	214	127	*Under*	260	154	*Under*	236	141	*Under*	-9%
Brooke Rd and Andrew Chapel Rd	4	468	385	*Under*	565	465	*Under*	558	454	*Under*	-2%

CLOSURE DIVERSION ANALYSIS RESULTS: COLEMANS MILL ROAD, CAROLINE COUNTY

The existing at-grade crossing of Colemans Mill Road is proposed to be closed as part of Build Alternative 4A by consolidating it with the existing grade-separated crossing at Dry Bridge Road, which is located approximately 1 mile south of the Colemans Mill Road crossing. The Colemans Mill Road crossing is projected to carry approximately 500 vehicles for 2025 No Build conditions. For 2025 Build conditions, the vehicles using the existing Colemans Mill Road crossing would use Rogers Clark Boulevard to the west of the rail corridor and Dry Bridge Road to the east, as shown in Figure 5-20.

Table 5-18 summarizes the predicted shift in traffic volumes and associated effects on LOS in the adjacent roadway network due to the crossing consolidation. The diversion analysis results indicate that while daily volumes along the adjacent roadways are projected to increase to accommodate the diverted vehicles, the closure of the Colemans Mill crossing would have minimal effect on the LOS of the adjacent roadways. All roadways are projected to operate at LOS A in 2015 and both 2025 No Build and Build conditions.

Table 5-19 summarizes the relative capacities of the intersections along the diversion routes. The analysis indicates that the closure would have minimal effect on the capacities of intersections near Colemans Mill Road; 2015 and both 2025 No Build and Build intersections are projected to operate under capacity at this location (generally equivalent to LOS A/B).

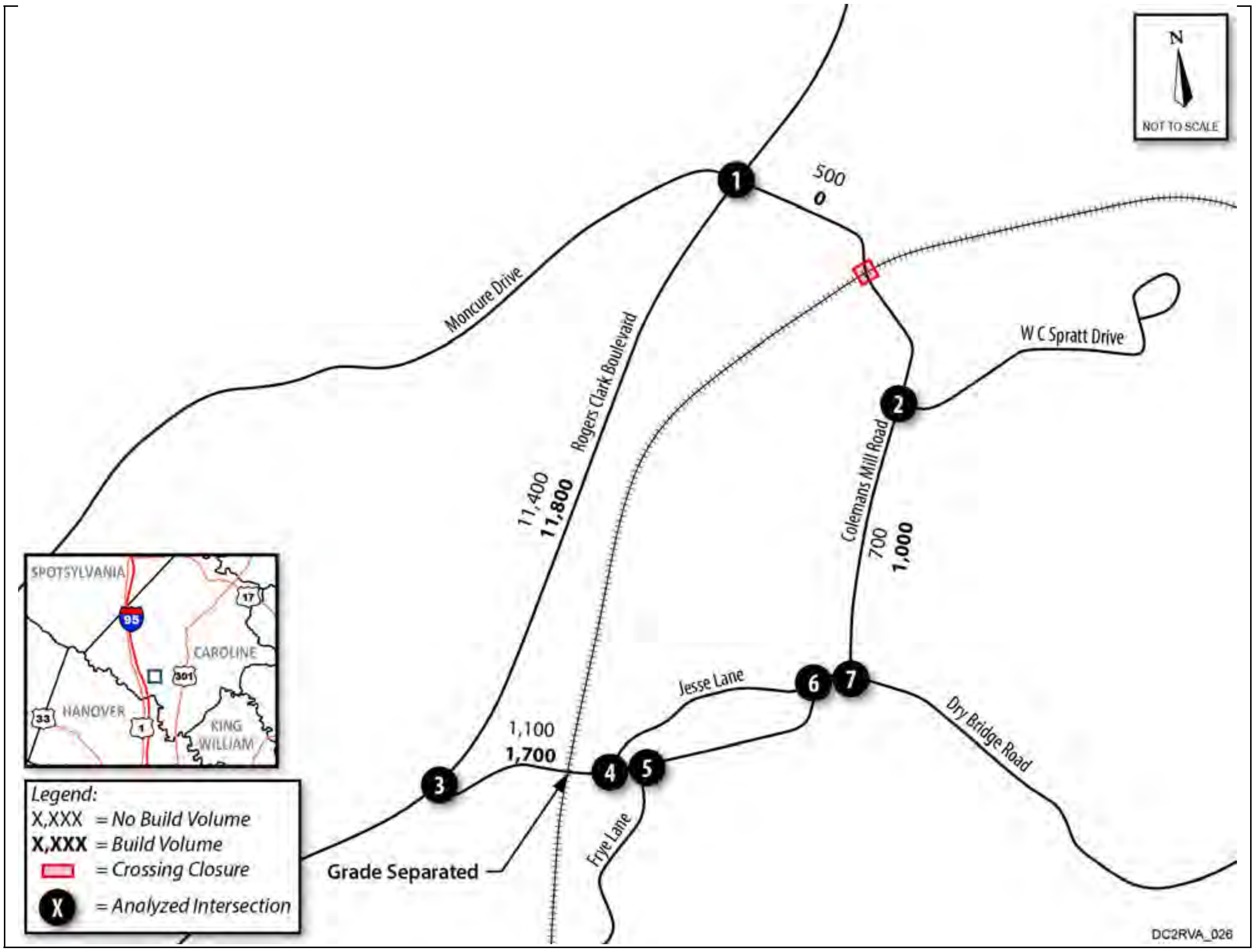

Figure 5-20: Closure Diversion 2025 Volumes, Colemans Mill Road, Build Alternative 4A

Table 5-18: Diversion Route Roadway Analysis: Colemans Mill Road

Roadway	Limits		2015		2025			
					No Build		Build	
			ADT	LOS	ADT	LOS	ADT	LOS
Colemans Mill Road	Roger Clark Boulevard	W C Spratt Drive	400	A	500	A	0	-
Colemans Mill Road	W C Spratt Drive	Dry Bridge Road	600	A	700	A	1,000	A
Dry Bridge Road	Rogers Clark Boulevard	Jesse Lane	900	A	1,100	A	1,700	A
Rogers Clark Boulevard	Moncure Drive	Dry Bridge Road	9,500	A	11,400	A	11,800	A

Table 5-19: Intersection Capacity Analysis: Colemans Mill Road

Intersection	Map Key (Figure 5-20)	2015			2025						
					No Build			Build			CLV Diff
		Total Vol	CLV / *Capacity*		Total Vol	CLV / *Capacity*		Total Vol	CLV / *Capacity*		
Moncure Drive at Rogers Clark Boulevard	1	837	247	*Under*	1,008	299	*Under*	998	283	*Under*	-6%
W C Spratt Drive at Colemans Mill Road	2	111	106	*Under*	135	129	*Under*	123	123	*Under*	-5%
Dry Bridge Road at Rogers Clark Boulevard	3	847	266	*Under*	1,018	320	*Under*	1,065	369	*Under*	13%
Dry Bridge Road at Jesse Lane	4	98	52	*Under*	122	66	*Under*	185	99	*Under*	33%
Dry Bridge Road at Frye Lane	5	98	53	*Under*	124	69	*Under*	179	97	*Under*	29%
Jesse Lane at Dry Bridge Road	6	89	48	*Under*	114	63	*Under*	163	86	*Under*	27%
Dry Bridge Road at Colemans Mill Road	7	97	63	*Under*	124	80	*Under*	161	123	*Under*	35%

CLOSURE DIVERSION ANALYSIS RESULTS: TOWN OF ASHLAND, CLOSE COLLEGE AVENUE CROSSING (BUILD ALTERNATIVES 5A AND 5C)

These two Build Alternatives result in a single closure: the College Avenue / Henry Clay Road crossing as a part of the station improvements in the Town of Ashland (i.e., the extension of the platform across College Avenue / Henry Clay Road). The analysis area through the Town of Ashland is shown in Figure 5-21 and includes a total of 24 roadway segments. By 2025, Henry Clay Road at the railroad crossing is projected to carry up to 1,600 VPD.

Table 5-20 summarizes the predicted shift in traffic to the immediately adjacent roadway network as well as the effect of these shifts on the LOS. England Street (N Center Street to Henry Street) and Thompson Street (N James Street to N Center Street) are projected to carry the greatest increase in daily traffic due to the closure, with an additional 800 VPD in Build conditions. The diversion analysis results indicate that the 2025 Build condition closure would result in reduced LOS along one roadway as described below (this location is highlighted in gray in the table):

- Thompson Street, between N James Street and N Center Street, is projected to drop from operating at LOS D (with 14,600 daily vehicles) in 2025 No Build to LOS E (with 15,400 daily vehicles) in 2025 Build.

While certain segments of Route 1 and England Street are projected to experience reduced LOS by 2025 No Build conditions as compared to 2015, these reductions are due to background growth in traffic and not due to the DC2RVA Project; the LOS between 2025 No Build and 2025 Build conditions are equivalent at these locations.

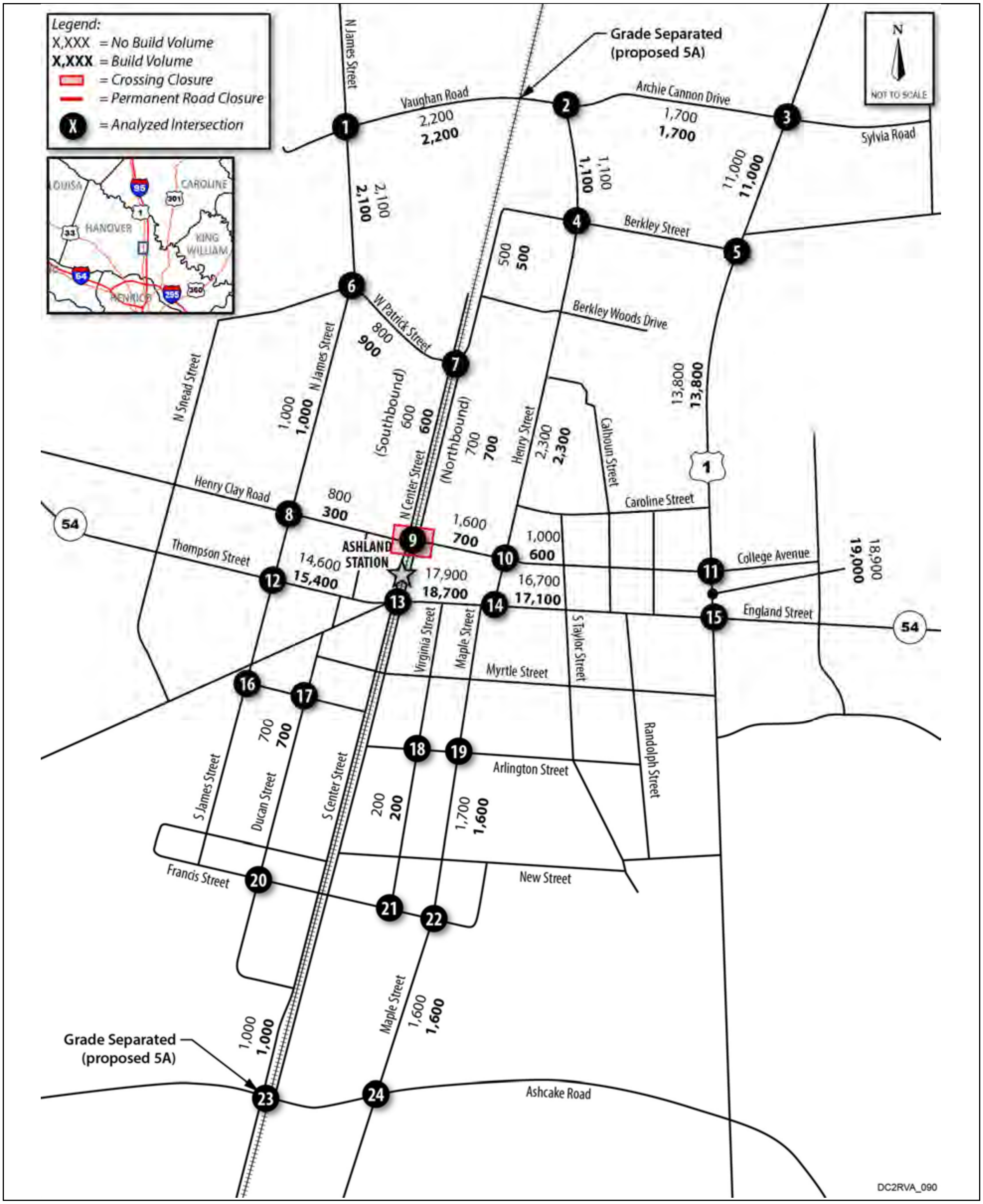

Figure 5-21: Closure Diversion 2025 Volumes, Town of Ashland, Build Alternatives 5A & 5C

Table 5-20: Diversion Route Roadway Analysis: Build Alternatives 5A and 5C

Roadway	Limits		2015		2025			
					No Build		Build	
			ADT	LOS	ADT	LOS	ADT	LOS
Vaughan Road	N James Street	Archie Cannon Drive	1,800	A	2,200	A	2,200	A
Archie Cannon Drive	Henry Street	Route 1	1,400	A	1,700	A	1,700	A
Route 1	Archie Cannon Drive	Berkley Street	9,200	B	11,000	B	11,000	B
Route 1	Berkley Street	Caroline Street	11,500	B	13,800	C	13,800	C
Route 1	College Avenue	England Street	15,800	B	18,900	C	19,000	C
Henry Street	Archie Cannon Drive	Berkley Street	900	A	1,100	A	1,100	A
Henry Street	Calhoun Street	Caroline Street	1,900	A	2,300	A	2,300	A
N Center Street (northbound)	Berkley Street	Berkley Woods Drive	400	A	500	A	500	A
N Center Street (northbound)	Berkley Woods Drive	College Avenue	500	A	700	A	700	A
College Avenue	Henry Street	S Taylor Street	800	A	1,000	A	600	A
College Avenue	N Center Street	Henry Street	1,400	A	1,600	A	700	A
England Street	Henry Street	S Taylor Street	13,900	D	16,700	F	17,100	F
England Street	N Center Street	Henry Street	14,900	D	17,900	F	18,700	F
Virginia Street	Arlington Street	New Street	200	A	200	A	200	A
Maple Street	Arlington Street	New Street	1,400	A	1,700	A	1,600	A
Maple Street	Francis Street	Ashcake Road	1,400	A	1,600	A	1,600	A
S Center Street	Early Street	Ashcake Road	900	A	1,000	A	1,000	A
Duncan Street	Hanover Ave	Francis Street	600	A	700	A	700	A
Thompson Street	N James Street	N Center Street	12,100	D	14,600	D	15,400	E
Henry Clay Road	N James Street	N Center Street	700	A	800	A	300	A
N James Street	Vaughan Road	W Patrick Street	1,800	A	2,100	A	2,100	A
N James Street	W Patrick Street	Henry Clay Road	800	A	1,000	A	1,000	A
N Center Street (southbound)	W Patrick Street	Henry Clay Road	500	A	600	A	600	A
W Patrick Street	N James Street	N Center Street	700	A	800	A	900	A

Note: Gray highlight represents location(s) where LOS is projected to decrease between No Build and Build conditions.

Table 5-21 summarizes the relative capacities of the intersections along the diversion routes. The analysis indicates that the 2025 Build condition closures would affect the capacity at one intersection as described below (this location is highlighted in gray in the table):

- Thompson/England Street at Center Street, which is the primary intersection in the center of the Town of Ashland, is projected to operate near capacity (generally equivalent to LOS C/D) during Build conditions, compared to under capacity (generally equivalent to LOS A/B) during 2025 No Build conditions.

While two other intersections along England Street are projected to experience reduced capacity by 2025 No Build conditions as compared to 2015, these reductions are due to background growth in traffic and not due to the DC2RVA Project; the capacity between 2025 No Build and 2025 Build conditions are equivalent at these locations.

Table 5-21: Intersection Capacity Analysis: Build Alternatives 5A and 5C

Intersection	**Map Key (Figure 5-21)**	**2015**			**2025**						
					No Build			**Build**			**CLV Diff**
		Total Vol	**CLV /**	***Capacity***	**Total Vol**	**CLV /**	***Capacity***	**Total Vol**	**CLV /**	***Capacity***	
Vaughan Road at N James Street	1	507	407	*Under*	612	491	*Under*	614	493	*Under*	0%
Vaughan Road/Archie Cannon Drive at Henry Street	2	383	282	*Under*	466	343	*Under*	466	343	*Under*	0%
Archie Cannon Drive at Route 1	3	1344	546	*Under*	1618	658	*Under*	1619	658	*Under*	0%
Berkley Street at Henry Street	4	341	269	*Under*	414	324	*Under*	415	326	*Under*	1%
Berkley Street at Route 1	5	1252	444	*Under*	1507	537	*Under*	1510	538	*Under*	0%
Patrick Street at N James Street	6	537	429	*Under*	649	518	*Under*	654	508	*Under*	-2%
Patrick Street at Center Street	7	413	319	*Under*	501	386	*Under*	500	384	*Under*	-1%
Henry Clay Road at N James Street	8	233	152	*Under*	281	182	*Under*	255	178	*Under*	-2%
Henry Clay Road/College Avenue at Center Street	9	452	367	*Under*	548	444	*Under*	469	249	*Under*	-78%
College Avenue at Henry Street	10	610	388	*Under*	737	468	*Under*	694	404	*Under*	-16%
College Avenue at Route 1	11	2081	702	*Under*	2503	844	*Under*	2485	851	*Under*	1%
Thompson Street at James Street	12	1418	851	*Under*	1707	1024	*Under*	1823	1121	*Under*	9%
Thompson Street/England Street at Center Street	13	1999	1220	*Under*	2,405	1467	*Under*	2534	1594	*Near*	8%
England Street at Henry Street	14	2101	1305	*Under*	2,524	1567	*Near*	2646	1670	*Near*	6%
England Street at Route 1	15	4054	1446	*Under*	4,873	1739	*Near*	4895	1750	*Near*	1%
Stebbins Street at S James Street	16	56	56	*Under*	68	66	*Under*	71	69	*Under*	4%
Stebbins Street at Duncan Street	17	175	120	*Under*	213	145	*Under*	214	146	*Under*	1%
Arlington Street at Virginia Street	18	104	81	*Under*	129	101	*Under*	129	101	*Under*	0%
Arlington Street at Maple Street	19	350	236	*Under*	424	285	*Under*	426	287	*Under*	1%
W Francis Street at Duncan Street	20	139	69	*Under*	170	83	*Under*	170	80	*Under*	-4%
E Francis Street at Virginia Street	21	53	48	*Under*	64	58	*Under*	64	58	*Under*	0%
E Francis Street at Maple Street	22	275	187	*Under*	331	225	*Under*	333	227	*Under*	1%
Ashcake Road at Center Street	23	1206	743	*Under*	1456	895	*Under*	1455	894	*Under*	0%
Ashcake Road at Maple Street	24	1265	712	*Under*	1524	858	*Under*	1524	858	*Under*	0%

Note: Gray highlight represents location(s) where LOS is projected to decrease between No Build and Build conditions.

CLOSURE DIVERSION ANALYSIS RESULTS: TOWN OF ASHLAND, CLOSE PORTION OF CENTER STREET / RAILROAD AVENUE (BUILD ALTERNATIVES 5B–ASHCAKE AND 5D–ASHCAKE)

Build Alternatives 5B–Ashcake and 5D–Ashcake result the same single public roadway closure in the Town of Ashland: the closure of Railroad Avenue / Center Street (on the east side of the tracks, between England /Thompson Street and Maiden Lane) due to conflicts with the addition of the 3rd track. The analysis area is shown in Figure 5-22. By 2025, Railroad Avenue / Center Street is projected to carry up to 1,200 daily vehicles, south of England Street.

Table 5-22 summarizes the predicted shift in traffic volumes and associated effects on roadway LOS in the adjacent roadway network due to the crossing consolidation. Despite general increases in daily traffic across the network, the diversion analysis results indicate that the closure of the portion of Railroad Avenue / Center Street between England Street and Maiden Lane would have minimal effect on the LOS of the adjacent roadways. While certain segments of Route 1 and England Street are projected to experience reduced LOS by 2025 No Build conditions as compared to 2015, these reductions are due to background growth in traffic and not due to the DC2RVA Project; the LOS between 2025 No Build and 2025 Build conditions are equivalent at these locations.

Table 5-22: Diversion Route Roadway Analysis: Build Alternative 5B-Ashcake & 5D-Ashcake

Roadway	Limits		2015		2025			
					No Build		Build	
			ADT	LOS	ADT	LOS	ADT	LOS
Vaughan Road	N James Street	Archie Cannon Drive	1,800	A	2,200	A	2,200	A
Archie Cannon Drive	Henry Street	Route 1	1,400	A	1,700	A	1,700	A
Route 1	Archie Cannon Drive	Berkley Street	9,200	B	11,000	B	11,000	B
Route 1	Berkley Street	Caroline Street	11,500	B	13,800	C	13,800	C
Route 1	College Avenue	England Street	15,800	C	18,900	C	18,900	C
Henry Street	Archie Cannon Drive	Berkley Street	900	A	1,100	A	1,100	A
Henry Street	Calhoun Street	Caroline Street	1,900	A	2,300	A	2,300	A
N Center Street (northbound)	Berkley Street	Berkley Woods Drive	400	A	500	A	400	A
N Center Street (northbound)	Berkley Woods Drive	College Avenue	500	A	700	A	600	A
College Avenue	Henry Street	S Taylor Street	800	A	1,000	A	1,000	A
College Avenue	N Center Street	Henry Street	1,400	A	1,600	A	1,600	A
England Street	Henry Street	S Taylor Street	13,900	D	16,700	F	16,700	F
England Street	N Center Street	Henry Street	14,900	D	17,900	F	17,700	F
Virginia Street	Arlington Street	New Street	200	A	200	A	200	A
Maple Street	Arlington Street	New Street	1,400	A	1,700	A	1,800	A
Maple Street	Francis Street	Ashcake Road	1,400	A	1,600	A	1,700	A
S Center Street	Early Street	Ashcake Road	900	A	1,000	A	1,100	A
Duncan Street	Hanover Ave	Francis Street	600	A	700	A	800	A
Thompson Street	N James Street	N Center Street	12,100	D	14,600	D	14,500	D
Henry Clay Road	N James Street	N Center Street	700	A	800	A	800	A
N James Street	Vaughan Road	W Patrick Street	800	A	1,000	A	1,000	A
N James Street	W Patrick Street	Henry Clay Road	1,800	A	2,100	A	2,100	A
N Center Street (southbound)	W Patrick Street	Henry Clay Road	500	A	600	A	600	A
W Patrick Street	N James Street	N Center Street	700	A	800	A	800	A

Table 5-23 summarizes the relative capacities of the intersections along the diversion route. The results indicate that the closure of Railroad Avenue / Center Street would have minimal effect on intersection capacity near the closure. While the intersection of England Street and Route 1 and the intersection of England Street and Henry Street are projected to experience reduced capacity by 2025 No Build conditions as compared to 2015, the reduction is due to background growth in traffic and not due to the DC2RVA Project; the capacity between 2025 No Build and 2025 Build conditions is equivalent at these locations.

Table 5-23: Intersection Capacity Analysis: Build Alternative 5B-Ashcake and 5D-Ashcake

Intersection	**Map Key**	**2015**			**2025**						
					No Build			**Build**			**CLV Diff**
	(Figure 5-22)	**Total Vol**	**CLV /**	***Capacity***	**Total Vol**	**CLV /**	***Capacity***	**Total Vol**	**CLV /**	***Capacity***	
Vaughan Road at N James Street	1	507	407	*Under*	612	491	*Under*	612	491	*Under*	0%
Vaughan Road/Archie Cannon Drive at Henry Street	2	383	282	*Under*	464	341	*Under*	464	341	*Under*	0%
Archie Cannon Drive at Route 1	3	1344	546	*Under*	1618	658	*Under*	1618	658	*Under*	0%
Berkley Street at Henry Street	4	341	269	*Under*	413	325	*Under*	413	325	*Under*	0%
Berkley Street at Route 1	5	1252	444	*Under*	1506	536	*Under*	1507	537	*Under*	0%
Patrick Street at N James Street	6	537	429	*Under*	647	516	*Under*	647	516	*Under*	0%
Patrick Street at Center Street	7	413	319	*Under*	500	384	*Under*	498	384	*Under*	0%
Henry Clay Road at N James Street	8	233	152	*Under*	281	182	*Under*	281	182	*Under*	0%
Henry Clay Road/College Avenue at Center Street	9	452	367	*Under*	550	446	*Under*	539	435	*Under*	-3%
College Avenue at Henry Street	10	610	388	*Under*	738	469	*Under*	738	460	*Under*	-2%
College Avenue at Route 1	11	2081	702	*Under*	2504	844	*Under*	2505	845	*Under*	0%
Thompson Street at James Street	12	1418	851	*Under*	1708	1024	*Under*	1704	1020	*Under*	0%
Thompson Street/England Street at Center Street	13	1999	1220	*Under*	2406	1468	*Under*	2260	1451	*Under*	-1%
England Street at Henry Street	14	2101	1305	*Under*	2526	1569	*Near*	2523	1582	*Near*	1%
England Street at Route 1	15	4054	1446	*Under*	4874	1738	*Near*	4877	1731	*Near*	0%
Stebbins Street at S James Street	16	56	56	*Under*	68	66	*Under*	86	84	*Under*	21%
Stebbins Street at Duncan Street	17	175	120	*Under*	213	146	*Under*	248	182	*Under*	20%
Arlington Street at Virginia Street	18	104	81	*Under*	133	105	*Under*	307	269	*Under*	61%
Arlington Street at Maple Street	19	350	236	*Under*	428	287	*Under*	475	285	*Under*	-1%
W Francis Street at Duncan Street	20	139	69	*Under*	169	82	*Under*	189	89	*Under*	8%
E Francis Street at Virginia Street	21	53	48	*Under*	65	59	*Under*	69	63	*Under*	6%
E Francis Street at Maple Street	22	275	187	*Under*	332	226	*Under*	336	213	*Under*	-6%
Ashcake Road at Center Street	23	1206	743	*Under*	1454	893	*Under*	1462	906	*Under*	1%
Ashcake Road at Maple Street	24	1265	712	*Under*	1523	857	*Under*	1530	855	*Under*	0%

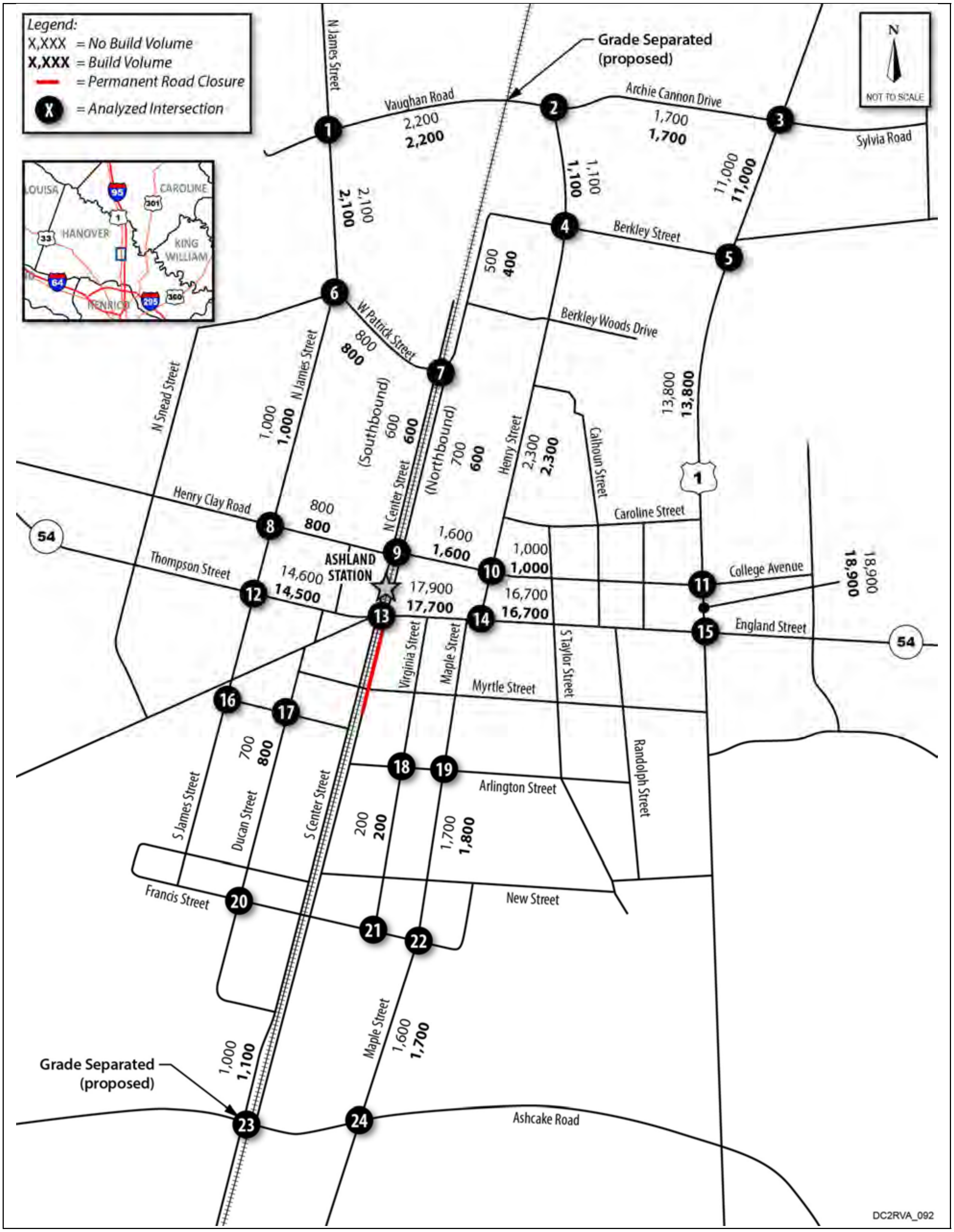

Figure 5-22: Closure Diversion 2025 Volumes, Town of Ashland, Build Alternatives 5B–Ashcake and 5D–Ashcake

CLOSURE DIVERSION ANALYSIS RESULTS: TOWN OF ASHLAND, CLOSE COLLEGE AVENUE CROSSING AND CLOSE PORTION OF CENTER STREET / RAILROAD AVENUE (BUILD ALTERNATIVE 5B)

Build Alternative 5B results in the following set of concurrent closures through the Town of Ashland: the closure of the College Avenue / Henry Clay Road crossing due to conflicts with the station platform improvements; and the closure of Railroad Avenue / Center Street (on the east side of the tracks, between England / Thompson Street and Maiden Lane) due to conflicts with the addition of the third track. The analysis area is shown in Figure 5-23 and includes a total of 24 roadway segments.

By 2025, College Avenue / Henry Clay Road is projected to carry up to 1,600 VPD at the crossing and Center Street / Railroad Avenue is projected to carry up to 1,200 daily vehicles, south of England Street.

Table 5-24 summarizes the predicted shift in traffic and associated effects on LOS due to the roadway closures throughout the Town of Ashland in Build Alternative 5B. England Street (N Center Street to Henry Street) and Thompson Street (N James Street to N Center Street) are projected to carry the greatest increases in daily traffic due to the closures, with an additional 700 VPD in Build conditions. The diversion analysis results indicate that the 2025 Build condition closures would result in reduced LOS along one roadway as described below (this location is highlighted in gray in the table):

- Thompson Street, between N James Street and N Center Street, is projected to drop from operating at LOS D (with 14,600 daily vehicles) in 2025 No Build to LOS E (with 15,300 daily vehicles) in 2025 Build.

While certain segments of Route 1 and England Street are projected to experience reduced LOS by 2025 No Build conditions as compared to 2015, these reductions are due to background growth in traffic and not due to the DC2RVA Project; the LOS between 2025 No Build and 2025 Build conditions are equivalent at these locations.

Table 5-24: Diversion Route Roadway Analysis: Build Alternative 5B

Roadway	Limits		2015		2025			
					No Build		Build	
			ADT	LOS	ADT	LOS	ADT	LOS
Vaughan Road	N James Street	Archie Cannon Drive	1,800	A	2,200	A	2,200	A
Archie Cannon Drive	Henry Street	Route 1	1,400	A	1,700	A	1,700	A
Route 1	Archie Cannon Drive	Berkley Street	9,200	B	11,000	B	11,000	B
Route 1	Berkley Street	Caroline Street	11,500	B	13,800	C	13,800	C
Route 1	College Avenue	England Street	15,800	C	18,900	C	19,000	C
Henry Street	Archie Cannon Drive	Berkley Street	900	A	1,100	A	1,100	A
Henry Street	Calhoun Street	Caroline Street	1,900	A	2,300	A	2,300	A
N Center Street (Northbound)	Berkley Street	Berkley Woods Drive	400	A	500	A	500	A
N Center Street (Northbound)	Berkley Woods Drive	College Avenue	500	A	700	A	700	A
College Avenue	Henry Street	S Taylor Street	800	A	1,000	A	600	A

Table 5-24: Diversion Route Roadway Analysis: Build Alternative 5B

Roadway	Limits		2015		2025			
					No Build		Build	
			ADT	LOS	ADT	LOS	ADT	LOS
College Avenue	N Center Street	Henry Street	1,400	A	1,600	A	700	A
England Street	Henry Street	S Taylor Street	13,900	D	16,700	F	17,000	F
England Street	N Center Street	Henry Street	14,900	D	17,900	F	18,600	F
Virginia Street	Arlington Street	New Street	200	A	200	A	200	A
Maple Street	Arlington Street	New Street	1,400	A	1,700	A	1,800	A
Maple Street	Francis Street	Ashcake Road	1,400	A	1,600	A	1,700	A
S Center Street	Early Street	Ashcake Road	900	A	1,000	A	1,100	A
Duncan Street	Hanover Ave	Francis Street	600	A	700	A	800	A
Thompson Street	N James Street	N Center Street	12,100	D	14,600	D	15,300	E
Henry Clay Road	N James Street	N Center Street	700	A	800	A	300	A
N James Street	Vaughan Road	W Patrick Street	800	A	1,000	A	1,000	A
N James Street	W Patrick Street	Henry Clay Road	1,800	A	2,100	A	2,100	A
N Center Street (southbound)	W Patrick Street	Henry Clay Road	500	A	600	A	600	A
W Patrick Street	N James Street	N Center Street	700	A	800	A	900	A

Note: Gray highlight represents location(s) where LOS is projected to decrease between No Build and Build conditions.

Table 5-25 summarizes the relative capacities of the intersections along the diversion routes. The analysis indicates that the 2025 Build condition closures would affect the capacity at one intersection as described below (this location is highlighted in gray in the table):

- Thompson/England Street at Center Street, which is the primary intersection in the center of the Town of Ashland, is projected to operate near capacity (generally equivalent to LOS C/D) during Build conditions, compared to under capacity (generally equivalent to LOS A/B) during 2025 No Build conditions.

While two other intersections along England Street are projected to experience reduced capacity by 2025 No Build conditions as compared to 2015, the reduction is due to background growth in traffic and not due to the DC2RVA Project; the capacity between 2025 No Build and 2025 Build conditions is equivalent at these locations.

Table 5-25: Intersection Capacity Analysis: Build Alternative 5B

Intersection	Map Key (Figure 5-23)	2015			2025						
					No Build			Build			CLV Diff
		Total Vol	CLV / *Capacity*		Total Vol	CLV / *Capacity*		Total Vol	CLV / *Capacity*		
Vaughan Road at N James Street	1	507	407	*Under*	612	491	*Under*	614	493	*Under*	0%
Vaughan Road/Archie Cannon Drive at Henry Street	2	383	282	*Under*	465	342	*Under*	466	343	*Under*	0%

Table 5-25: Intersection Capacity Analysis: Build Alternative 5B

Intersection	Map Key (Figure 5-23)	2015			2025						
					No Build			Build			CLV Diff
		Total Vol	CLV / *Capacity*		Total Vol	CLV / *Capacity*		Total Vol	CLV / *Capacity*		
Archie Cannon Drive at Route 1	3	1344	546	*Under*	1618	658	*Under*	1619	658	*Under*	0%
Berkley Street at Henry Street	4	341	269	*Under*	414	324	*Under*	416	327	*Under*	1%
Berkley Street at Route 1	5	1252	444	*Under*	1507	537	*Under*	1510	539	*Under*	0%
Patrick Street at N James Street	6	537	429	*Under*	649	518	*Under*	654	508	*Under*	-2%
Patrick Street at Center Street	7	413	319	*Under*	501	385	*Under*	498	384	*Under*	0%
Henry Clay Road at N James Street	8	233	152	*Under*	281	182	*Under*	255	178	*Under*	-2%
Henry Clay Road/College Avenue at Center Street	9	452	367	*Under*	550	446	*Under*	459	239	*Under*	-87%
College Avenue at Henry Street	10	610	388	*Under*	738	468	*Under*	696	396	*Under*	-18%
College Avenue at Route 1	11	2081	702	*Under*	2505	844	*Under*	2486	851	*Under*	1%
Thompson Street at James Street	12	1418	851	*Under*	1706	1023	*Under*	1818	1116	*Under*	8%
Thompson Street/England Street at Center Street	13	1999	1220	*Under*	2407	1468	*Under*	2378	1555	*Near*	6%
England Street at Henry Street	14	2101	1305	*Under*	2526	1569	*Near*	2644	1684	*Near*	7%
England Street at Route 1	15	4054	1446	*Under*	4874	1739	*Near*	4898	1742	*Near*	0%
Stebbins Street at S James Street	16	56	56	*Under*	68	66	*Under*	93	91	*Under*	27%
Stebbins Street at Duncan Street	17	175	120	*Under*	213	146	*Under*	246	180	*Under*	19%
Arlington Street at Virginia Street	18	104	81	*Under*	133	105	*Under*	303	265	*Under*	60%
Arlington Street at Maple Street	19	350	236	*Under*	428	287	*Under*	477	287	*Under*	0%
W Francis Street at Duncan Street	20	139	69	*Under*	169	82	*Under*	193	87	*Under*	6%
E Francis Street at Virginia Street	21	53	48	*Under*	65	59	*Under*	69	63	*Under*	6%
E Francis Street at Maple Street	22	275	187	*Under*	332	226	*Under*	337	214	*Under*	-6%
Ashcake Road at Center Street	23	1206	743	*Under*	1455	894	*Under*	1459	905	*Under*	1%
Ashcake Road at Maple Street	24	1265	712	*Under*	1523	857	*Under*	1530	855	*Under*	0%

Note: Gray highlight represents location(s) where LOS is projected to decrease between No Build and Build conditions.

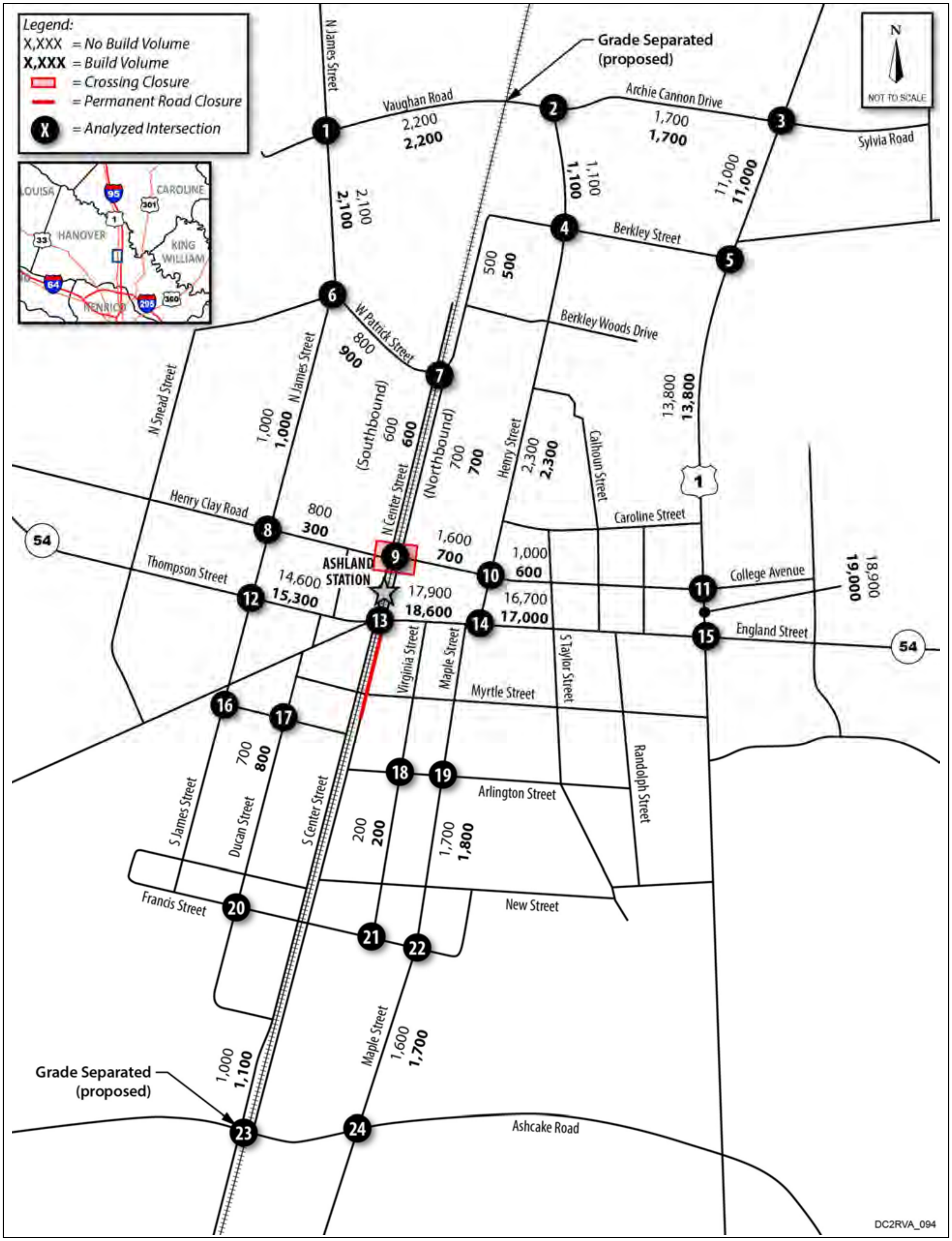

Figure 5-23: Closure Diversion 2025 Volumes, Town of Ashland, Build Alternative 5B

CLOSURE DIVERSION ANALYSIS RESULTS: INDEPENDENCE ROAD, HANOVER COUNTY

Independence Road is not a railroad crossing roadway under existing conditions, but would be a new crossing as part of Build Alternative 5C. In accordance with Virginia State Code that requires all new crossings to be grade-separated or closed, Independence Road is proposed to be closed. The W Patrick Henry Road crossing, which is a proposed new grade-separated crossing as part of the DC2RVA Project, is located within ½ mile south of the proposed Independence Road crossing. At the railroad crossing location, Independence Road is projected to carry approximately 1,100 VPD by 2025. For 2025 Build conditions, diverted vehicles would access the W Patrick Henry Road crossing by using Blanton Road, which intersects both Independence Road and W Patrick Henry Road within less than ½ mile of each other, as shown in Figure 5-24.

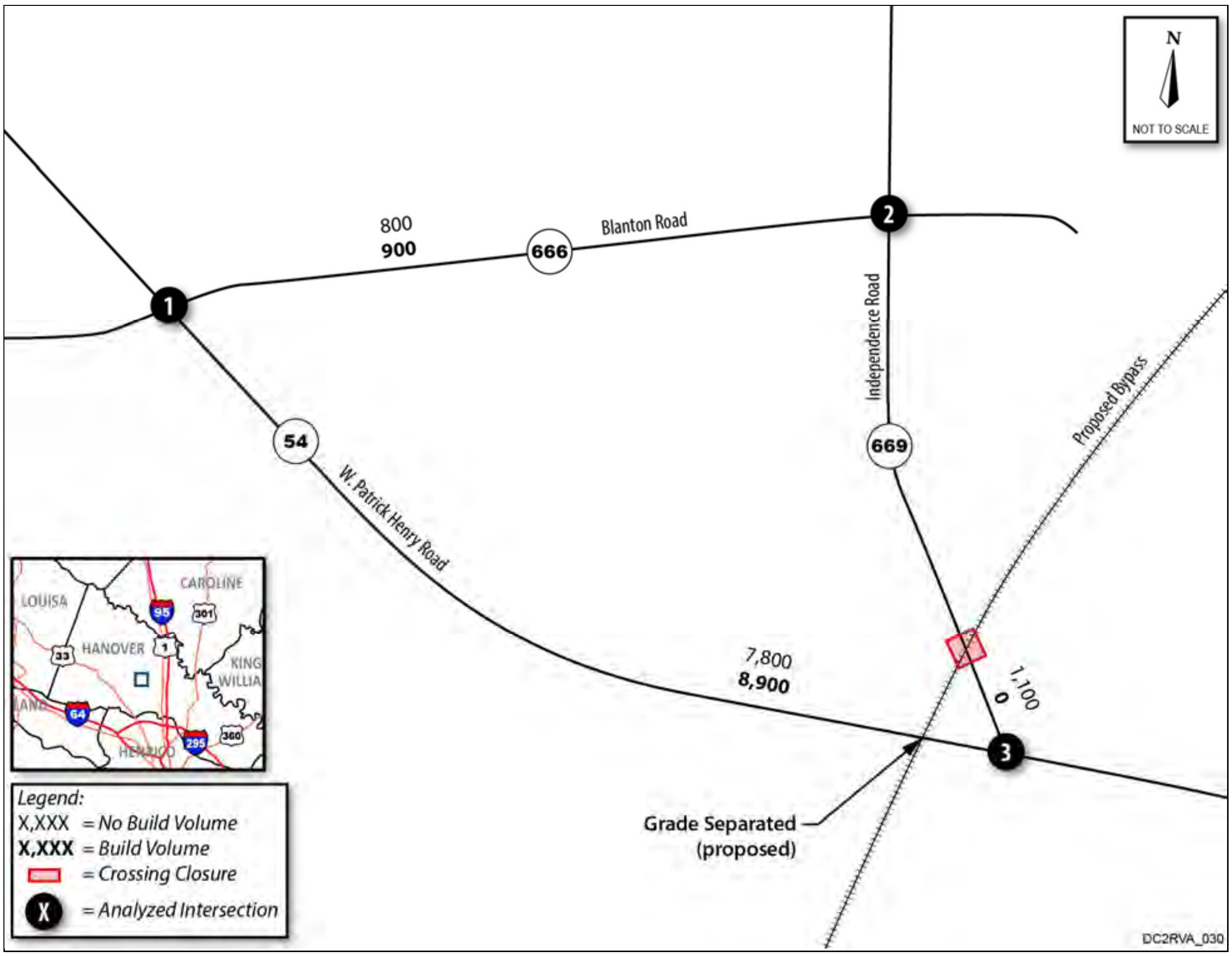

Figure 5-24: Closure Diversion 2025 Volumes, Independence Road, Build Alternative 5C

Table 5-26 summarizes the predicted shift in traffic volumes and associated effects on roadway LOS in the adjacent roadway network due to the crossing consolidation. Despite general increases in daily traffic across the network, the diversion analysis results indicate that the closure of Independence Road at the proposed crossing location would have minimal effect on the LOS of the adjacent roadways. All roadways are projected to operate at LOS A or B in 2015 and both 2025 No Build and Build conditions.

Table 5-26: Diversion Route Roadway Analysis: Independence Road

Roadway	Limits		2015		2025			
					No Build		Build	
			ADT	LOS	ADT	LOS	ADT	LOS
Blanton Road	W Patrick Henry Road	Independence Road	700	A	800	A	900	A
Independence Road	Blanton Road	W Patrick Henry Road	900	A	1,100	A	0	-
W Patrick Henry Road	Blanton Road	Independence Road	6,500	B	7,800	B	8,900	B

Table 5-27 summarizes the relative capacities of the intersections along the diversion route. The results indicate that the closure of Independence Road at the proposed crossing location would have minimal effect on intersection capacity near the closure; 2015 and both 2025 No Build and Build intersections are projected to operate under capacity (generally equivalent to LOS A/B).

Table 5-27: Intersection Capacity Analysis: Independence Road

Intersection	Map Key (Figure 5-24)	2015			2025						
					No Build			Build			CLV Diff
		Total Vol	CLV / *Capacity*		Total Vol	CLV / *Capacity*		Total Vol	CLV / *Capacity*		
Blanton Road at W Patrick Henry Road	1	804	397	*Under*	968	478	*Under*	1,030	508	*Under*	6%
Blanton Road at Independence Road	2	110	87	*Under*	137	107	*Under*	88	84	*Under*	-27%
W Patrick Henry Road at Independence Road	3	720	414	*Under*	868	500	*Under*	864	440	*Under*	-14%

CLOSURE DIVERSION ANALYSIS RESULTS: BASSETT AVENUE, CITY OF RICHMOND

The existing at-grade crossing of Bassett Avenue is proposed to be closed under several Richmond area Build Alternatives. The Jahnke Road crossing and the Midlothian Turnpike crossing are located within ½ mile north and south, respectively, of the Bassett Avenue crossing. Bassett Avenue at the railroad crossing location is projected to carry approximately 1,700 daily vehicles by 2025. Vehicles diverted from the closed Bassett Avenue crossing would access alternate crossings by using Boroughbridge Road / Covington Road to the west of the rail corridor and Westover Hill Boulevard to the east, as shown in Figure 5-25.

Table 5-28 summarizes the predicted shift in traffic and associated roadway LOS in the adjacent roadway network due to the closure of the Bassett Avenue crossing. Midlothian Turnpike is projected to carry the greatest increases in daily traffic due to the crossing closure, with an additional 1,000 VPD during the Build condition. The diversion analysis results indicate that, while both adjacent crossing roadways are projected to carry higher volumes in the 2025 Build conditions to accommodate the diverted vehicles, the closure of the Bassett Avenue crossing would have minimal effect on the LOS on the adjacent roadways. All 2025 Build conditions LOS are equivalent to 2025 No Build conditions. While portions of Westover Hill Boulevard and Covington Road are projected to experience decreased LOS between 2015 and 2025 No Build conditions, those decreases are due to background traffic growth and not the DC2RVA Project.

Table 5-28: Diversion Route Roadway Analysis: Bassett Avenue

Roadway	Limits		2015		2025			
					No Build		Build	
			ADT	LOS	ADT	LOS	ADT	LOS
Jahnke Road	Covington Road	Forest Hill Avenue	10,500	D	12,600	D	13,200	D
Forest Hill Avenue	Jahnke Road	Westover Hill Boulevard	25,200	D	30,200	D	30,900	D
Westover Hill Boulevard	Forest Hill Road	Bassett Avenue	18,000	C	21,600	D	21,900	D
Bassett Avenue	Covington Road	Westover Hills Boulevard	1,400	A	1,700	A	0	-
Westover Hill Boulevard	Bassett Avenue	Crutchfield Street	18,100	C	21,700	D	21,700	D
Midlothian Turnpike	Covington Road	Westover Hill Boulevard	21,900	D	26,200	D	27,200	D
Covington Road	Bassett Avenue	Midlothian Turnpike	9,500	B	11,400	C	11,400	C
Covington Road	Jahnke Road	Bassett Avenue	1,100	A	1,400	A	1,100	A

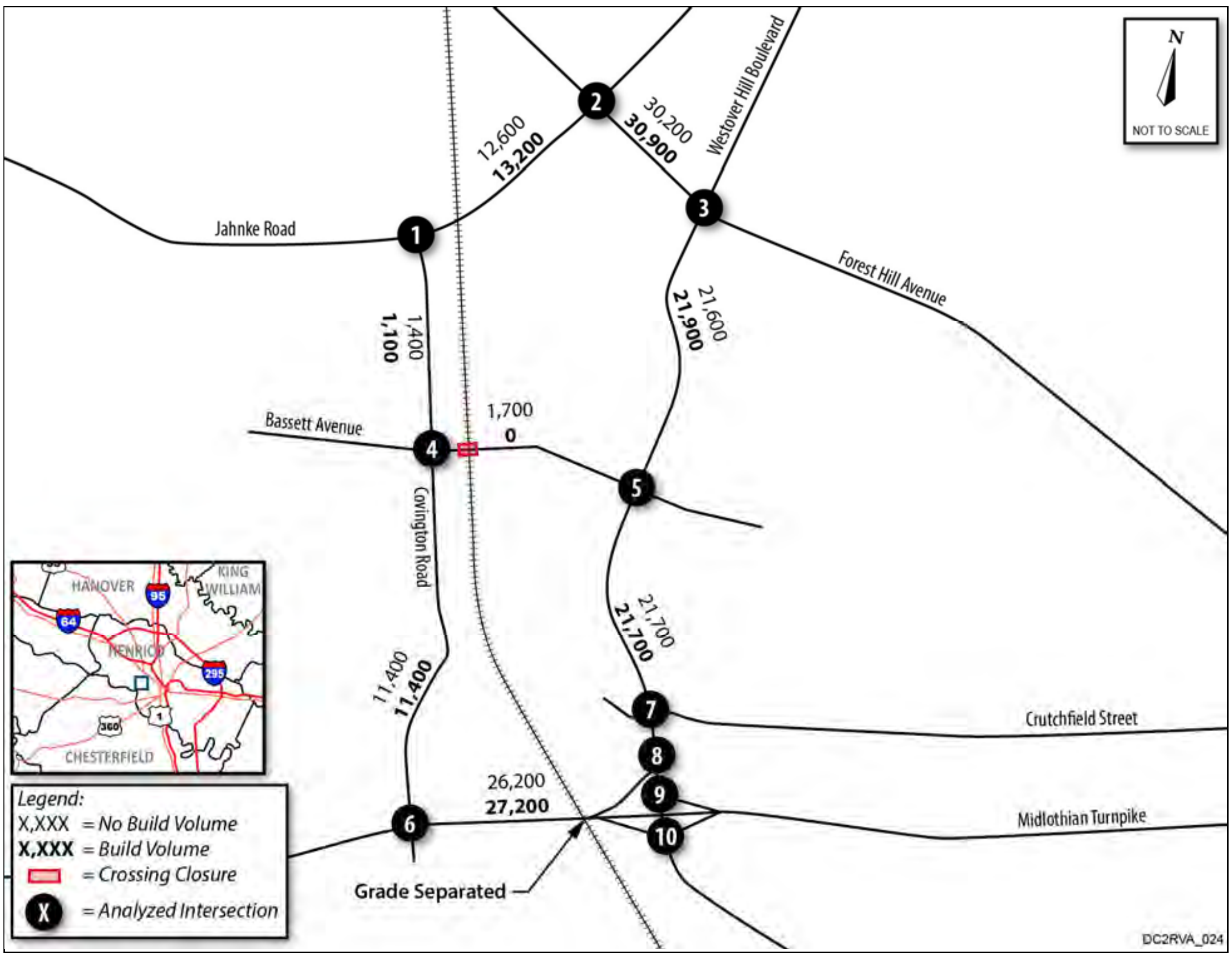

Figure 5-25: Closure Diversion 2025 Volumes, Bassett Avenue, Build Alternatives 6A, 6B–A-Line, 6C, and 6E

Table 5-29 summarizes the capacities of the intersections along the diversion route. The analysis results indicate that the closure of Bassett Avenue would have minimal effect on intersection capacity near the closure. While three intersections are projected to operate over capacity in 2025 Build conditions (generally equivalent to LOS E/F), all intersections are projected to operate at equivalent levels to 2025 No Build conditions and any changes in capacity between 2015 and 2025 No Build conditions are due to background traffic growth and not the DC2RVA Project.

Table 5-29: Intersection Capacity Analysis: Bassett Avenue

Intersection	Map Key (Figure 5-25)	2015			2025						
					No Build			Build			CLV Diff
		Total Vol	CLV / *Capacity*		Total Vol	CLV / *Capacity*		Total Vol	CLV / *Capacity*		
Jahnke Road at Boroughbridge Road	1	999	583	*Under*	1,202	702	*Under*	1,218	716	*Under*	2%
Jahnke Road at Forest Hill Avenue	2	2,765	1,304	*Near*	3,327	1,570	*Over*	3,384	1,627	*Over*	4%
Forest Hill Avenue at Westover Hills Boulevard	3	3,699	1,292	*Near*	4,445	1,552	*Over*	4,497	1,588	*Over*	2%
Bassett Avenue at Boroughbridge Road	4	231	171	*Under*	281	207	*Under*	197	164	*Under*	-26%
Bassett Avenue at Westover Hill Boulevard	5	1,918	699	*Under*	2,309	842	*Under*	2,272	791	*Under*	-6%
Midlothian Turnpike at Covington Road	6	2,985	1,802	*Over*	3,590	2,167	*Over*	3,639	2,170	*Over*	0%
Westover Hills Boulevard at Crutchfield Street	7	2,062	951	*Under*	2,481	1,145	*Under*	2,501	1,145	*Under*	0%
Westover Hills Boulevard at Midlothian Turnpike Ramps *(see Figure 5-25 for locations)*	8	3,369	1,208	*Under*	2,452	671	*Under*	2,492	676	*Under*	1%
	9	2,039	559	*Under*	2,272	709	*Under*	2,278	711	*Under*	0%
	10	1,889	590	*Under*	2,387	1,067	*Under*	2,410	1,088	*Under*	2%

CLOSURE DIVERSION ANALYSIS RESULTS: TERMINAL AVENUE, CITY OF RICHMOND

The existing at-grade crossing of Terminal Avenue, which dead-ends west of the crossing location, is proposed to be closed under several of the Richmond area Build Alternatives, with proposed intersection improvements to allow access to the signalized intersection with Hopkins Road (western side of the rail corridor). In the base analysis year, Hopkins Road carries 8,600 VPD and E Belt Boulevard, which is located on the eastern side of the rail corridor, carries 6,600 VPD. Terminal Avenue near the existing crossing between Hopkins Road and E Belt Boulevard serves five houses in total (four houses west of the crossing and one house east of the crossing). While this closure would cause the redirection of traffic to and from these houses onto Hopkins Road and E Belt Boulevard, it was qualitatively determined that the few residences would not have an effect on the high carrying capacity of the adjacent roadways over the course of a day, and no further quantitative diversion analyses were required.

CLOSURE DIVERSION ANALYSIS RESULTS: THURSTON ROAD, CHESTERFIELD COUNTY

The existing Thurston Road at-grade crossing on the A-Line is proposed to be closed as part of several Richmond area Build Alternatives. The Kingsland Road crossing is located approximately ½ mile to the north of the Thurston Road crossing. The Thurston Road crossing is projected to carry approximately 600 VPD by 2025. For 2025 Build conditions, diverted vehicles would access the Kingsland Road crossing by using Hopkins Road to the west of the rail corridor and Dorsey Road to the east, as shown in Figure 5-26.

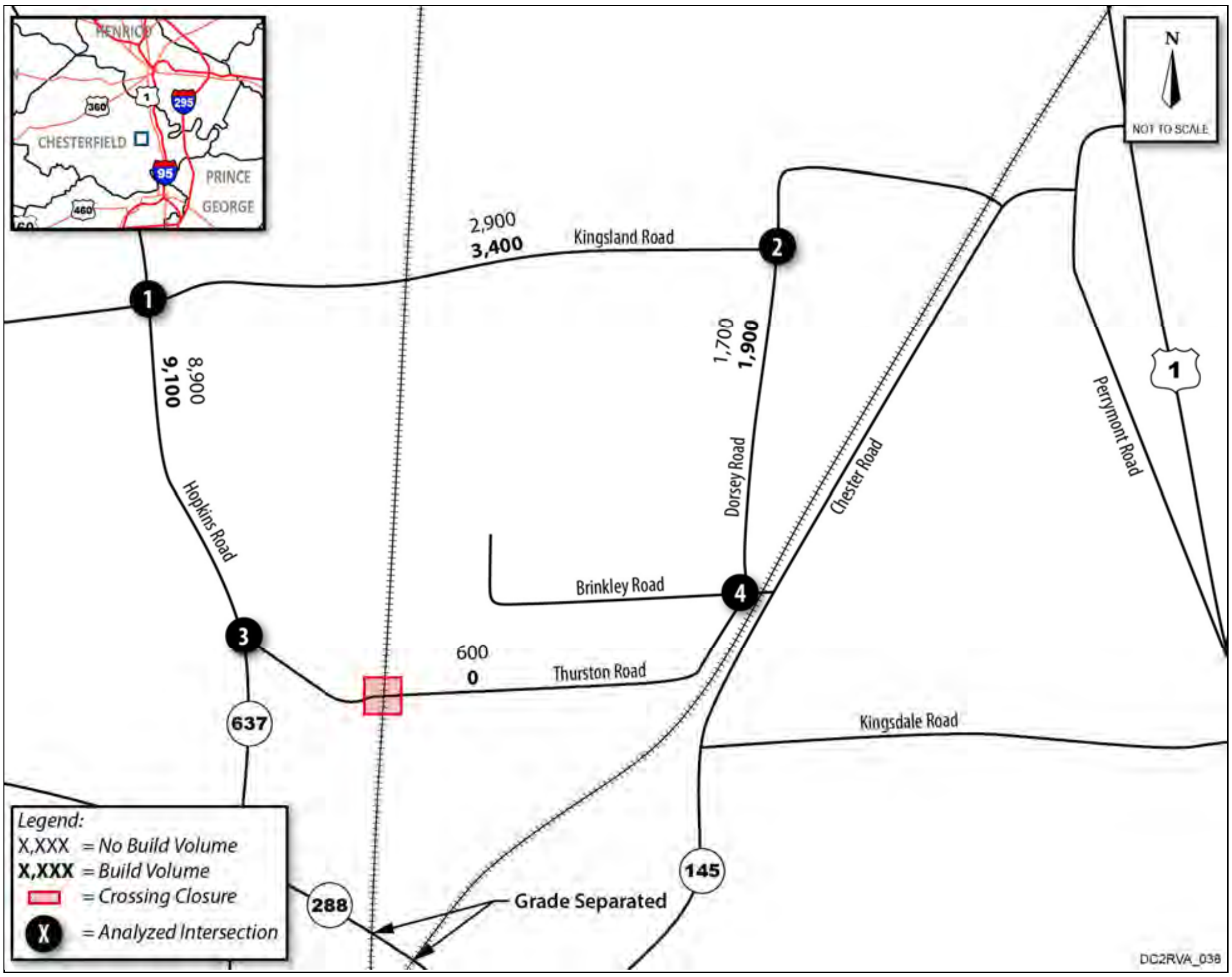

Figure 5-26: Closure Diversion 2025 Volumes, Thurston Road, Build Alternatives 6A, 6B–A-Line, 6C, and 6E

Table 5-30 summarizes the predicted shift in traffic and associated roadway LOS in the adjacent roadway network due to the crossing consolidation. Kingsland Road is projected to carry the greatest increase in traffic due to the closure, with an additional 500 VPD in the Build conditions. Despite these increases, the diversion analysis results indicate that the closure of the Thurston

Road crossing would have minimal effect on the LOS of the adjacent roadways. All roadways are projected to operate at LOS A or B in 2015 and both 2025 No Build and Build conditions.

Table 5-30: Diversion Route Roadway Analysis: Thurston Road

Roadway	Limits		2015		2025			
					No Build		Build	
			ADT	LOS	ADT	LOS	ADT	LOS
Kingsland Road	Hopkins Road	Dorsey Road	2,400	B	2,900	B	3,400	B
Hopkins Road	Kingsland Road	Thurston Road	7,400	B	8,900	B	9,100	B
Dorsey Road	Kingsland Road	Brinkley Road	1,400	A	1,700	A	1,900	A
Thurston Road	Hopkins Road	Dorsey Road	500	A	600	A	0	-

Table 5-31 summarizes the relative capacities of the intersections along the diversion route. The results indicate that the closure of the Thurston Road crossing would have minimal effect on intersection capacity near the closure; 2015 and both 2025 No Build and Build intersections are projected to operate under capacity (generally equivalent to LOS A/B).

Table 5-31: Intersection Capacity Analysis: Thurston Road

Intersection	Map Key (Figure 5-26)	2015			2025						
					No Build			Build			CLV Diff
		Total Vol	CLV / *Capacity*		Total Vol	CLV / *Capacity*		Total Vol	CLV / *Capacity*		
Kingsland Road at Hopkins Road	1	1,101	560	*Under*	1,331	675	*Under*	1,367	673	*Under*	0%
Kingsland Road at Dorsey Road	2	274	272	*Under*	332	329	*Under*	380	380	*Under*	13%
Thurston Road at Hopkins Road	3	752	471	*Under*	906	568	*Under*	879	521	*Under*	-9%
Brinkley Road at Dorsey/Thurston Road	4	188	183	*Under*	228	222	*Under*	203	201	*Under*	-10%

CLOSURE DIVERSION ANALYSIS RESULTS: BRINKLEY ROAD, CHESTERFIELD COUNTY

The existing at-grade crossing of the S-Line of Brinkley Road is proposed to be closed as part of several Richmond area Build Alternatives. The Kingsland Road crossing is located just over approximately ½ mile north of the Brinkley Road crossing. The Brinkley Road crossing is projected to carry approximately 2,200 VPD for 2025 No Build conditions. For 2025 Build conditions, diverted vehicles would access the alternate crossing at Kingsland Road by using Dorsey Road to the west of the rail corridor and Chester Road to the east, as shown in Figure 5-27.

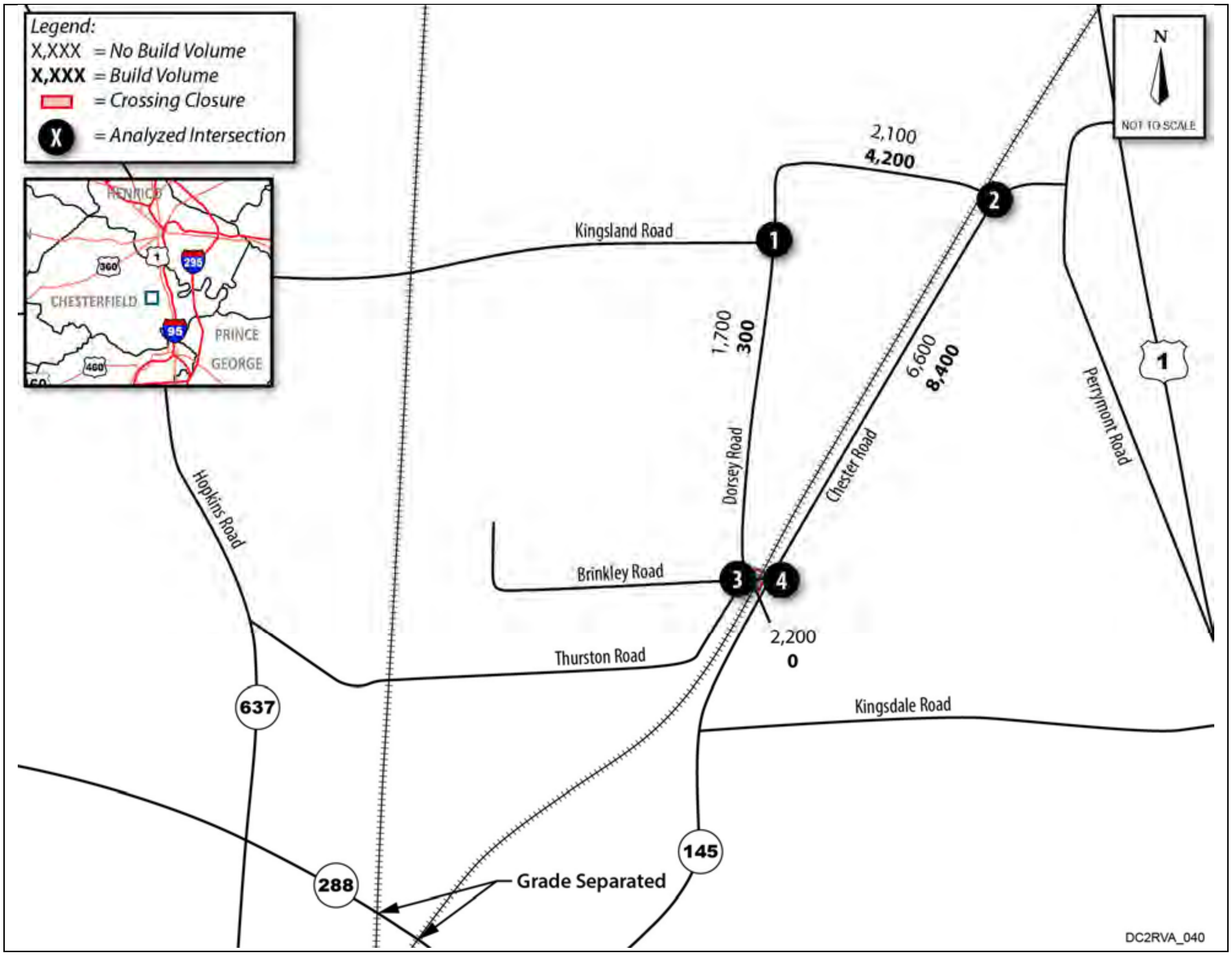

Figure 5-27: Closure Diversion 2025 Volumes, Brinkley Road Build Alternative 6B–S-Line, 6D, 6F, and 6G

Table 5-32 summarizes the predicted shift in traffic and associated roadway LOS in the adjacent roadway. Kingsland Road and Chester Road are projected to carry the greatest increases in daily traffic, with an additional 2,100 and 1,800 VPD, respectively, in the 2025 Build conditions. The diversion analysis results indicate that the 2025 Build condition closure of Brinkley Road would result in reduced LOS along one roadway as described below (this location is highlighted in gray in the table):

- Kingsland Road, between Dorsey Road and Chester Road is projected to drop from operating at LOS A (with 2,100 daily vehicles) in the 2025 No Build conditions to LOS B (with 4,200 daily vehicles) in the 2025 Build conditions.

While Chester Road near this closure is projected to experience reduced LOS by 2025 No Build conditions (LOS C) as compared to 2015 (LOS B), these reductions are due to background growth in traffic and not due to the DC2RVA Project; the LOS between 2025 No Build and 2025 Build conditions is equivalent (LOS C) at this location.

Table 5-32: Diversion Route Roadway Analysis: Brinkley Road

Roadway	Limits		2015		2025			
					No Build		Build	
			ADT	LOS	ADT	LOS	ADT	LOS
Kingsland Road	Dorsey Road	Chester Road	1,700	A	2,100	A	4,200	B
Chester Road	Kingsland Road	Brinkley Road	5,500	B	6,600	C	8,400	C
Dorsey Road	Kingsland Road	Brinkley Road	1,400	A	1,700	A	300	A
Brinkley Road	Dorsey Road	Chester Road	1,800	A	2,200	A	0	-

Note: Gray highlight represents location(s) where LOS is projected to decrease between No Build and Build conditions.

Table 5-33 summarizes the relative capacities of the intersections along the diversion route. The results indicate that the closure of the Brinkley Road crossing would have minimal effect on intersection capacity near the closure; 2015 and both 2025 No Build and Build intersections are projected to operate under capacity (generally equivalent to LOS A/B).

Table 5-33: Intersection Capacity Analysis: Brinkley Road

Intersection	Map Key (Figure 5-27)	2015			2025						
					No Build			Build			CLV Diff
		Total Vol	CLV / *Capacity*		Total Vol	CLV / *Capacity*		Total Vol	CLV / *Capacity*		
Kingsland Road at Dorsey Road	1	274	272	*Under*	332	329	*Under*	402	385	*Under*	15%
Kingsland Rd at Chester Rd	2	694	501	*Under*	839	606	*Under*	1,038	813	*Under*	25%
Brinkley Road at Dorsey/Thurston Road	3	188	183	*Under*	228	222	*Under*	28	17	*Under*	-1206%
Brinkley Road at Chester Road	4	682	471	*Under*	821	567	*Under*	799	479	*Under*	-18%

CLOSURE DIVERSION ANALYSIS RESULTS: OLD LANE, CHESTERFIELD COUNTY

The existing Old Lane at-grade crossing is proposed to be closed as part of all Richmond area Build Alternatives. The Centralia Road crossing, which is proposed to be grade-separated as a part of the Richmond-to-Raleigh (R2R) project, is located approximately ½ mile south of the Old Lane crossing. The Old Lane crossing is projected to carry approximately 5,800 VPD by 2025. For 2025 Build conditions, diverted vehicles would access the Centralia Road crossing by using Hopkins Road to the west of the rail corridor and Chester Road to the east, as shown in Figure 5-28.

Table 5-34 summarizes the predicted shift in traffic and associated roadway LOS in the adjacent roadway network from the Old Lane crossing consolidation. Centralia Road between Hopkins Road and Chester Road is projected to experience the greatest increases in daily traffic due to the closure, with an additional daily 5,800 vehicles (i.e., the crossing volume at Old Lane) in the 2025 Build conditions. Hopkins Road is projected to experience an increase in daily volumes in 2025 Build conditions of 3,900 vehicles. As a result of these increases, the diversion analysis results indicate that the 2025 Build condition closure of Old Lane would result in reduced LOS along two roadways as described below (these locations are highlighted in gray in the table):

- Centralia Road, between Hopkins Road and Chester Road, is projected to drop from operating at LOS B (with 10,500 daily vehicles) in the 2025 No Build conditions to LOS E (with 16,300 daily vehicles) in the 2025 Build conditions. However, the Centralia Road near this segment, would be redesigned and reconstructed (including the grade separation) to accommodate these future volumes.
- Hopkins Road, between Old Lane and Centralia Road, is projected to drop from operating at LOS B (with 4,100 daily vehicles) in the 2025 No Build conditions to LOS C (with 8,000 daily vehicles) in the 2025 Build conditions.

Table 5-34: Diversion Route Roadway Analysis: Old Lane

Roadway	Limits		2015		2025			
					No Build		Build	
			ADT	LOS	ADT	LOS	ADT	LOS
Old Lane	Hopkins Road	Advantage Storage Drive	4,800	B	5,800	C	0	-
Chester Road	Old Lane	Centralia Road	20,600	B	24,700	B	23,300	B
Centralia Road	Hopkins Road	Chester Road	8,800	B	10,500	B	16,300	E
Hopkins Road	Old Lane	Centralia Road	3,400	B	4,100	B	8,000	C

Note: Gray highlight represents location(s) where LOS is projected to decrease between No Build and Build conditions.

Table 5-35 summarizes the relative capacities of the intersections along the diversion routes. The analysis indicates that the 2025 Build condition closures would affect the capacity at one intersection as described below (this location is highlighted in gray in the table):

- Centralia Road at Chester Road is projected to operate near capacity (generally equivalent to LOS C/D) during Build conditions, compared to under capacity (generally equivalent to LOS A/B) during 2025 No Build conditions.

While one other intersection along Centralia Road is projected to experience reduced capacity by 2025 No Build conditions as compared to 2015, the reduction is due to background growth in traffic and not due to the DC2RVA Project. The capacity between the 2025 No Build and 2025 Build conditions is equivalent at this location.

Table 5-35: Intersection Capacity Analysis: Old Lane

Intersection	Map Key (Figure 5-28)	2015			2025						
					No Build			Build			CLV Diff
		Total Vol	CLV / *Capacity*		Total Vol	CLV / *Capacity*		Total Vol	CLV / *Capacity*		
Hopkins Road at Old Lane	1	761	723	*Under*	916	870	*Under*	801	801	*Under*	-9%
Old Lane at Advantage Storage Drive	2	493	296	*Under*	595	357	*Under*	21	11	*Under*	-3145%
Old Lane at Chester Road	3	1,600	775	*Under*	1,923	932	*Under*	1,549	542	*Under*	-72%
Hamlin Creek Parkway at Chester Road	4	2,159	717	*Under*	2,597	863	*Under*	2,434	860	*Under*	0%
Centralia Road at Hopkins Road	5	1,673	1,232	*Near*	2,015	1,483	*Over*	2,516	1,950	*Over*	24%
Centralia Road at Chester Road	6	2,674	857	*Under*	3,216	1,030	*Under*	3,433	1,380	*Near*	25%

Note: Gray highlight represents location(s) where LOS is projected to decrease between No Build and Build conditions.

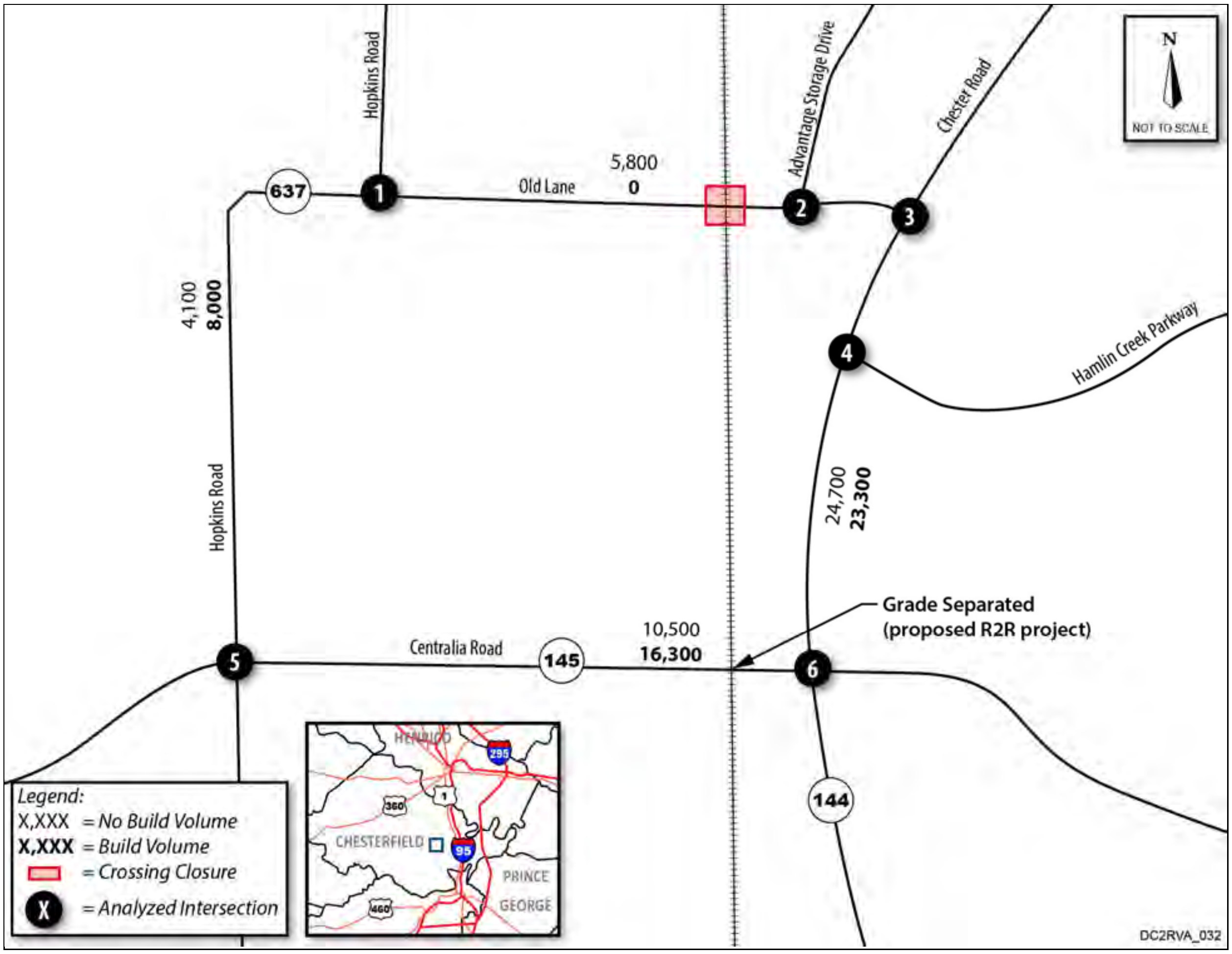

Figure 5-28: Closure Diversion 2025 Volumes, Old Lane, All Richmond Build Alternatives

CLOSURE DIVERSION ANALYSIS RESULTS: OWNBY LANE, CITY OF RICHMOND

The existing at-grade crossing of Hermitage Road is proposed to be grade-separated as part of Richmond area Build Alternative 6B–S-Line. As part of the construction of the grade separation, an existing connection between Ownby Lane and Hermitage Road would be closed; the detoured traffic would connect to Hermitage Road via Overbrook Road, instead of directly from Ownby Lane. The distance between the Hermitage Road/Overbrook Road and the Hermitage Road/Ownby Lane intersection is 0.1 miles north; with the exception of this short section of roadway, traffic on Hermitage Road is not anticipated to be affected by the construction of the proposed overpass. The effects of re-routing access from the low to median density light industry and service uses land uses along Ownby Lane to Hermitage Road are also expected to be minimal based on low traffic volumes on both Overbrook Road and Ownby Lane. Overbrook Road carries 2,200 VPD while Ownby Lane is a 0.30 mile collector facility. Based on the low volumes on both roads, shifting traffic from the Hermitage Road/Ownby Lane intersection to the Hermitage Road/Overbrook Road intersection would not result in increased traffic delays. Therefore, DRPT determined that no further diversion analyses were required.

CLOSURE DIVERSION ANALYSIS RESULTS: ST JAMES STREET, CITY OF RICHMOND

The existing at-grade roadway crossing of St James Street is proposed to be closed under several of the Richmond area Build Alternatives, though a grade-separated pedestrian crossing is proposed to maintain non-vehicular access across the rail corridor. The N 1st Street crossing is located less than ½ mile south of the St James Street crossing. The St James Street crossing is projected to carry approximately 1,800 VPD for 2025 No Build conditions. For 2025 Build conditions, diverted vehicles would access the alternate crossing at N 1st Street by using Poe Street to the north of the rail corridor and E Hill Street to the south, as shown in Figure 5-29.

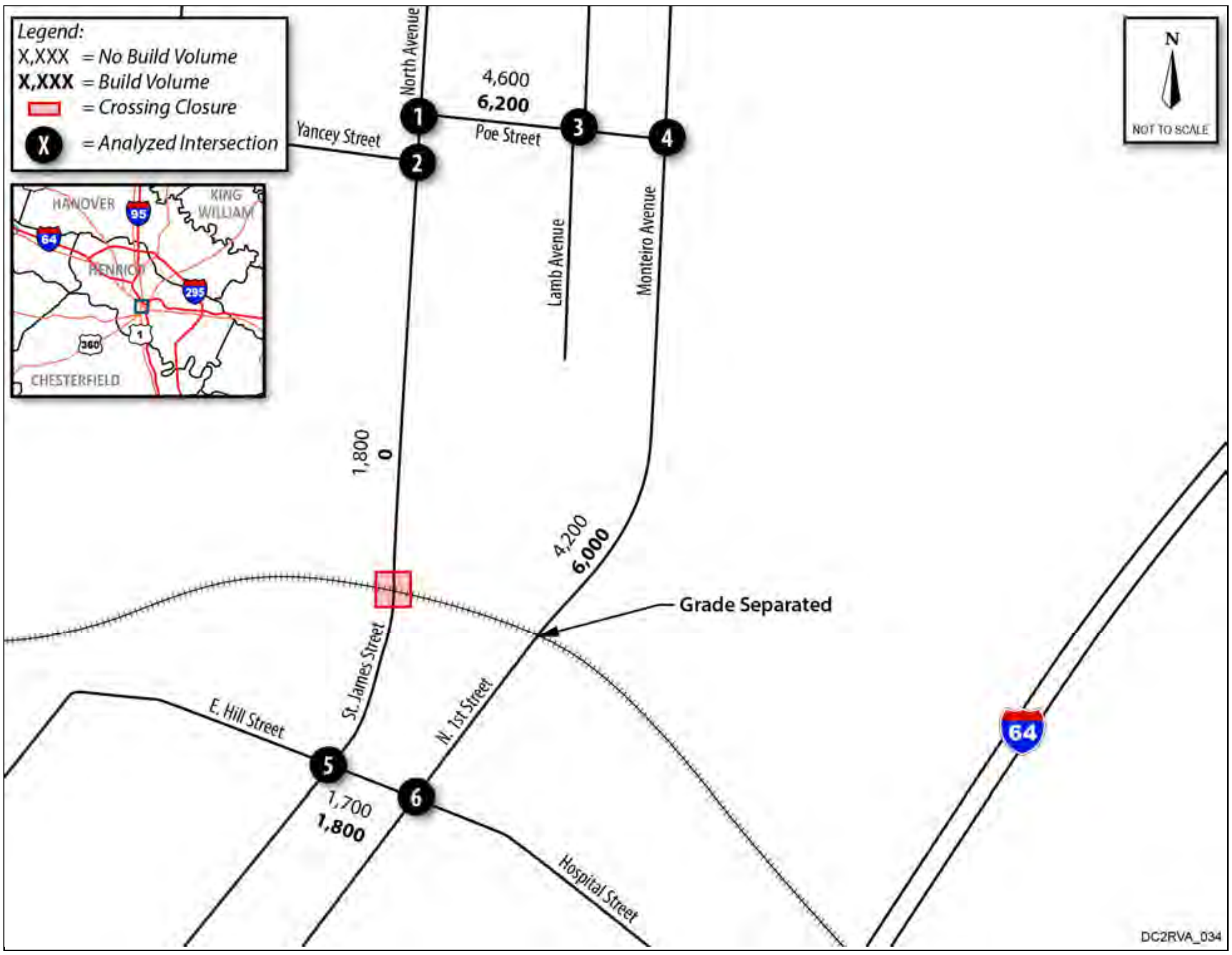

Figure 5-29: Closure Diversion 2025 Volumes, St James Street Build Alternative 6B–S-Line, 6D, 6F, and 6G

Table 5-36 summarizes the predicted shift in traffic volumes and associated effects on roadway LOS in the adjacent roadway network due to the crossing consolidation. Despite increases in daily traffic throughout the network, the diversion analysis results indicate that the closure of the St James Street crossing would have minimal effect on the LOS of the adjacent roadways. All roadways are projected to operate at LOS A or B in 2015 and both 2025 No Build and Build conditions.

Table 5-36: Diversion Route Roadway Analysis: St James Street

Roadway	Limits		2015		2025			
					No Build		Build	
			ADT	LOS	ADT	LOS	ADT	LOS
Poe Street	North Avenue	Monteiro Avenue	3,800	A	4,600	A	6,200	A
N 1st Street	Poe Street	E Hill Street	3,500	A	4,200	A	6,000	A
E Hill Street	St James Street	N 1st Street	1,400	A	1,700	A	1,800	A
St James Street	E Hill Street	Poe Street	1,500	A	1,800	A	0	-

Table 5-37 summarizes the relative capacities of the intersections along the diversion route. The results indicate that the closure of the St James Street crossing would have minimal effect on intersection capacity near the closure; 2015 and both 2025 No Build and Build intersections are projected to operate under capacity (generally equivalent to LOS A/B).

Table 5-37: Intersection Capacity Analysis: St James Street

Intersection	Map Key (Figure 5-29)	2015			2025						
					No Build			Build			CLV Diff
		Total Vol	CLV / *Capacity*		Total Vol	CLV / *Capacity*		Total Vol	CLV / *Capacity*		
Poe Street at St James Street	1	561	482	*Under*	677	581	*Under*	675	654	*Under*	11%
Yancey Street at St James Street	2	181	125	*Under*	220	152	*Under*	64	56	*Under*	-171%
Poe Street at Lamb Ave	3	348	225	*Under*	426	276	*Under*	583	372	*Under*	26%
Poe Street at Montiero Ave	4	333	330	*Under*	404	400	*Under*	568	564	*Under*	29%
Hospital Street at St James Street	5	290	219	*Under*	353	266	*Under*	279	251	*Under*	-6%
Hospital Street at N 1Street	6	450	282	*Under*	548	344	*Under*	642	454	*Under*	24%

CLOSURE DIVERSION ANALYSIS RESULTS: N 2ND STREET / VALLEY ROAD, CITY OF RICHMOND

The existing at-grade crossing of N 2nd Street is proposed to be closed under several of the Richmond area Build Alternatives. The N 2nd Street / Valley Road crossing carries 2,100 VPD in the base analysis year (2014). The adjacent Hospital Street crossing is located less than ½ mile south-east of the N 2nd Street / Valley Road crossing, and would be used as the main alternate route under 2025 Build conditions. As a part of this DC2RVA Project, the Hospital Street crossing is proposed to be grade-separated with intersection improvements to adjacent roadways. While the closure of N 2nd Street / Valley Road would divert traffic via the roadway network to the Hospital Street crossing, the additional traffic would be incorporated into the final design of the Hospital Street grade separation as part of the DC2RVA Project. Therefore, DRPT determined that no further diversion analyses were required.

CLOSURE DIVERSION ANALYSIS RESULTS: DALE AVENUE / TRENTON AVENUE, CITY OF RICHMOND

The existing at-grade crossing of Dale Avenue is proposed to be closed under several of the Richmond area Build Alternatives. However, this crossing does not function as a public roadway[37] and therefore does not require further analysis.

5.4.4 Closure Diversion Analysis – Summary of Results

A summary of the results of the crossing diversion analyses is provided in Table 5-38. While the closure diversion roadways were analyzed separately, with the exception of within the Town of Ashland, this table presents the overall results as a total for each Build Alternative. As shown in the results table, the majority of the proposed crossing and roadway closures are anticipated to have a minimal effect on both the roadway volumes and associated LOS as well as the capacity of the intersections along the diversion route(s). The table highlights only those locations that are projected to have reduced LOS or capacity as a result of the DC2RVA Project (i.e., as compared between 2025 No Build and 2025 Build conditions). The results indicate the following effects on roadway traffic volumes and intersection capacity along roadways that are proposed to be closed as part of the DC2RVA Project:

- No public roadway closures in the Arlington (Build Alternatives 1A through 1C) or Fredericksburg (Build Alternatives 3A through 3C) areas.
- Minimal effects to roadway and intersection operations in the Northern Virginia (Build Alternative 2A) or Central Virginia (Build Alternative 4A) areas.
- In the Ashland area:
  - Build Alternatives 5A, 5B, and 5C are anticipated to experience both reduced roadway levels of service and reduced intersection capacity:
    - Thompson Street is projected to operate at LOS E in Build conditions, compared to LOS D in No Build conditions.
    - England / Thompson Street at Center Street is projected to operate near capacity in Build conditions (compared to under capacity in No Build conditions) in Build Alternatives 5A through 5D–Ashcake.
  - Build Alternatives 5D–Ashcake and 5B–Ashcake are projected to have minimal effects on roadway and intersection operations.
  - Build Alternative 5A–Ashcake does not include any closures of public roadways and therefore does not affect roadway and intersection operations.
  - Build Alternative 5C–Ashcake is projected to have minimal effects on roadway and intersection operations.
- In the Richmond area, all Build Alternatives are projected to have similar effects to both roadway operations and intersection capacity due to the proposed Old Lane roadway crossing closure.
  - Centralia Road: LOS B (No Build) to LOS E (Build)
  - Hopkins Road: LOS B (No Build) to LOS C (Build)
  - Kingsland Road: LOS A (No Build) to LOS B (Build)
  - Centralia Road at Chester Road intersection: Under Capacity (No Build) to Near Capacity (Build)

Table 5-38: Summary of Closure Diversion Analysis Results, by Build Alternative

Alternative Area/ Build Alternative[1]		**Description**	**Closure Diversion Roadway(s) Analyzed**	**Effects on Roadway Traffic Volumes and Associated LOS**	**Effects on Intersection Capacity**
Northern Virginia	2A	Add 1 Track	Mount Hope Church Road	Minimal Effect	Minimal Effect
Central Virginia	4A	Add 1 Track	Colemans Mill Road	Minimal Effect	Minimal Effect
Ashland	5A	Maintain Existing	College Avenue/Henry Clay Road	Thompson Street: *14,600 vehicles/LOS D, No Build* *15,400 vehicles/LOS E, Build* All other locations minimal effect.	England/Thompson Street at Center Street: *Under Capacity, No Build* *Near Capacity, Build* All other locations minimal effect.
	5A–Ashcake	Maintain Existing (New Station)	*No Closures for this Build Alternative*	*n/a*	*n/a*
	5B	Add 1 Track	College Avenue / Henry Clay Road; Railroad Avenue / Center Street	Thompson Street: *14,600 vehicles/LOS D, No Build* *15,300 vehicles/LOS E, Build* All other locations minimal effect.	England/Thompson Street at Center Street: *Under Capacity, No Build* *Near Capacity, Build* All other locations minimal effect.
	5B–Ashcake	Add 1 Track (New Station)	*Same as 5D–Ashcake*	*Same as 5D–Ashcake*	*Same as 5D–Ashcake*
	5C	2-Track West Bypass	College Avenue / Henry Clay Road; Independence Road	Thompson Street: *14,600 vehicles/LOS D, No Build* *15,400 vehicles/LOS E, Build* All other locations minimal effect.	England/Thompson Street at Center Street: *Under Capacity, No Build* *Near Capacity, Build* All other locations minimal effect.
	5C–Ashcake	2-Track West Bypass (New Station)	Independence Road	Minimal Effect	Minimal Effect
	5D–Ashcake	Center 3 Tracks (New Station)	Railroad Avenue / Center Street	Minimal Effect	Minimal Effect

Table 5-38: Summary of Closure Diversion Analysis Results, by Build Alternative

Alternative Area/ Build Alternative[1]		Description	Closure Diversion Roadway(s) Analyzed	Effects on Roadway Traffic Volumes and Associated LOS	Effects on Intersection Capacity
Richmond	6A	Staples Mill Only	Bassett Avenue; Terminal Avenue; Thurston Road; Old Lane	Centralia Road: *10,500 vehicles/LOS B, No Build* *16,300 vehicles/LOS E, Build* Hopkins Road: *4,100 vehicles/LOS B, No Build* *8,000 vehicles/LOS C, Build* All other locations minimal effect.	Centralia Road at Chester Road: *Under Capacity, No Build* *Near Capacity, Build* All other locations minimal effect.
	6B–A-Line	Boulevard Rd Only (A-Line)	*Same as 6A*	*Same as 6A*	*Same as 6A*
	6B–S-Line	Boulevard Rd Only (S-Line)	St James Street; N. 2nd Street/Valley Road; Dale Avenue/Trenton Avenue; Brinkley Road; Old Lane	*Same as 6A* Kingsland Road: *2,100 vehicles/LOS A, No Build* *4,200 vehicles/LOS B, Build* All other locations minimal effect.	*Same as 6A*
	6C	Broad St Only	*Same as 6A*	*Same as 6A*	*Same as 6A*
	6D	Main St Only	*Same as 6B–S-Line*	*Same as 6B–S-Line*	*Same as 6B–S-Line*
	6E	Split Service	*Same as 6A*	*Same as 6A*	*Same as 6A*
	6F	Full Service	*Same as 6B–S-Line*	*Same as 6B–S-Line*	*Same as 6B–S-Line*
	6G	Shared Service	*Same as 6B–S-Line*	*Same as 6B–S-Line*	*Same as 6B–S-Line*

[1] No closure diversion analysis locations in alternative areas 1 or 3.

5.5 DAILY VEHICLE DELAY

5.5.1 Methodology

The total vehicle delay per day is the amount of time that vehicles spend queuing at an at-grade crossing over the course of a day (24 hours) based on the number of trains that are expected to pass through the crossing.

The purpose of the daily delay calculations as part of the DC2RVA transportation analysis is to quantify the delay experienced by vehicles due to the number and type of trains traveling through the public at-grade highway-rail crossings for existing, No Build, and Build conditions. This daily vehicle delay calculation applies only to the at-grade public crossings themselves in the DC2RVA corridor[38]; it is not an analysis of anticipated increases in travel times and/or delays from required detours resulting from any of the proposed conditions (refer to Section 5.4 for diversion analysis for proposed crossing closures which does address these potential travel time changes).

The daily vehicle delay is based on the following input factors:

- Average individual delay per vehicle per day
- Annual average daily traffic

The first factor above was calculated using Adolf May's *Traffic Flow Fundamentals*[39], which is the traffic flow theory upon which most of the Transportation Research Board's *Highway Capacity Manual* (HCM) equations are based. Input factors to calculate the average individual delay per vehicle per crossing are:

- Arrival rate. This represents how many vehicles are arriving at the crossing per lane.
- Service rate. This is a constant factor, based on highway characteristics, that represents how many vehicles a highway can functionally accommodate, per lane.
- Activation time. This represents the length of time it takes for the train to complete the crossing, and is based on the length of the train and the speed of the train.
- Cycle time. The represents the amount of time between crossings each day and is directly based on the number of trains per day.

The total daily delay calculation is a straightforward multiplication of those factors. More trains and longer and/or slower moving trains result in more crossing closure time, and more motor vehicles on the crossing road means that there is more total vehicle delay. Any combination of more trains, slower trains, and more motor vehicles would result in increases in estimated daily vehicle delay.

Because trains could arrive at any time and the equation provides estimates of daily vehicle delays, the analysis does not separately calculate delays for particular peak or off-peak hours. While the total vehicle delay may be higher when traffic volumes are higher, it would also be lower when traffic volumes are lower. It is assumed, for purposes of this analysis, that the high and low peaks would balance out over the course of a typical day.

Since the DC2RVA Project rail lines carry various types of passenger and freight trains, all of which have distinct speed and length characteristics, the delay calculation was separated into six calculations (one for each type of intercity passenger train, one for VRE commuter trains, and one for freight trains) so as to not over- or under-estimate total delay. While in day-to-day operations, it is possible that trains may simultaneously pass through an at-grade crossing that has multiple tracks, the No Build and Build conditions assumed that all train crossings occur as separate crossing events to be conservative.

Data for length, speed, and number of daily trains were input separately into the analysis calculations for each train type for each Build Alternative, as applicable. The calculated daily delay for each train type was then combined to provide a single total daily delay at each roadway crossing for each Build Alternative.

FHWA's *Railroad-Highway Grade Crossing Handbook* (Revised Second Edition August 2007) includes daily vehicle delay as one of the eleven criteria for which grade separation at existing at-grade crossings should be considered[40]; the criteria threshold set by FHWA for vehicle delay is 40 vehicle hours of delay per day.

5.5.2 Effects of Types of Crossing Treatments on Daily Vehicle Delay

Different crossing treatments that are proposed as part of the DC2RVA Build Alternatives would have different effects on the total daily delay. Crossing elimination, which is defined as grade-separation or crossing closure, is the type of crossing improvement that can have the largest effect on the daily delay calculation, as it fully removes the delay condition of vehicles queueing at an at-grade crossing.

Grade-separation eliminates the vehicle delay by physically separating the train traffic from the roadway vehicles, though all vehicles use the crossing in the same travel patterns as the existing condition. This would affect the daily delay calculation by "zeroing out" the daily delay at the grade-separated crossing in the Build condition. For the DC2RVA Project, the following proposed crossing closure locations would divert vehicular traffic to adjacent crossing(s) that are grade-separated, as previously presented in Section 5.4, and therefore do not require diverted vehicles to be accounted for in the analysis of delay. There are no proposed closures in Build Alternatives 1, 3A, 3B, or 3C.

- Mount Hope Church Road, Build Alternative 2A, Stafford County
- Colemans Mill Road, Build Alternative 4A, Caroline County
- Independence Road, Build Alternative 5C, Hanover County
- Old Lane, all Richmond Build Alternatives, Chesterfield County
- St James Street, Build Alternative 6B–S-Line, 6D, 6F, and 6G, Richmond
- Terminal Avenue, Build Alternative 6A, 6B–A-Line, 6C, and 6E, Richmond
- N 2nd Street / Valley Road, Build Alternative 6B–S-Line, 6D, 6F, and 6G, Richmond
- Dale Avenue / Trenton Avenue is not considered an existing public crossing and therefore has no effect on the delay analyses.

Crossing closure eliminates the vehicle delay by physically removing the ability of roadway vehicles to cross the rail corridor at an existing location; these vehicles would be accommodated via a permanent detour of vehicular traffic to adjacent crossing(s) as presented in Section 5.4. This would affect the daily delay in two ways in the Build conditions: (1) it would "zero out" the daily delay at the location of the crossing closure, and (2) it would increase the delay at any adjacent at-grade crossing(s) that the detoured vehicles use. If the adjacent crossing used by detoured vehicles is a grade-separated crossing(s), there is no effect on the grade-separated crossing because, as noted above, there is no interaction between motor vehicles and rail traffic.

The proposed crossing closures would require detouring vehicles to adjacent at-grade crossing(s) and, therefore, would require inclusion of diverted vehicles on those adjacent crossing(s) as part of the Build condition are presented in Table 5-39 and Table 5-40. Table 5-39 shows the percent of traffic diverted to each adjacent crossing for the Build condition by crossing closure. The closure diversion methodology that was used to developed these values is detailed in Section 5.4. As described in that section, a separate analysis that accounts for multiple crossings in close proximity was used within the Town of Ashland to ascertain the effects of the proposed concurrent closures, and potentially including the closure of a short portion of a non-crossing roadway, by Build Alternative. The percent change in volume between No Build and Build conditions for each crossing within Ashland is shown separately in Table 5-40 by Build Alternative.

Table 5-39. Crossing Closures with Diversions to Adjacent Crossings

Roadway	Crossing Type, Build Condition	% of Traffic Diverted from Closure	2025 Build Volume, with Diverted Vehicles	Change in Volume, Build to No Build
Proposed Closure: Bassett Avenue, Build Alternative 6A, 6B–A-Line, 6C, and 6E				
Jahnke Road	At-Grade	40%	15,280	4%
Bassett Avenue	Closed	--	0	-100%
Midlothian Turnpike	Grade-separated	60%	27,874	4%
Proposed Closure: Thurston Road, Build Alternative 6A, 6B–A-Line, 6C, and 6E				
Kingsland Road	At-Grade	100%	3,111	21%
Thurston Road	Closed	--	0	-100%
Proposed Closure: Brinkley Road, Build Alternative 6B–S-Line 6D, 6F, and 6G				
Kingsland Road	At-Grade	100%	4,636	90%
Brinkley Road	Closed	--	0	-100%

Table 5-40: Ashland Crossing Closures: Diversions to Adjacent Crossings

Roadway	Crossing Type, Build Condition	% Change in Volume, Build to No Build*	2025 Build Volume, with Diverted Vehicles
Build Alternative 5A			
W Patrick Street	Four-Quadrant Gates	15%	419
College Avenue /Henry Clay Street	Closed	-100%	0
England Street /Thompson Street	Four-Quadrant Gates	5%	17,934
Build Alternative 5B			

Table 5-40: Ashland Crossing Closures: Diversions to Adjacent Crossings

Roadway	Crossing Type, Build Condition	% Change in Volume, Build to No Build*	2025 Build Volume, with Diverted Vehicles
W Patrick Street	Four-Quadrant Gates	15%	419
College Avenue /Henry Clay Street	Closed	-100%	0
England Street /Thompson Street	Four-Quadrant Gates	5%	17,934
Myrtle Street	Four-Quadrant Gates	-35%	1,427
E Francis Street	Four-Quadrant Gates	5%	1,793
Center Street / Railroad Avenue	Non-Crossing Roadway Closure	-100%	0
Build Alternative 5B–Ashcake and 5D–Ashcake			
Myrtle Street	Four-Quadrant Gates	-35%	1,427
E Francis Street	Four-Quadrant Gates	5%	1,793
Center Street / Railroad Avenue	Non-Crossing Roadway Closure	-100%	0
Build Alternative 5C			
W Patrick Street	Four-Quadrant Gates	15%	419
College Avenue /Henry Clay Street	Closed	-100%	0
England Street /Thompson Street	Four-Quadrant Gates	5%	17,934

* The roadway network within the town of Ashland was analyzed using a traffic assignment model and proposed build conditions were analyzed as a total set by Build Alternative, as detailed in Section 5.4.

Build Alternative 5A–Ashcake and 5C–Ashcake do not include any proposed crossing or roadway closures within the town of Ashland.

5.5.3 Source Data

Input data was developed for each individual existing at-grade roadway crossing for each of the six train types (four intercity trains, VRE, and freight trains) for existing, No Build and Build conditions, as detailed below.

Roadway Input Source Data and Assumptions:

- Crossing Volume (daily vehicles):
  - VDOT GIS online database for Annual Average Daily Traffic with Vehicle Classification for 2014 (accessed January 2016); grown to 2015 and 2025 as necessary (refer to Section 4 for details on growth rates).
- Number of Traffic Lanes:
  - Verified per aerial imagery and/or field visits. The number of future year traffic lanes is assumed to be equal to the existing condition, as a worst-case analysis.
- Roadway Functional Classification:
  - VDOT 2014 Approved Functional Classification[41]

Train Input Source Data and Assumptions:

- Train Length (feet):

- Intercity and VRE Passenger Trains: DC2RVA Operations Modeling Methodology
- Freight Trains: CSXT: DC2RVA Projected Growth and Planned Capacity Projects
- Train length for all train types remains constant for 2015 and 2025 No Build conditions and increases for 2025 Build conditions, with the exception of VRE Passenger trains, which increase by 2025 No Build, and Freight trains, which are assumed to remain constant for all conditions.

▪ Train Frequency (daily total):

- Intercity and VRE Passenger Trains: DC2RVA Operations Modeling Methodology. The VRE No Build and Build estimates are assumed to be equal.
- Freight Trains: CSXT: DC2RVA Projected Growth and Planned Capacity Projects
  - ▪ Engineering judgment was used to determine train volumes on mainline versus bypass rail alignments, as applicable. In future daily operation, the use of tracks is at the dispatcher's discretion.
  - ▪ To determine CSXT freight growth from 2015 to future years, the U.S.DOT's Freight Analysis Framework (FAF) data was used.
- Input values were estimated based on an assumed typical operating day.
- All input values represent the daily total number of one-way train trips passing through individual existing at-grade crossings[42].
- Train frequency through a specific crossing varies by Build Alternative. The change in intercity passenger trips occur mainly in the sections of the DC2RVA corridor that are located north of Alexandria and south of Staples Mill Road on the A-Line; however, the majority of the existing at-grade crossings occur in between those limits.

▪ Train Speed (miles per hour):

- All train types: DC2RVA Project Engineering Track Diagrams.
- In general, train speeds for all train types are assumed to remain constant for 2015 and 2025 No Build conditions and increase for 2025 Build conditions. Train speed through a specific at-grade crossing does not vary by Build Alternative.
- Train speed data represents the maximum speed of the line or line segment for freight and passenger train types separately. For example, speeds through the Town of Ashland were restricted to 35mph for all types of trains for all conditions.
- For Build conditions through Richmond, two train speeds were developed and applied, as required, based on the Build Alternative being analyzed. For example, the train speeds on the S-Line south of Richmond would increase only for crossings that are being improved/used for certain Build Alternatives.

5.5.4 Vehicle Delay Results, Existing (2015) and No Build (2025) Conditions

Table 5-41 below presents the total daily vehicle delay by Build Alternative for all train types as well as delay from intercity passenger trains[43] only; the subsequent Table 5-42 presents the associated daily vehicle delay for each at-grade roadway crossing within each Build Alternative.

The data indicate that none of the roadway crossings exceed the FHWA criteria threshold of 40 hours of total vehicle delay per day in either 2015 or 2025 No Build conditions. The crossing that experiences the highest level of daily vehicle delay is the England Street / Thompson Street crossing in the Town of Ashland, with just over 20 hours of total daily delay in 2015 (i.e., approximately half of the FHWA criteria threshold) and just over 37 hours of total daily delay by 2025 (which approaches but does not exceed the FHWA criteria threshold).

Intercity passenger trains represent a relatively small percentage of total daily delays at crossings; as shown in the summary Table 5-41, the total daily delay in 2015 resulting from the four types of intercity passenger trains represents:

- 10 to 11 percent of the total daily delay in the Northern Virginia, Fredericksburg, and Central Virginia areas. The slightly lower 10 percent value is due to the addition of the VRE trains in the northern portion of the corridor.
- 9 percent of the total daily delay through the Ashland area.
- 11 percent, 7 percent, and 1 percent of the total daily delay through the Richmond area for the RF&P, A, and S rail lines, respectively.

By 2025 (No Build conditions), the percentage of the total daily delay that the four types of intercity passenger trains generally represent decreases of 1 to 2 percent from existing conditions. This is because the other types of trains in the corridor are projected to increase at a higher level (more trains per day) than the intercity passenger trains for these No Build conditions. Throughout the corridor in both 2015 and 2025 No Build conditions, the delay from the Freight Trains represents approximately 85 to 100 percent of total delay experienced at all crossings in the corridor.

In terms of total delay resulting from both intercity passenger and freight trains, the total expected 2025 No Build daily delay for motor vehicles at the existing at-grade crossings of the DC2RVA corridor is projected to increase by approximately 120 hours (to a total daily delay of almost 360 hours in Build conditions), representing an increase of over 50 percent from 2015. Ashland and Richmond are anticipated to have the highest increase in total hours of delay.

No passenger trains currently serve nor would serve either of the bypass alignments during existing or future No Build conditions.

Table 5-41: Summary of Total Daily Delay (Hours) at Public At-Grade Crossings, 2015 and 2025 No Build

Alternative Area[1]		**At-Grade Crossings that Exceed FHWA 40-hour Total Delay Threshold**		**2015**				**2025 No Build**				***Change in Total Delay, 2025 No Build To 2015***	
		2015	**2025 No Build**	**TOTAL Delay (hours)**	***Total Delay, Intercity Trains %***	***Total Delay, VRE Trains %***	***Total Delay, Freight Trains %***	**TOTAL Delay (hours)**	***Total Delay, Intercity Trains %***	***Total Delay, VRE Trains %***	***Total Delay, Freight Trains %***	***Daily Delay Hours***	***% Increase***
2	Northern Virginia	0	0	14.79	10%	6%	84%	23.28	8%	6%	86%	*8.49*	*57%*
3	Fredericksburg	0	0	10.73	10%	6%	84%	16.61	8%	6%	86%	*5.89*	*55%*
	Fredericksburg Bypass[2] (Existing)	0	0	15.82	0%	0%	100%	19.76	0%	0%	100%	*3.94*	*25%*
4	Central Virginia	0	0	2.39	11%	0%	89%	3.58	9%	0%	91%	*1.19*	*50%*
5	Ashland	0	0	47.74	9%	0%	91%	73.94	7%	0%	93%	*26.20*	*55%*
6	Richmond RFP Line	0	0	16.52	11%	0%	89%	25.19	9%	0%	91%	*8.67*	*52%*
	Richmond A-Line	0	0	33.45	7%	0%	93%	53.51	7%	0%	93%	*20.06*	*60%*
	Richmond S-Line	0	0	92.51	0.5%	0%	99.5%	142.76	0.4%	0%	99.6%	*50.25*	*54%*
TOTALS:		*0*	*0*	*233.94*	*5%*	*1%*	*94%*	*358.62*	*4%*	*1%*	*95%*	*124.68*	*53%*

[1]There are no public at-grade crossings located within Area 1 Arlington (Long Bridge Approach).
[2]This row reflects the existing crossings along the Dahlgren Spur, which would become part of the proposed Fredericksburg Bypass as part of the DC2RVA Build Alternative 3B.

Table 5-42: Total Daily Vehicle Delay (Hours) by Public At-Grade Crossing, 2015 and 2025 No Build

Crossing Roadway Name	Rail Line	Milepost	Location (County/City)	2015				2025 NO BUILD			
				TOTAL Delay (hours)	Total Delay, Intercity Trains %	Total Delay, VRE Trains %	Total Delay, Freight Trains %	TOTAL Delay (hours)	Total Delay, Intercity Trains %	Total Delay, VRE Trains %	Total Delay, Freight Trains %
Northern Virginia (Alternative Area 2)											
Featherstone Road	RF&P	CFP 86.85	Prince William County	8.06	10%	6%	84%	12.76	8%	6%	86%
Potomac Avenue	RF&P	CFP 78.79	Prince William County	6.26	10%	6%	84%	9.83	8%	6%	86%
Brent Point Road	RF&P	CFP 72.35	Stafford County	0.33	10%	6%	84%	0.49	8%	6%	86%
Mount Hope Church Road	RF&P	CFP 67.54	Stafford County	0.13	10%	6%	84%	0.19	8%	6%	86%
			Total:	**14.79**	**10%**	**6%**	**84%**	**23.28**	**8%**	**6%**	**86%**
Fredericksburg (Alternative Area 3) - RF&P Line											
Landsdowne Road	RF&P	CFP 57.51	Fredericksburg City	6.65	10%	6%	84%	10.40	8%	6%	86%
Mine Road	RF&P	CFP 54.77	Spotsylvania County	3.57	10%	6%	84%	5.45	8%	6%	86%
Summit Crossing Road	RF&P	CFP 51.45	Spotsylvania County	0.23	11%	0%	89%	0.35	9%	0%	91%
Claiborne Crossing Road	RF&P	CFP 48.63	Caroline County	0.28	11%	0%	89%	0.41	9%	0%	91%
			Total:	**10.73**	**10%**	**6%**	**84%**	**16.61**	**8%**	**6%**	**86%**
Fredericksburg (Alternative Area 3) - Bypass Crossings Only (Existing Dahlgren Spur)											
Debruen Lane	FBP	CFQ 0.53	Stafford County	0.54	0%	0%	100%	0.65	0%	0%	100%
Ferry Road	FBP	CFQ 1.70	Stafford County	12.13	0%	0%	100%	15.32	0%	0%	100%
Federal Drive	FBP	CFQ 2.89	Stafford County	1.44	0%	0%	100%	1.73	0%	0%	100%
Little Falls Road	FBP	CFQ 3.80	Stafford County	0.16	0%	0%	100%	0.19	0%	0%	100%
Forest Lane Road	FBP	CFQ 4.68	Stafford County	1.55	0%	0%	100%	1.87	0%	0%	100%
			Total:	**15.82**	**0%**	**0%**	**100%**	**19.76**	**0%**	**0%**	**100%**

Table 5-42: Total Daily Vehicle Delay (Hours) by Public At-Grade Crossing, 2015 and 2025 No Build

Crossing Roadway Name	Rail Line	Milepost	Location (County/City)	2015				2025 NO BUILD			
				TOTAL Delay (hours)	Total Delay, Intercity Trains %	Total Delay, VRE Trains %	Total Delay, Freight Trains %	TOTAL Delay (hours)	Total Delay, Intercity Trains %	Total Delay, VRE Trains %	Total Delay, Freight Trains %
Central Virginia (Alternative Area 4)											
Stonewall Jackson Road	RF&P	CFP 47.27	Caroline County	1.15	11%	0%	89%	1.73	9%	0%	91%
Woodford Road	RF&P	CFP 44.54	Caroline County	0.22	11%	0%	89%	0.33	9%	0%	91%
Woodslane Road	RF&P	CFP 43.51	Caroline County	0.06	11%	0%	89%	0.09	9%	0%	91%
Paige Road	RF&P	CFP 40.40	Caroline County	0.28	11%	0%	89%	0.41	9%	0%	91%
Penola Road	RF&P	CFP 33.00	Caroline County	0.25	11%	0%	89%	0.37	9%	0%	91%
Colemans Mill Road	RF&P	CFP 29.70	Caroline County	0.26	11%	0%	89%	0.39	9%	0%	91%
Doswell Road	RF&P	CFP 21.88	Hanover County	0.18	11%	0%	89%	0.27	9%	0%	91%
			Total:	**2.39**	**11%**	**0%**	**89%**	**3.58**	**9%**	**0%**	**91%**
Ashland (Alternative Area 5)											
W Vaughan Road / Henry Street	RF&P	CFP 15.64	Hanover County	1.80	8%	0%	92%	2.72	7%	0%	93%
W Patrick Street	RF&P	CFP 15.21	Hanover County	0.40	8%	0%	92%	0.60	7%	0%	93%
College Avenue / Henry Clay Street	RF&P	CFP 14.90	Hanover County	1.79	8%	0%	92%	2.69	7%	0%	93%
England Street / Thompson Street	RF&P	CFP 14.77	Hanover County	23.67	8%	0%	92%	37.37	7%	0%	93%
Myrtle Street	RF&P	CFP 14.66	Hanover County	2.50	8%	0%	92%	3.78	7%	0%	93%
E Francis Street	RF&P	CFP 14.22	Hanover County	1.95	8%	0%	92%	2.94	7%	0%	93%
Ashcake Road	RF&P	CFP 13.85	Hanover County	11.44	8%	0%	92%	17.55	7%	0%	93%
Gwathmey Church Road	RF&P	CFP 12.94	Hanover County	0.09	11%	0%	89%	0.14	9%	0%	91%

Table 5-42: Total Daily Vehicle Delay (Hours) by Public At-Grade Crossing, 2015 and 2025 No Build

Crossing Roadway Name	Rail Line	Milepost	Location (County/City)	2015				2025 NO BUILD			
				TOTAL Delay (hours)	Total Delay, Intercity Trains %	Total Delay, VRE Trains %	Total Delay, Freight Trains %	TOTAL Delay (hours)	Total Delay, Intercity Trains %	Total Delay, VRE Trains %	Total Delay, Freight Trains %
Elmont Road	RF&P	CFP 11.54	Hanover County	1.28	11%	0%	89%	1.92	9%	0%	91%
Cedar Lane	RF&P	CFP 11.15	Hanover County	1.15	11%	0%	89%	1.73	9%	0%	91%
Mill Road	RF&P	CFP 9.65	Henrico County	1.67	11%	0%	89%	2.52	9%	0%	91%
			Total:	**47.74**	**9%**	**0%**	**91%**	**73.94**	**7%**	**0%**	**93%**
Richmond (Alternative Area 6) - RF&P Line											
Mountain Road	RF&P	CFP 8.15	Henrico County	3.27	11%	0%	89%	4.95	9%	0%	91%
Hungary Road	RF&P	CFP 6.59	Henrico County	10.55	11%	0%	89%	16.13	9%	0%	91%
Hermitage Road	RF&P	CFP 5.43	Henrico County	2.70	11%	0%	89%	4.11	9%	0%	91%
			Total:	**16.52**	**11%**	**0%**	89%	**25.19**	**9%**	**0%**	**91%**
Richmond (Alternative Area 6) - A-Line											
Jahnke Road	A-LINE	A 0.68	Richmond	8.21	7%	0%	93%	13.02	7%	0%	93%
Bassett Avenue	A-LINE	A 1.01	Richmond	0.80	7%	0%	93%	1.23	7%	0%	93%
Broad Rock Boulevard	A-LINE	A 3.08	Richmond	14.94	7%	0%	93%	24.62	7%	0%	93%
Terminal Avenue	A-LINE	A 3.88	Richmond	0.38	7%	0%	93%	0.58	7%	0%	93%
Walmsley Boulevard	A-LINE	A 5.54	Richmond	4.59	7%	0%	93%	7.06	6%	0%	94%
Kingsland Road	A-LINE	A 9.37	Chesterfield County	1.24	7%	0%	93%	1.89	7%	0%	93%
Thurston Road	A-LINE	A 10.00	Chesterfield County	0.26	7%	0%	93%	0.39	7%	0%	93%
Old Lane	A-LINE	A 10.74	Chesterfield County	3.03	7%	0%	93%	4.71	7%	0%	93%
			Total:	**33.45**	**7%**	**0%**	93%	**53.51**	**7%**	**0%**	**93%**

Table 5-42: Total Daily Vehicle Delay (Hours) by Public At-Grade Crossing, 2015 and 2025 No Build

Crossing Roadway Name	Rail Line	Milepost	Location (County/City)	2015				2025 NO BUILD			
				TOTAL Delay (hours)	Total Delay, Intercity Trains %	Total Delay, VRE Trains %	Total Delay, Freight Trains %	TOTAL Delay (hours)	Total Delay, Intercity Trains %	Total Delay, VRE Trains %	Total Delay, Freight Trains %
Richmond (Alternative Area 6) - S-Line											
Hermitage Road	S-LINE	SRN 3.37	Richmond	17.27	1%	0%	99%	26.20	1%	0%	99%
Brook Road	S-LINE	SRN 2.34	Richmond	13.78	1%	0%	99%	20.83	1%	0%	99%
St James Street	S-LINE	SRN 1.75	Richmond	1.61	1%	0%	99%	2.42	1%	0%	99%
N 2nd Street / Valley Road	S-LINE	SRN 1.60	Richmond	5.32	1%	0%	99%	8.05	1%	0%	99%
Hospital Street / N 7th Street	S-LINE	SRN 1.24	Richmond	14.80	1%	0%	99%	22.51	1%	0%	99%
Maury Street	S-LINE	S 0.78	Richmond	14.59	0%	0%	100%	23.07	0%	0%	100%
Goodes Street	S-LINE	S 1.66	Richmond	0.20	0%	0%	100%	0.31	0%	0%	100%
E Commerce Road	S-LINE	S 2.98	Richmond	4.44	0%	0%	100%	6.99	0%	0%	100%
Ruffin Road	S-LINE	S 3.98	Richmond	1.86	0%	0%	100%	2.92	0%	0%	100%
Bells Road	S-LINE	S 4.46	Richmond	9.32	0%	0%	100%	14.70	0%	0%	100%
Dale Avenue / Trenton Avenue[1]	S-LINE	S 4.98	Richmond	0.00	n/a	n/a	n/a	0.00	n/a	n/a	n/a
Kingsland Road	S-LINE	S 9.14	Chesterfield County	2.08	0%	0%	100%	3.26	0%	0%	100%
Brinkley Road	S-LINE	S 9.83	Chesterfield County	1.88	0%	0%	100%	2.96	0%	0%	100%
Old Lane	S-Line	A 10.74	Chesterfield County	5.35	0%	0%	100%	8.54	0%	0%	100%
			Total:	**92.51**	**1%**	**0%**	99%	**142.76**	**0%**	**0%**	100%

[1] **Dale Avenue / Trenton Avenue is closed to through public traffic in the existing condition.**

5.5.5 Daily Vehicle Delay Results by Crossing, Build Conditions

Table 5-43 presents the analysis at each existing at-grade highway-rail crossing for 2025 Build conditions; the 2025 No Build results are copied in this table for ease of comparison. A review of the results by crossing roadway within each Build Alternative indicate the following:

- For Build Alternative 2A, one of the four at-grade crossings is eliminated, resulting in a 1% total reduction in daily delay across all four crossings when compared to No Build.
- Within the Fredericksburg area, the only Build Alternative that includes a crossing elimination is 3B, where one of the four at-grade crossings (at Landsdowne Road) would be grade-separated. This conversion from at-grade to grade-separated results in a 60% reduction in daily delay compared to No Build.
- Within Build Alternative 4A, there is one crossing elimination of the seven at-grade crossings (at Colemans Mill Road); the closure of this crossing would result in a 6% reduction in daily delay across all seven crossing when compared to No Build.
- Within the Ashland area, the Build Alternatives with the greatest reductions in daily delay occur for the bypass alignments (5C and 5C–Ashcake), which would result in reductions in daily delay of approximately 90% at the existing at-grade crossings in town by removing freight and long-distance passenger trains from traveling through town. For all other Build Alternatives, which vary in the total number and location of crossing elimination, there is a reduction of approximately 25% in daily delay compared to No Build.
- Within the Richmond area, the Build Alternatives that use the A-Line include a total of seven crossing eliminations out of eleven total at-grade crossings; this would result in a reduction in daily delay of 66% as compared to No Build. The exception is 6C, which includes two new at-grade crossings at the Broad Street Station and results in a reduction in daily delay of 38% as compared to No Build.
- Within the Richmond area, the S-Line Build Alternatives include seven crossing eliminations out of a total of seventeen at-grade crossings; this would result in a 59-60% reduction in daily delay as compared to No Build. The exception is 6B–S-Line which includes an additional crossing elimination in proximity to the Boulevard Station, and results in a reduction in daily delay of 76% as compared to No Build.

In addition to crossing elimination, decreases in delay in the Build condition within Fredericksburg, Ashland, and Richmond result from changes in train operating conditions through individual at-grade crossings, including diversion of train trips to bypass alignments or changes in use of the A and S-Lines in Richmond. Additionally, total daily delay at the Potomac Avenue crossing in Build Alternative 2A decreases compared to No Build conditions due to increases in train operating speed (the other at-grade crossings in that Build Alternative already operate at higher speeds so do not experience the same levels of decrease in build conditions).

For crossings that remain at-grade and experience increases in delay in the Build condition, the change in total daily delay is less than 8% for most crossings. Less than ten individual crossings that are located within Fredericksburg, Ashland, and Richmond will experience higher total daily delay. The greatest percentage of increased delay at all individual crossings is due to freight train traffic.

For at-grade crossings that receive diverted traffic volumes from adjacent crossing closures in the Build condition, a review of the results reflects the following delay:

- Build Alternative 5A
  - W Patrick Street: 0.72 hours (21% increase from No Build to Build)
  - England Street / Thompson Street: 41.85 hours (12% increase from No Build to Build)
- Build Alternative 5B
  - W Patrick Street: 0.72 hours (21% increase from No Build to Build)
  - England Street / Thompson Street: 41.85 hours (12% increase from No Build to Build)
  - Myrtle Street: 2.53 hours (33% decrease from No Build to Build)
  - E Francis Street: 3.24 hours (10% increase from No Build to Build)
- Build Alternative 5B–Ashcake and 5D–Ashcake
  - Myrtle Street: 2.53 hours (33% decrease from No Build to Build)
  - E Francis Street: 3.24 hours (10% increase from No Build to Build)
- Build Alternative 5C
  - W Patrick Street: 0.03 hours (95% decrease from No Build to Build)
  - England Street / Thompson Street: 1.79 hours (95% decrease from No Build to Build)
- Build Alternative 6A, 6B–A-Line, 6C, and 6E
  - Jahnke Road – 14.46 hours (11% increase from No Build to Build)
  - Kingsland Road – 2.45 hours (29% increase from No Build to Build)
- Build Alternative 6B–S-Line, 6D, and 6F
  - Kingsland Road – 1.93 hours (41% decrease from No Build to Build)
- Build Alternative 6G
  - Kingsland Road – 1.82 hours (44% decrease from No Build to Build)

Refer to Section 5.5.6 for presentation of this data summarized by Build Alternative.

Table 5-43: Total Daily Vehicle Delay by Public At-Grade Crossing, 2025 Build Condition

Crossing Roadway Name	Milepost	Location	No Build Delay	Crossing Build Conditions		Daily Vehicle Delay, Hours							Daily Vehicle Delay, %			Change in Delay, Build to No Build	
						Intercity Delay				VRE Delay	Freight Delay	Total Delay, All Trains	Intercity Percent of Total Delay	VRE Percent of Total Delay	Freight Percent of Total Delay		
				Proposed Crossing Improvement	Removes At-Grade Condition?	Northeast Regional Passenger	Interstate Corridor	Long Distance Passenger	Auto Train Passenger							Hours	%
2A: Add 1 Track																	
Featherstone Road	CFP 86.85	Prince William County	12.76	No change	N	0.77	0.38	0.24	0.30	0.71	10.99	**13.39**	13%	5%	82%	0.63	5%
Potomac Avenue	CFP 78.79	Prince William County	9.83	Four-Quadrant Gates	N	0.56	0.28	0.17	0.20	0.49	7.40	**9.11**	13%	5%	81%	-0.73	-7%
Brent Point Road	CFP 72.35	Stafford County	0.49	Four-Quadrant Gates	N	0.03	0.01	0.01	0.01	0.03	0.43	**0.52**	13%	5%	82%	0.02	5%
Mount Hope Church Road	CFP 67.54	Stafford County	0.19	Closure	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-0.19	-100%
		Total	**23.28**		**1**	**1.36**	**0.68**	**0.42**	**0.52**	**1.22**	**18.81**	**23.01**	**13%**	**5%**	**82%**	**-0.26**	**-1%**
3A: Maintain Existing																	
Landsdowne Road	CFP 57.51	Fredericksburg City	10.40	Four-Quadrant Gates	N	0.68	0.34	0.21	0.25	0.59	8.95	**11.02**	13%	5%	81%	0.62	6%
Mine Road	CFP 54.77	Spotsylvania County	5.45	Four-Quadrant Gates	N	0.36	0.18	0.11	0.13	0.31	4.70	**5.78**	13%	5%	81%	0.33	6%
Summit Crossing Road	CFP 51.45	Spotsylvania County	0.35	Four-Quadrant Gates	N	0.02	0.01	0.01	0.01	0.00	0.32	**0.37**	14%	0%	86%	0.02	7%
Claiborne Crossing Road	CFP 48.63	Caroline County	0.41	Median Treatment	N	0.03	0.01	0.01	0.01	0.00	0.38	**0.44**	13%	0%	87%	0.02	6%
		Total	**16.61**		**0**	**1.08**	**0.54**	**0.34**	**0.39**	**0.90**	**14.35**	**17.61**	**13%**	**5%**	**81%**	**0.99**	**6%**
3B: Add 1 track																	
Landsdowne Road	CFP 57.51	Fredericksburg City	10.40	Grade Separate	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-10.40	-100%
Mine Road	CFP 54.77	Spotsylvania County	5.45	Four-Quadrant Gates	N	0.36	0.18	0.11	0.13	0.31	4.70	**5.78**	13%	5%	81%	0.33	6%
Summit Crossing Road	CFP 51.45	Spotsylvania County	0.35	Four-Quadrant Gates	N	0.02	0.01	0.01	0.01	0.00	0.32	**0.37**	14%	0%	86%	0.02	7%
Claiborne Crossing Road	CFP 48.63	Caroline County	0.41	Median Treatment	N	0.03	0.01	0.01	0.01	0.00	0.38	**0.44**	13%	0%	87%	0.02	6%
		Total	**16.61**		**1**	**0.41**	**0.20**	**0.13**	**0.15**	**0.31**	**5.39**	**6.59**	**13%**	**5%**	**82%**	**-10.03**	**-60%**
3C: 2-Track East Bypass																	
Landsdowne Road	CFP 57.51	Fredericksburg City	10.40	Four-Quadrant Gates	N	0.68	0.34	0.07	0.00	0.00	1.28	**2.37**	46%	0%	54%	-8.03	-77%
Mine Road	CFP 54.77	Spotsylvania County	5.45	Four-Quadrant Gates	N	0.36	0.18	0.04	0.00	0.00	0.67	**1.24**	46%	0%	54%	-4.21	-77%
Summit Crossing Road	CFP 51.45	Spotsylvania County	0.35	Four-Quadrant Gates	N	0.02	0.01	0.01	0.01	0.00	0.32	**0.37**	14%	0%	86%	0.02	7%
Claiborne Crossing Road	CFP 48.63	Caroline County	0.41	Median Treatment	N	0.03	0.01	0.01	0.01	0.00	0.38	**0.44**	13%	0%	87%	0.02	6%
Debruen Lane	CFQ 0.53	Stafford County	0.65	Median Treatment	N	0.00	0.00	0.01	0.01	0.00	0.34	**0.36**	6%	0%	94%	-0.28	-44%
Ferry Road	CFQ 1.70	Stafford County	15.32	Four-Quadrant Gates	N	0.00	0.00	0.25	0.67	0.00	24.96	**25.87**	4%	0%	96%	10.55	69%
Federal Drive	CFQ 2.89	Stafford County	1.73	Four-Quadrant Gates	N	0.00	0.00	0.02	0.04	0.00	0.92	**0.98**	6%	0%	94%	-0.76	-44%
Little Falls Road	CFQ 3.80	Stafford County	0.19	Median Treatment	N	0.00	0.00	0.00	0.00	0.00	0.10	**0.11**	5%	0%	95%	-0.08	-44%
Forest Lane Road	CFQ 4.68	Stafford County	1.87	Median Treatment	N	0.00	0.00	0.02	0.04	0.00	1.00	**1.06**	6%	0%	94%	-0.82	-44%
		Total	**36.37**		**0**	**1.08**	**0.54**	**0.42**	**0.78**	**0.00**	**29.97**	**32.79**	**9%**	**0%**	**91%**	**-3.58**	**-10%**

Table 5-43: Total Daily Vehicle Delay by Public At-Grade Crossing, 2025 Build Condition

Crossing Roadway Name	Milepost	Location	No Build Delay	Crossing Build Conditions		Daily Vehicle Delay, Hours							Daily Vehicle Delay, %			Change in Delay, Build to No Build	
						Intercity Delay				VRE Delay	Freight Delay	Total Delay, All Trains	Intercity Percent of Total Delay	VRE Percent of Total Delay	Freight Percent of Total Delay		
				Proposed Crossing Improvement	Removes At-Grade Condition?	Northeast Regional Passenger	Interstate Corridor	Long Distance Passenger	Auto Train Passenger							Hours	%
4A: Add 1 Track																	
Stonewall Jackson Road	CFP 47.27	Caroline County	1.73	Four-Quadrant Gates	N	0.11	0.06	0.03	0.04	0.00	1.58	**1.83**	13%	0%	87%	0.10	6%
Woodford Road	CFP 44.54	Caroline County	0.33	Four-Quadrant Gates	N	0.02	0.01	0.00	0.01	0.00	0.30	**0.34**	12%	0%	88%	0.01	4%
Woodslane Road	CFP 43.51	Caroline County	0.09	Median Treatment	N	0.01	0.00	0.00	0.00	0.00	0.08	**0.09**	12%	0%	88%	0.00	4%
Paige Road	CFP 40.40	Caroline County	0.41	Median Treatment	N	0.03	0.01	0.00	0.01	0.00	0.38	**0.43**	12%	0%	88%	0.01	4%
Penola Road	CFP 33.00	Caroline County	0.37	Four-Quadrant Gates	N	0.03	0.01	0.00	0.01	0.00	0.34	**0.38**	13%	0%	87%	0.02	5%
Colemans Mill Road	CFP 29.70	Caroline County	0.39	Closure	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-0.39	-100%
Doswell Road	CFP 21.88	Hanover County	0.27	Four-Quadrant Gates	N	0.02	0.01	0.00	0.01	0.00	0.25	**0.28**	12%	0%	88%	0.01	4%
		Total	**3.58**		**1**	**0.21**	**0.10**	**0.03**	**0.08**	**0.00**	**2.92**	**3.35**	**13%**	**0%**	**87%**	**-0.23**	**-6%**
5A: Maintain Existing																	
W Vaughan Road / Henry Street	CFP 15.64	Hanover County	2.72	Grade Separate	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-2.72	-100%
W Patrick Street	CFP 15.21	Hanover County	0.60	Four-Quadrant Gates	N	0.03	0.02	0.01	0.02	0.00	0.64	**0.72**	11%	0%	89%	0.12	21%
College Avenue / Henry Clay Street	CFP 14.90	Hanover County	2.69	Closure	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-2.69	-100%
England Street / Thompson Street	CFP 14.77	Hanover County	37.37	Four-Quadrant Gates	N	1.91	0.96	0.61	1.11	0.00	37.26	**41.85**	11%	0%	89%	4.49	12%
Myrtle Street	CFP 14.66	Hanover County	3.78	Four-Quadrant Gates	N	0.18	0.09	0.06	0.10	0.00	3.52	**3.96**	11%	0%	89%	0.18	5%
E Francis Street	CFP 14.22	Hanover County	2.94	Four-Quadrant Gates	N	0.14	0.07	0.05	0.08	0.00	2.74	**3.08**	11%	0%	89%	0.14	5%
Ashcake Road	CFP 13.85	Hanover County	17.55	Grade Separate	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-17.55	-100%
Gwathmey Church Road	CFP 12.94	Hanover County	0.14	Four-Quadrant Gates	N	0.01	0.00	0.00	0.00	0.00	0.13	**0.15**	13%	0%	87%	0.01	6%
Elmont Road	CFP 11.54	Hanover County	1.92	Four-Quadrant Gates	N	0.12	0.06	0.04	0.05	0.00	1.76	**2.03**	13%	0%	87%	0.11	6%
Cedar Lane	CFP 11.15	Hanover County	1.73	Four-Quadrant Gates	N	0.11	0.06	0.03	0.04	0.00	1.58	**1.83**	13%	0%	87%	0.10	6%
Mill Road	CFP 9.65	Henrico County	2.52	Median Treatment	N	0.16	0.08	0.05	0.06	0.00	2.30	**2.66**	13%	0%	87%	0.14	6%
		Total	**73.94**		**3**	**2.67**	**1.34**	**0.85**	**1.47**	**0.00**	**49.95**	**56.28**	**11%**	**0%**	**89%**	**-17.66**	**-24%**
5A–Ashcake: Maintain Existing (New Station)																	
W Vaughan Road / Henry Street	CFP 15.64	Hanover County	2.72	Grade Separate	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-2.72	-100%
W Patrick Street	CFP 15.21	Hanover County	0.60	Four-Quadrant Gates	N	0.03	0.01	0.01	0.02	0.00	0.56	**0.63**	11%	0%	89%	0.03	5%
College Avenue / Henry Clay Street	CFP 14.90	Hanover County	2.69	Four-Quadrant Gates	N	0.13	0.06	0.04	0.07	0.00	2.51	**2.82**	11%	0%	89%	0.13	5%
England Street / Thompson Street	CFP 14.77	Hanover County	37.37	Four-Quadrant Gates	N	1.79	0.90	0.57	1.04	0.00	34.88	**39.18**	11%	0%	89%	1.82	5%
Myrtle Street	CFP 14.66	Hanover County	3.78	Four-Quadrant Gates	N	0.18	0.09	0.06	0.10	0.00	3.52	**3.96**	11%	0%	89%	0.18	5%
E Francis Street	CFP 14.22	Hanover County	2.94	Four-Quadrant Gates	N	0.14	0.07	0.05	0.08	0.00	2.74	**3.08**	11%	0%	89%	0.14	5%

Table 5-43: Total Daily Vehicle Delay by Public At-Grade Crossing, 2025 Build Condition

Crossing Roadway Name	Milepost	Location	No Build Delay	Crossing Build Conditions		Daily Vehicle Delay, Hours							Daily Vehicle Delay, %			Change in Delay, Build to No Build	
						Intercity Delay				VRE Delay	Freight Delay	Total Delay, All Trains	Intercity Percent of Total Delay	VRE Percent of Total Delay	Freight Percent of Total Delay		
				Proposed Crossing Improvement	Removes At-Grade Condition?	Northeast Regional Passenger	Interstate Corridor	Long Distance Passenger	Auto Train Passenger							Hours	%
Ashcake Road	CFP 13.85	Hanover County	17.55	Grade Separate	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-17.55	-100%
Gwathmey Church Road	CFP 12.94	Hanover County	0.14	Four-Quadrant Gates	N	0.01	0.00	0.00	0.00	0.00	0.13	**0.15**	13%	0%	87%	0.01	6%
Elmont Road	CFP 11.54	Hanover County	1.92	Four-Quadrant Gates	N	0.12	0.06	0.04	0.05	0.00	1.76	**2.03**	13%	0%	87%	0.11	6%
Cedar Lane	CFP 11.15	Hanover County	1.73	Four-Quadrant Gates	N	0.11	0.06	0.03	0.04	0.00	1.58	**1.83**	13%	0%	87%	0.10	6%
Mill Road	CFP 9.65	Henrico County	2.52	Median Treatment	N	0.16	0.08	0.05	0.06	0.00	2.30	**2.66**	13%	0%	87%	0.14	6%
		Total	**73.94**		**2**	**2.67**	**1.34**	**0.85**	**1.47**	**0.00**	**49.99**	**56.33**	**11%**	**0%**	**89%**	**-17.61**	**-24%**
5B: Add 1 Track																	
W Vaughan Road / Henry Street	CFP 15.64	Hanover County	2.72	Grade Separate	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-2.72	-100%
W Patrick Street	CFP 15.21	Hanover County	0.60	Four-Quadrant Gates	N	0.03	0.02	0.01	0.02	0.00	0.64	**0.72**	11%	0%	89%	0.12	21%
College Avenue / Henry Clay Street	CFP 14.90	Hanover County	2.69	Closure	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-2.69	-100%
England Street / Thompson Street	CFP 14.77	Hanover County	37.37	Four-Quadrant Gates	N	1.91	0.96	0.61	1.11	0.00	37.26	**41.85**	11%	0%	89%	4.49	12%
Myrtle Street	CFP 14.66	Hanover County	3.78	Four-Quadrant Gates	N	0.12	0.06	0.04	0.07	0.00	2.25	**2.53**	11%	0%	89%	-1.25	-33%
E Francis Street	CFP 14.22	Hanover County	2.94	Four-Quadrant Gates	N	0.15	0.07	0.05	0.09	0.00	2.89	**3.24**	11%	0%	89%	0.31	10%
Ashcake Road	CFP 13.85	Hanover County	17.55	Grade Separate	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-17.55	-100%
Gwathmey Church Road	CFP 12.94	Hanover County	0.14	Four-Quadrant Gates	N	0.01	0.00	0.00	0.00	0.00	0.13	**0.15**	13%	0%	87%	0.01	6%
Elmont Road	CFP 11.54	Hanover County	1.92	Four-Quadrant Gates	N	0.12	0.06	0.04	0.05	0.00	1.76	**2.03**	13%	0%	87%	0.11	6%
Cedar Lane	CFP 11.15	Hanover County	1.73	Four-Quadrant Gates	N	0.11	0.06	0.03	0.04	0.00	1.58	**1.83**	13%	0%	87%	0.10	6%
Mill Road	CFP 9.65	Henrico County	2.52	Median Treatment	N	0.16	0.08	0.05	0.06	0.00	2.30	**2.66**	13%	0%	87%	0.14	6%
		Total	**73.94**		**3**	**2.61**	**1.31**	**0.83**	**1.44**	**0.00**	**48.82**	**55.01**	**11%**	**0%**	**89%**	**-18.93**	**-26%**
5B–Ashcake: Add 1 Track (New Station) and 5D–Ashcake: Center 3 Tracks (New Station)																	
W Vaughan Road / Henry Street	CFP 15.64	Hanover County	2.72	Grade Separate	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-2.72	-100%
W Patrick Street	CFP 15.21	Hanover County	0.60	Four-Quadrant Gates	N	0.03	0.01	0.01	0.02	0.00	0.56	**0.63**	11%	0%	89%	0.03	5%
College Avenue / Henry Clay Street	CFP 14.90	Hanover County	2.69	Four-Quadrant Gates	N	0.13	0.06	0.04	0.07	0.00	2.51	**2.82**	11%	0%	89%	0.13	5%
England Street / Thompson Street	CFP 14.77	Hanover County	37.37	Four-Quadrant Gates	N	1.79	0.90	0.57	1.04	0.00	34.88	**39.18**	11%	0%	89%	1.82	5%
Myrtle Street	CFP 14.66	Hanover County	3.78	Four-Quadrant Gates	N	0.12	0.06	0.04	0.07	0.00	2.25	**2.53**	11%	0%	89%	-1.25	-33%
E Francis Street	CFP 14.22	Hanover County	2.94	Four-Quadrant Gates	N	0.15	0.07	0.05	0.09	0.00	2.89	**3.24**	11%	0%	89%	0.31	10%
Ashcake Road	CFP 13.85	Hanover County	17.55	Grade Separate	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-17.55	-100%
Gwathmey Church Road	CFP 12.94	Hanover County	0.14	Four-Quadrant Gates	N	0.01	0.00	0.00	0.00	0.00	0.13	**0.15**	13%	0%	87%	0.01	6%
Elmont Road	CFP 11.54	Hanover County	1.92	Four-Quadrant Gates	N	0.12	0.06	0.04	0.05	0.00	1.76	**2.03**	13%	0%	87%	0.11	6%

Table 5-43: Total Daily Vehicle Delay by Public At-Grade Crossing, 2025 Build Condition

Crossing Roadway Name	Milepost	Location	No Build Delay	Crossing Build Conditions: Proposed Crossing Improvement	Crossing Build Conditions: Removes At-Grade Condition?	Daily Vehicle Delay, Hours: Intercity Delay: Northeast Regional Passenger	Intercity Delay: Interstate Corridor	Intercity Delay: Long Distance Passenger	Intercity Delay: Auto Train Passenger	VRE Delay	Freight Delay	Total Delay, All Trains	Daily Vehicle Delay, %: Intercity Percent of Total Delay	VRE Percent of Total Delay	Freight Percent of Total Delay	Change in Delay, Build to No Build: Hours	Change in Delay, Build to No Build: %
Cedar Lane	CFP 11.15	Hanover County	1.73	Four-Quadrant Gates	N	0.11	0.06	0.03	0.04	0.00	1.58	**1.83**	13%	0%	87%	0.10	6%
Mill Road	CFP 9.65	Henrico County	2.52	Median Treatment	N	0.16	0.08	0.05	0.06	0.00	2.30	**2.66**	13%	0%	87%	0.14	6%
Total			**73.94**		**2**	**2.62**	**1.31**	**0.83**	**1.44**	**0.00**	**48.86**	**55.06**	**11%**	**0%**	**89%**	**-18.88**	**-26%**
5C: 2-Track West Bypass																	
W Vaughan Road / Henry Street	CFP 15.64	Hanover County	2.72	Four-Quadrant Gates	N	0.13	0.00	0.00	0.00	0.00	0.00	**0.13**	100%	0%	0%	-2.59	-95%
W Patrick Street	CFP 15.21	Hanover County	0.60	Four-Quadrant Gates	N	0.03	0.00	0.00	0.00	0.00	0.00	**0.03**	100%	0%	0%	-0.57	-94%
College Avenue / Henry Clay Street	CFP 14.90	Hanover County	2.69	Closure	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-2.69	-100%
England Street / Thompson Street	CFP 14.77	Hanover County	37.37	Four-Quadrant Gates	N	1.91	0.00	0.00	0.00	0.00	0.00	**1.91**	100%	0%	0%	-35.45	-95%
Myrtle Street	CFP 14.66	Hanover County	3.78	Four-Quadrant Gates	N	0.18	0.00	0.00	0.00	0.00	0.00	**0.18**	100%	0%	0%	-3.59	-95%
E Francis Street	CFP 14.22	Hanover County	2.94	Four-Quadrant Gates	N	0.14	0.00	0.00	0.00	0.00	0.00	**0.14**	100%	0%	0%	-2.80	-95%
Ashcake Road	CFP 13.85	Hanover County	17.55	Four-Quadrant Gates	N	0.84	0.00	0.00	0.00	0.00	0.00	**0.84**	100%	0%	0%	-16.71	-95%
Gwathmey Church Road	CFP 12.94	Hanover County	0.14	Four-Quadrant Gates	N	0.01	0.00	0.00	0.00	0.00	0.00	**0.01**	100%	0%	0%	-0.13	-94%
Elmont Road	CFP 11.54	Hanover County	1.92	Four-Quadrant Gates	N	0.12	0.06	0.04	0.05	0.00	1.76	**2.03**	13%	0%	87%	0.11	6%
Cedar Lane	CFP 11.15	Hanover County	1.73	Four-Quadrant Gates	N	0.11	0.06	0.03	0.04	0.00	1.58	**1.83**	13%	0%	87%	0.10	6%
Mill Road	CFP 9.65	Henrico County	2.52	Median Treatment	N	0.16	0.08	0.05	0.06	0.00	2.30	**2.66**	13%	0%	87%	0.14	6%
Total			**73.94**		**1**	**3.64**	**0.20**	**0.12**	**0.16**	**0.00**	**5.65**	**9.76**	**42%**	**0%**	**58%**	**-64.18**	**-87%**
5C–Ashcake: 2-Track West Bypass (New Station)																	
W Vaughan Road / Henry Street	CFP 15.64	Hanover County	2.72	Four-Quadrant Gates	N	0.13	0.00	0.00	0.00	0.00	0.00	**0.13**	100%	0%	0%	-2.59	-95%
W Patrick Street	CFP 15.21	Hanover County	0.60	Four-Quadrant Gates	N	0.03	0.00	0.00	0.00	0.00	0.00	**0.03**	100%	0%	0%	-0.57	-95%
College Avenue / Henry Clay Street	CFP 14.90	Hanover County	2.69	Four-Quadrant Gates	N	0.13	0.00	0.00	0.00	0.00	0.00	**0.13**	100%	0%	0%	-2.56	-95%
England Street / Thompson Street	CFP 14.77	Hanover County	37.37	Four-Quadrant Gates	N	1.79	0.00	0.00	0.00	0.00	0.00	**1.79**	100%	0%	0%	-35.58	-95%
Myrtle Street	CFP 14.66	Hanover County	3.78	Four-Quadrant Gates	N	0.18	0.00	0.00	0.00	0.00	0.00	**0.18**	100%	0%	0%	-3.59	-95%
E Francis Street	CFP 14.22	Hanover County	2.94	Four-Quadrant Gates	N	0.14	0.00	0.00	0.00	0.00	0.00	**0.14**	100%	0%	0%	-2.80	-95%
Ashcake Road	CFP 13.85	Hanover County	17.55	Four-Quadrant Gates	N	0.84	0.00	0.00	0.00	0.00	0.00	**0.84**	100%	0%	0%	-16.71	-95%
Gwathmey Church Road	CFP 12.94	Hanover County	0.14	Four-Quadrant Gates	N	0.01	0.00	0.00	0.00	0.00	0.00	**0.01**	100%	0%	0%	-0.13	-94%
Elmont Road	CFP 11.54	Hanover County	1.92	Four-Quadrant Gates	N	0.12	0.06	0.04	0.05	0.00	1.76	**2.03**	13%	0%	87%	0.11	6%
Cedar Lane	CFP 11.15	Hanover County	1.73	Four-Quadrant Gates	N	0.11	0.06	0.03	0.04	0.00	1.58	**1.83**	13%	0%	87%	0.10	6%
Mill Road	CFP 9.65	Henrico County	2.52	Median Treatment	N	0.16	0.08	0.05	0.06	0.00	2.30	**2.66**	13%	0%	87%	0.14	6%

Table 5-43: Total Daily Vehicle Delay by Public At-Grade Crossing, 2025 Build Condition

Crossing Roadway Name	Milepost	Location	No Build Delay	Crossing Build Conditions		Daily Vehicle Delay, Hours							Daily Vehicle Delay, %			Change in Delay, Build to No Build	
						Intercity Delay				VRE Delay	Freight Delay	Total Delay, All Trains	Intercity Percent of Total Delay	VRE Percent of Total Delay	Freight Percent of Total Delay		
				Proposed Crossing Improvement	Removes At-Grade Condition?	Northeast Regional Passenger	Interstate Corridor	Long Distance Passenger	Auto Train Passenger							Hours	%
		Total	**73.94**		**0**	**3.64**	**0.20**	**0.12**	**0.16**	**0.00**	**5.65**	**9.77**	**42%**	**0%**	**58%**	**-64.17**	**-87%**
6A: Staples Mill Only																	
Mountain Road	CFP 8.15	Henrico County	4.95	No change	N	0.32	0.16	0.10	0.12	0.00	4.53	**5.22**	13%	0%	87%	0.28	6%
Hungary Road	CFP 6.59	Henrico County	16.13	Grade Separate	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-16.13	-100%
Hermitage Road	CFP 5.43	Henrico County	4.11	Four-Quadrant Gates	N	0.26	0.13	0.08	0.10	0.00	3.76	**4.34**	13%	0%	87%	0.23	6%
Jahnke Road	A 0.68	Richmond	13.02	Four-Quadrant Gates	N	0.57	0.47	0.29	0.35	0.00	12.78	**14.46**	12%	0%	88%	1.44	11%
Bassett Avenue	A 1.01	Richmond	1.23	Closure	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-1.23	-100%
Broad Rock Boulevard	A 3.08	Richmond	24.62	Grade Separate	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-24.62	-100%
Terminal Avenue	A 3.88	Richmond	0.58	Closure	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-0.58	-100%
Walmsley Boulevard	A 5.54	Richmond	7.06	Grade Separate	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-7.06	-100%
Kingsland Road	A 9.37	Chesterfield County	1.89	Median Treatment	N	0.10	0.08	0.05	0.06	0.00	2.17	**2.45**	12%	0%	88%	0.56	29%
Thurston Road	A 10.00	Chesterfield County	0.39	Closure	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-0.39	-100%
Old Lane	A 10.74	Chesterfield County	4.71	Closure	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-4.71	-100%
		Total	**78.70**		**7**	**1.24**	**0.84**	**0.52**	**0.64**	**0.00**	**23.23**	**26.48**	**12%**	**0%**	**88%**	**-52.22**	**-66%**
6B–A-Line: Boulevard Road Only (A-Line)																	
Mountain Road	CFP 8.15	Henrico County	4.95	No change	N	0.32	0.16	0.10	0.12	0.00	4.53	**5.22**	13%	0%	87%	0.28	6%
Hungary Road	CFP 6.59	Henrico County	16.13	Grade Separate	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-16.13	-100%
Hermitage Road	CFP 5.43	Henrico County	4.11	Four-Quadrant Gates	N	0.26	0.13	0.08	0.10	0.00	3.76	**4.34**	13%	0%	87%	0.23	6%
Jahnke Road	A 0.68	Richmond	13.02	Four-Quadrant Gates	N	0.57	0.47	0.29	0.35	0.00	12.78	**14.46**	12%	0%	88%	1.44	11%
Bassett Avenue	A 1.01	Richmond	1.23	Closure	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-1.23	-100%
Broad Rock Boulevard	A 3.08	Richmond	24.62	Grade Separate	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-24.62	-100%
Terminal Avenue	A 3.88	Richmond	0.58	Closure	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-0.58	-100%
Walmsley Boulevard	A 5.54	Richmond	7.06	Grade Separate	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-7.06	-100%
Kingsland Road	A 9.37	Chesterfield County	1.89	Median Treatment	N	0.10	0.08	0.05	0.06	0.00	2.17	**2.45**	12%	0%	88%	0.56	29%
Thurston Road	A 10.00	Chesterfield County	0.39	Closure	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-0.39	-100%
Old Lane	A 10.74	Chesterfield County	4.71	Closure	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-4.71	-100%
		Total	**78.70**		**7**	**1.24**	**0.84**	**0.52**	**0.64**	**0.00**	**23.23**	**26.48**	**12%**	**0%**	**88%**	**-52.22**	**-66%**
6B–S-Line: Boulevard Road Only (S-Line)																	
Mountain Road	CFP 8.15	Henrico County	4.95	No change	N	0.32	0.16	0.10	0.12	0.00	4.53	**5.22**	13%	0%	87%	0.28	6%
Hungary Road	CFP 6.59	Henrico County	16.13	Grade Separate	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-16.13	-100%
Hermitage Road	CFP 5.43	Henrico County	4.11	Four-Quadrant Gates	N	0.26	0.13	0.08	0.10	0.00	3.76	**4.34**	13%	0%	87%	0.23	6%
Hermitage Road	SRN 3.37	Richmond	26.20	Grade Separate	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-26.20	-100%
Brook Road	SRN 2.34	Richmond	20.83	Median Treatment	N	0.95	0.47	0.31	0.00	0.00	20.68	**22.40**	8%	0%	92%	1.57	8%
St James Street	SRN 1.75	Richmond	2.42	Closure	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-2.42	-100%
N 2nd Street / Valley Road	SRN 1.60	Richmond	8.05	Closure	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-8.05	-100%
Hospital Street / N 7th Street	SRN 1.24	Richmond	22.51	Grade Separate	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-22.51	-100%

Table 5-43: Total Daily Vehicle Delay by Public At-Grade Crossing, 2025 Build Condition

Crossing Roadway Name	Milepost	Location	No Build Delay	Crossing Build Conditions		Daily Vehicle Delay, Hours							Daily Vehicle Delay, %			Change in Delay, Build to No Build	
						Intercity Delay				VRE Delay	Freight Delay	Total Delay, All Trains	Intercity Percent of Total Delay	VRE Percent of Total Delay	Freight Percent of Total Delay		
				Proposed Crossing Improvement	Removes At-Grade Condition?	Northeast Regional Passenger	Interstate Corridor	Long Distance Passenger	Auto Train Passenger							Hours	%
Maury Street	S 0.78	Richmond	23.07	Four-Quadrant Gates	N	0.10	0.08	0.05	0.00	0.00	1.02	**1.25**	18%	0%	82%	-21.81	-95%
Goodes Street	S 1.66	Richmond	0.31	Four-Quadrant Gates	N	0.01	0.01	0.00	0.00	0.00	0.07	**0.09**	18%	0%	82%	-0.22	-71%
E Commerce Road	S 2.98	Richmond	6.99	Grade Separate	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-6.99	-100%
Ruffin Road	S 3.98	Richmond	2.92	Median Treatment	N	0.07	0.06	0.03	0.00	0.00	0.69	**0.85**	18%	0%	82%	-2.07	-71%
Bells Road	S 4.46	Richmond	14.70	Median Treatment	N	0.33	0.28	0.17	0.00	0.00	3.50	**4.29**	18%	0%	82%	-10.41	-71%
Dale Avenue / Trenton Avenue	S 4.98	Richmond	0.42	Closure	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-0.42	-100%
Kingsland Road	S 9.14	Chesterfield County	3.26	Four-Quadrant Gates	N	0.16	0.13	0.08	0.00	0.00	1.56	**1.93**	19%	0%	81%	-1.33	-41%
Brinkley Road	S 9.83	Chesterfield County	2.96	Closure	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-2.96	-100%
Old Lane	A 10.74	Chesterfield County	8.54	Closure	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-8.54	-100%
		Total	**168.36**		**9**	**2.19**	**1.32**	**0.83**	**0.23**	**0.00**	**35.81**	**40.37**	**11%**	**0%**	**89%**	**-127.99**	**-76%**
6C: Broad Street Only																	
Mountain Road	CFP 8.15	Henrico County	4.95	No change	N	0.32	0.16	0.10	0.12	0.00	4.53	**5.22**	13%	0%	87%	0.28	6%
Hungary Road	CFP 6.59	Henrico County	16.13	Grade Separate	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-16.13	-100%
Hermitage Road	CFP 5.43	Henrico County	4.11	Four-Quadrant Gates	N	0.26	0.13	0.08	0.10	0.00	3.76	**4.34**	13%	0%	87%	0.23	6%
Jahnke Road	A 0.68	Richmond	13.02	Four-Quadrant Gates	N	0.57	0.47	0.29	0.35	0.00	12.78	**14.46**	12%	0%	88%	1.44	11%
Bassett Avenue	A 1.01	Richmond	1.23	Closure	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-1.23	-100%
Broad Rock Boulevard	A 3.08	Richmond	24.62	Grade Separate	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-24.62	-100%
Terminal Avenue	A 3.88	Richmond	0.58	Closure	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-0.58	-100%
Walmsley Boulevard	A 5.54	Richmond	7.06	Grade Separate	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-7.06	-100%
Kingsland Road	A 9.37	Chesterfield County	1.89	Median Treatment	N	0.10	0.08	0.05	0.06	0.00	2.17	**2.45**	12%	0%	88%	0.56	29%
Thurston Road	A 10.00	Chesterfield County	0.39	Closure	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-0.39	-100%
Old Lane	A 10.74	Chesterfield County	4.71	Closure	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-4.71	-100%
Hermitage Road	SRN 3.37	Richmond	26.20	Median Treatment	N	0.36	0.00	0.00	0.00	0.00	26.01	**26.37**	1%	0%	99%	0.17	1%
W Leigh St (near Myers Street)	(new)	Richmond	0	Median Treatment	N	3.29	1.65	1.11	0.00	0.00	0.00	**6.05**	100%	0%	0%	6.05	n/a
W Leigh St (near Hermitage Road)	(new)	Richmond	0	Median Treatment	N	3.29	1.65	1.11	0.00	0.00	0.00	**6.05**	100%	0%	0%	6.05	n/a
		Total	**104.90**		**7**	**8.19**	**4.14**	**2.74**	**0.64**	**0.00**	**49.24**	**64.95**	**24%**	**0%**	**76%**	**-39.95**	**-38%**
6D: Main Street Only																	
Mountain Road	CFP 8.15	Henrico County	4.95	No change	N	0.32	0.16	0.10	0.12	0.00	4.53	**5.22**	13%	0%	87%	0.28	6%
Hungary Road	CFP 6.59	Henrico County	16.13	Grade Separate	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-16.13	-100%
Hermitage Road	CFP 5.43	Henrico County	4.11	Four-Quadrant Gates	N	0.26	0.13	0.08	0.10	0.00	3.76	**4.34**	13%	0%	87%	0.23	6%
Hermitage Road	SRN 3.37	Richmond	26.20	Median Treatment	N	1.19	0.60	0.38	0.00	0.00	26.01	**28.18**	8%	0%	92%	1.98	8%
Brook Road	SRN 2.34	Richmond	20.83	Median Treatment	N	0.95	0.47	0.31	0.00	0.00	20.68	**22.40**	8%	0%	92%	1.57	8%
St James Street	SRN 1.75	Richmond	2.42	Closure	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-2.42	-100%
N 2nd Street / Valley Road	SRN 1.60	Richmond	8.05	Closure	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-8.05	-100%
Hospital Street / N 7th Street	SRN 1.24	Richmond	22.51	Grade Separate	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-22.51	-100%

Table 5-43: Total Daily Vehicle Delay by Public At-Grade Crossing, 2025 Build Condition

Crossing Roadway Name	Milepost	Location	No Build Delay	Crossing Build Conditions		Daily Vehicle Delay, Hours							Daily Vehicle Delay, %			Change in Delay, Build to No Build	
						Intercity Delay				VRE Delay	Freight Delay	Total Delay, All Trains	Intercity Percent of Total Delay	VRE Percent of Total Delay	Freight Percent of Total Delay		
				Proposed Crossing Improvement	Removes At-Grade Condition?	Northeast Regional Passenger	Interstate Corridor	Long Distance Passenger	Auto Train Passenger							Hours	%
Maury Street	S 0.78	Richmond	23.07	Four-Quadrant Gates	N	0.10	0.08	0.05	0.00	0.00	1.02	**1.25**	18%	0%	82%	-21.81	-95%
Goodes Street	S 1.66	Richmond	0.31	Four-Quadrant Gates	N	0.01	0.01	0.00	0.00	0.00	0.07	**0.09**	18%	0%	82%	-0.22	-71%
E Commerce Road	S 2.98	Richmond	6.99	Grade Separate	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-6.99	-100%
Ruffin Road	S 3.98	Richmond	2.92	Median Treatment	N	0.07	0.06	0.03	0.00	0.00	0.69	**0.85**	18%	0%	82%	-2.07	-71%
Bells Road	S 4.46	Richmond	14.70	Median Treatment	N	0.33	0.28	0.17	0.00	0.00	3.50	**4.29**	18%	0%	82%	-10.41	-71%
Dale Avenue / Trenton Avenue	S 4.98	Richmond	0.42	Closure	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-0.42	-100%
Kingsland Road	S 9.14	Chesterfield County	3.26	Four-Quadrant Gates	N	0.16	0.13	0.08	0.00	0.00	1.56	**1.93**	19%	0%	81%	-1.33	-41%
Brinkley Road	S 9.83	Chesterfield County	2.96	Closure	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-2.96	-100%
Old Lane	A 10.74	Chesterfield County	8.54	Closure	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-8.54	-100%
		Total	**168.36**		**8**	**3.38**	**1.91**	**1.21**	**0.23**	**0.00**	**61.82**	**68.55**	**10%**	**0%**	**90%**	**-99.81**	**-59%**
6E: Split Service																	
Mountain Road	CFP 8.15	Henrico County	4.95	No change	N	0.32	0.16	0.10	0.12	0.00	4.53	**5.22**	13%	0%	87%	0.28	6%
Hungary Road	CFP 6.59	Henrico County	16.13	Grade Separate	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-16.13	-100%
Hermitage Road	CFP 5.43	Henrico County	4.11	Four-Quadrant Gates	N	0.26	0.13	0.08	0.10	0.00	3.76	**4.34**	13%	0%	87%	0.23	6%
Jahnke Road	A 0.68	Richmond	13.02	Four-Quadrant Gates	N	0.57	0.47	0.29	0.35	0.00	12.78	**14.46**	12%	0%	88%	1.44	11%
Bassett Avenue	A 1.01	Richmond	1.23	Closure	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-1.23	-100%
Broad Rock Boulevard	A 3.08	Richmond	24.62	Grade Separate	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-24.62	-100%
Terminal Avenue	A 3.88	Richmond	0.58	Closure	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-0.58	-100%
Walmsley Boulevard	A 5.54	Richmond	7.06	Grade Separate	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-7.06	-100%
Kingsland Road	A 9.37	Chesterfield County	1.89	Median Treatment	N	0.10	0.08	0.05	0.06	0.00	2.17	**2.45**	12%	0%	88%	0.56	29%
Thurston Road	A 10.00	Chesterfield County	0.39	Closure	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-0.39	-100%
Old Lane	A 10.74	Chesterfield County	4.71	Closure	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-4.71	-100%
		Total	**78.70**		**7**	**1.24**	**0.84**	**0.52**	**0.64**	**0.00**	**23.23**	**26.48**	**12%**	**0%**	**88%**	**-52.22**	**-66%**
6F: Full Service																	
Mountain Road	CFP 8.15	Henrico County	4.95	No change	N	0.32	0.16	0.10	0.12	0.00	4.53	**5.22**	13%	0%	87%	0.28	6%
Hungary Road	CFP 6.59	Henrico County	16.13	Grade Separate	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-16.13	-100%
Hermitage Road	CFP 5.43	Henrico County	4.11	Four-Quadrant Gates	N	0.26	0.13	0.08	0.10	0.00	3.76	**4.34**	13%	0%	87%	0.23	6%
Hermitage Road	SRN 3.37	Richmond	26.20	Median Treatment	N	1.19	0.60	0.38	0.00	0.00	26.01	**28.18**	8%	0%	92%	1.98	8%
Brook Road	SRN 2.34	Richmond	20.83	Median Treatment	N	0.95	0.47	0.31	0.00	0.00	20.68	**22.40**	8%	0%	92%	1.57	8%
St James Street	SRN 1.75	Richmond	2.42	Closure	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-2.42	-100%
N 2nd Street / Valley Road	SRN 1.60	Richmond	8.05	Closure	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-8.05	-100%
Hospital Street / N 7th Street	SRN 1.24	Richmond	22.51	Grade Separate	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-22.51	-100%
Maury Street	S 0.78	Richmond	23.07	Four-Quadrant Gates	N	0.10	0.08	0.05	0.00	0.00	1.02	**1.25**	18%	0%	82%	-21.81	-95%
Goodes Street	S 1.66	Richmond	0.31	Four-Quadrant Gates	N	0.01	0.01	0.00	0.00	0.00	0.07	**0.09**	18%	0%	82%	-0.22	-71%

Table 5-43: Total Daily Vehicle Delay by Public At-Grade Crossing, 2025 Build Condition

Crossing Roadway Name	Milepost	Location	No Build Delay	Crossing Build Conditions		Daily Vehicle Delay, Hours							Daily Vehicle Delay, %			Change in Delay, Build to No Build	
						Intercity Delay				VRE Delay	Freight Delay	Total Delay, All Trains	Intercity Percent of Total Delay	VRE Percent of Total Delay	Freight Percent of Total Delay		
				Proposed Crossing Improvement	Removes At-Grade Condition?	Northeast Regional Passenger	Interstate Corridor	Long Distance Passenger	Auto Train Passenger							Hours	%
E Commerce Road	S 2.98	Richmond	6.99	Grade Separate	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-6.99	-100%
Ruffin Road	S 3.98	Richmond	2.92	Median Treatment	N	0.07	0.06	0.03	0.00	0.00	0.69	**0.85**	18%	0%	82%	-2.07	-71%
Bells Road	S 4.46	Richmond	14.70	Median Treatment	N	0.33	0.28	0.17	0.00	0.00	3.50	**4.29**	18%	0%	82%	-10.41	-71%
Dale Avenue / Trenton Avenue	S 4.98	Richmond	0.42	Closure	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-0.42	-100%
Kingsland Road	S 9.14	Chesterfield County	3.26	Four-Quadrant Gates	N	0.16	0.13	0.08	0.00	0.00	1.56	**1.93**	19%	0%	81%	-1.33	-41%
Brinkley Road	S 9.83	Chesterfield County	2.96	Closure	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-2.96	-100%
Old Lane	A 10.74	Chesterfield County	8.54	Closure	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-8.54	-100%
		Total	**168.36**		**8**	**3.38**	**1.91**	**1.21**	**0.23**	**0.00**	**61.82**	**68.55**	**10%**	**0%**	**90%**	**-99.81**	**-59%**
6G: Shared Service																	
Mountain Road	CFP 8.15	Henrico County	4.95	No change	N	0.32	0.16	0.10	0.12	0.00	4.53	**5.22**	13%	0%	87%	0.28	6%
Hungary Road	CFP 6.59	Henrico County	16.13	Grade Separate	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-16.13	-100%
Hermitage Road	CFP 5.43	Henrico County	4.11	Four-Quadrant Gates	N	0.26	0.13	0.08	0.10	0.00	3.76	**4.34**	13%	0%	87%	0.23	6%
Hermitage Road	SRN 3.37	Richmond	26.20	Median Treatment	N	1.19	0.48	0.00	0.00	0.00	26.01	**27.68**	6%	0%	94%	1.48	6%
Brook Road	SRN 2.34	Richmond	20.83	Median Treatment	N	0.95	0.38	0.00	0.00	0.00	20.68	**22.00**	6%	0%	94%	1.17	6%
St James Street	SRN 1.75	Richmond	2.42	Closure	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-2.42	-100%
N 2nd Street / Valley Road	SRN 1.60	Richmond	8.05	Closure	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-8.05	-100%
Hospital Street / N 7th Street	SRN 1.24	Richmond	22.51	Grade Separate	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-22.51	-100%
Maury Street	S 0.78	Richmond	23.07	Four-Quadrant Gates	N	0.10	0.07	0.00	0.00	0.00	1.02	**1.19**	14%	0%	86%	-21.88	-95%
Goodes Street	S 1.66	Richmond	0.31	Four-Quadrant Gates	N	0.01	0.00	0.00	0.00	0.00	0.07	**0.09**	14%	0%	86%	-0.22	-72%
E Commerce Road	S 2.98	Richmond	6.99	Grade Separate	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-6.99	-100%
Ruffin Road	S 3.98	Richmond	2.92	Median Treatment	N	0.07	0.04	0.00	0.00	0.00	0.69	**0.80**	14%	0%	86%	-2.11	-72%
Bells Road	S 4.46	Richmond	14.70	Median Treatment	N	0.33	0.22	0.00	0.00	0.00	3.50	**4.06**	14%	0%	86%	-10.64	-72%
Dale Avenue / Trenton Avenue	S 4.98	Richmond	0.42	Closure	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-0.42	-100%
Kingsland Road	S 9.14	Chesterfield County	3.26	Four-Quadrant Gates	N	0.16	0.11	0.00	0.00	0.00	1.56	**1.82**	14%	0%	86%	-1.44	-44%
Brinkley Road	S 9.83	Chesterfield County	2.96	Closure	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-2.96	-100%
Old Lane	A 10.74	Chesterfield County	8.54	Closure	Y	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	n/a	n/a	n/a	-8.54	-100%
		Total	**168.36**		**8**	**3.38**	**1.59**	**0.18**	**0.23**	**0.00**	**61.82**	**67.20**	**8%**	**0%**	**92%**	**-101.17**	**-60%**

Delay represents the Total Daily Vehicle Delay for all train types. It is the cumulative delay for all at-grade crossings.

There are no public at-grade crossings located within Area 1 Arlington (Long Bridge Approach).

Remove of the At-Grade Highway-Rail Crossing Condition includes the proposed improvements of Grade Separation and Crossing Closure. Y = Yes, removes at-grade condition. N = No, does not remove at-grade condition.

Build Alternative 6C includes the delay associated with the two new at-grade crossings in all calculations excluding the No Build condition.

5.5.6 Daily Vehicle Delay Net Effects by Build Alternative

Table 5-44 presents the summary of the total daily delay results for the Build conditions by Build Alternative; the 2025 No Build results are also shown for ease of comparison. The data indicate the following:

- Effect of the DC2RVA Project on the 40-hour FHWA Daily Delay Threshold:
  - The 40-hour FHWA threshold for total daily delay at an individual at-grade crossing is not met or exceeded under existing or No Build conditions.
  - The 40-hour FHWA threshold for total daily delay at an individual at-grade crossing is not met or exceeded by the crossing conditions for any Build Alternative as part of the DC2RVA Project with the exception of one crossing:
    - The England Street / Thompson Street crossing exceeds the 40-hour FHWA threshold in two of the build alternatives that pass through the Town of Ashland (Build Alternatives 5A and 5B), with 41.85 total daily hours. The total daily delay at this crossing is 37.37 hours in No Build conditions.
    - For Build Alternatives 5A–Ashcake, 5B–Ashcake, and 5D–Ashcake, the England Street / Thompson Street is projected to experience 39.18 total hours of daily delay, which approaches but does not exceed the 40-hour FHWA threshold.
- Effect of the DC2RVA Project on Total Daily Vehicle Delay: The vehicle delay for Build conditions reflects the decreases in vehicle delay due to removal of at-grade crossings (either through grade separation or crossing closure) or other service changes (e.g., such as bypassing trains around town centers) as part of the DC2RVA Project.
  - The project's effect on the vehicle delay at an at-grade crossing is location-specific and depends on traffic demands and other variables at each specific crossing. The results that are shown in the table are the sum totals for all crossings within the Build Alternative.
  - Corridor-wide, the Build Alternatives with the greatest reductions in total vehicle delay hours are represented by the areas with the most at-grade crossing eliminations (i.e., grade separation or crossing closure) or those with service changes (i.e., the bypass alignments that reduce the daily number of trains through existing at-grade crossings).
  - DRPT anticipates that the DC2RVA Project will reduce vehicle delay for each Build Alternative with the exception of Build Alternative 3A (compared to No Build conditions).
    - This indicates that the overall proposed grade separations and operating conditions that reduce delay (i.e., improved train speeds) outweigh the proposed changes that would increase delay (i.e., number of daily vehicles and trains, length of train). While vehicles at crossing closures will divert to adjacent crossings, as described in Section 5.3.2 above, the majority of diverted vehicles would utilize adjacent grade-separated crossings (thus removing the daily delay of those vehicles) and/or are relatively not high volumes of vehicles that are detoured.
    - As part of Build Alternative 3A, which is the Fredericksburg area alternative that does not add an additional track, no existing at-grade crossings are proposed to be

eliminated. The increase of 1 hour of total daily delay for Build Alternative 3A is due to a combination of maintaining existing crossing conditions and increases in train frequency.

- For areas with multiple Build Alternatives, the following are projected to have the greatest percent reductions when compared to No Build conditions:
  - Build Alternative 3B (add 1 track east of existing) within the Fredericksburg area, which has the fewest number of at-grade crossings in the Build condition.
  - Build Alternative 5C (2-track west bypass) and Build Alternative 5C–Ashcake within the Ashland area, which remove freight and long-distance passenger trains from traveling through the at-grade crossings in town
  - Build Alternative 6B–S-Line (Boulevard Station only, S-Line) within the Richmond area, which eliminates the most at-grade crossings in Build conditions.

- Total Daily Delay Due to Types of Trains:
  - The delay due to intercity passenger trains continues to represent a relatively small fraction of the total daily vehicle delay experienced at at-grade crossings in 2025 Build conditions.
  - The majority of the total delay experienced throughout all Build Alternative areas would continue to be from freight trains, which represents almost 90 percent of the total delay corridor-wide in 2025.
    - The exception to this is Build Alternative 5C and 5C–Ashcake, which shift all freight trains onto the bypass. Accordingly, the existing at-grade intersections through the Town of Ashland would therefore have reduced daily delay due to freight trains for the bypass alternatives.
  - The delay due to intercity passenger trains for the majority of the corridor increases compared to No Build conditions due to the increase in the number of intercity passenger trains in the Build conditions.
    - A 4 percent increase in total daily delay is projected throughout most of the Build Alternative areas, including Northern Virginia, Central Virginia, and the non-bypass alternatives through the Fredericksburg and Ashland areas.
    - The delay due to intercity passenger trains in the bypass Build Alternatives represents either 0 or 100% of the daily delay, depending on how trains of all types utilize the proposed bypass.
    - The intercity passenger train delay through the Richmond area varies widely as compared to No Build due to the range of options being considered. For most of the Build Alternatives, 8-12% of total daily delay is projected to be as a result of intercity passenger trains; Build Alternative 6C, which would create two new at-grade crossings in the vicinity of the new station area, is the exception with 24% of delay.

Table 5-44: Summary of Total Daily Delay[1] Results, 2025 Build Conditions, by Build Alternative

Alternative Area / Build Alternative [2]			Crossings that Exceed FHWA 40-hour Daily Delay Threshold		Total Daily Vehicle Delay Results						Change in Daily Delay	
			No Build	Build	No Build	At-Grade Crossings Removed[3] as part of project	Build	Intercity Percent of Total Delay	VRE Percent of Total Delay	Freight Percent of Total Delay	Build to No Build Hours	Build to No Build % Change
Northern Virginia	2A	Add 1 Track	0	0	23.28	1	23.01	13%	5%	82%	-0.26	-1%
Fredericks-burg	3A	Maintain Existing	0	0	16.61	0	17.61	13%	5%	81%	0.99	6%
	3B	Add 1 Track	0	0	16.61	1	6.59	13%	5%	82%	-10.03	-60%
	3C	2-Track East Bypass	0	0	36.37	0	32.79	9%	0%	91%	-3.58	-10%
Central Virginia	4A	Add 1 Track	0	0	3.58	1	3.35	13%	0%	87%	-0.23	-6%
Ashland	5A	Maintain Existing	0	1	73.94	3	56.28	11%	0%	89%	-17.66	-24%
	5A–Ashcake	Maintain Existing (New Station)	0	0	73.94	2	56.33	11%	0%	89%	-17.61	-24%
	5B	Add Main Track	0	1	73.94	3	55.01	11%	0%	89%	-18.93	-26%
	5B–Ashcake, and 5D–Ashcake	Add 1 Track (New Station), and Center 3 Tracks (New Station)	0	0	73.94	2	55.06	11%	0%	89%	-18.88	-26%
	5C	2-Track West Bypass	0	0	73.94	1	9.76	42%	0%	58%	-64.18	-87%
	5C–Ashcake	2-Track West Bypass (New Station)	0	0	73.94	0	9.77	42%	0%	58%	-64.17	-87%
Richmond	6A, 6B–A-Line, and 6E	Staples Mill Only, Boulevard Road Only (A-Line), and Split Service	0	0	78.70	7	26.48	12%	0%	88%	-52.22	-66%
	6B–S-Line	Boulevard Road Only (S-Line)	0	0	168.36	9	40.37	11%	0%	89%	-127.99	-76%
	6C[4]	Broad Street Only	0	0	104.90	7	64.95	24%	0%	76%	-39.95	-38%
	6D, and 6F	Main Street Only, and Full Service	0	0	168.36	8	68.55	10%	0%	90%	-99.81	-59%
	6G	Shared Service	0	0	168.36	8	67.20	8%	0%	92%	-101.17	-60%

[1] Delay represents the Total Daily Vehicle Delay for all train types. It is the cumulative delay for all at-grade crossings.
[2] Note that there are no public at-grade crossings located within Alternative Area 1 (Arlington).
[3] Removal of the At-Grade Highway-Rail Crossing Condition includes the proposed improvements of Grade Separation and Crossing Closure.
[4] Build Alternative 6C includes the delay associated with the two new at-grade crossings in all calculations excluding the No Build condition.

6 SUMMARY OF EFFECTS

This summary provides a high-level overview of the transportation analysis and resulting effects that were conducted for the DC2RVA Project. It is not intended to inventory all data and analysis, but rather to summarize key results that differentiate the alternatives and assist in the decisions to be made. Readers who are interested in more detailed results and explanations should refer to the full analysis sections in this technical report, which are referenced in the summaries below.

The transportation analysis for the DC2RVA Project was conducted at two scales—Regional and Corridor-wide—which are summarized separately below.

6.1 REGIONAL SCALE SUMMARY OF EFFECTS

The regional scale analyses determined the effects due to the DC2RVA train service and ridership, which is projected to increase by a total of approximately 50 percent corridor-wide for all Build Alternatives. *Refer to Section 4.2.*

6.1.1 Ridership Effects on the Regional Roadway Network

By shifting some travel to passenger rail, it is expected that up to 2,050 vehicles per day and 250,000 vehicle-miles would be removed from the parallel roads of I-95 and U.S. Route 1 in the 123-mile project corridor. This represents a reduction in vehicle-miles of approximately 0.6 percent. *Refer to Sections 4.3 and 4.4.*

6.1.2 Ridership Effects on Roadways Adjacent to Amtrak Stations

Changes in vehicular traffic on roadways adjacent to the DC2RVA stations for each Build Alternative are a function of projected annual rail ridership; however, while increases in DC2RVA ridership would cause increases in vehicle trips to and from stations, the levels of increase in ridership do not directly correlate to the same percent increases in traffic. *Refer to Section 4.5.1.*

Overall, the results indicate the following effects on daily vehicular traffic:

- For each Build Alternative, the DC2RVA ridership equates to a total of over 2,000 new daily motor vehicle trips at each station (for each single-station alternative) or combination of stations (for each two-station alternative). Most roadways adjacent to the stations would experience nominal increases in daily traffic (under 1 percent) for most Build conditions. In general, the majority of the roadways adjacent to the stations are multi-lane facilities with relatively high carrying capacity under existing conditions; overall, these facilities are expected to adequately accommodate increases in vehicular trips due to the DC2RVA Project.

- Overall, the highest percentage increases in traffic on adjacent roadways due to DC2RVA ridership are anticipated at the Fredericksburg Station; traffic volumes would increase by 7 to 8 percent on the adjacent roads.
- Within Ashland, the location of the station has minimal effect on the results. Increases to traffic on adjacent roadways are nominal (less than 1 percent change in daily traffic) for both the existing station location and the station relocation to Ashcake Road.
- For the single station Build Alternatives in the Richmond area, the greatest increases in traffic on adjacent roadways are anticipated for the two stations that are not currently served by any passenger trains (Boulevard and Broad Street stations), which are projected to increase approximately 5 percent.
- For the two-station Build Alternatives in the Richmond area, the traffic increases vary by station; however, all projected traffic increases are anticipated to be under 2 percent at both locations for all three two-station conditions.
- Reductions in traffic due to the DC2RVA ridership are anticipated at stations that are being served in the No Build condition but are not being served in the Build condition.

6.1.3 Ridership Effects on Parking Needs at Intercity Passenger Stations

DRPT calculated a range of daily parking space demand (a high and low range) at each intercity passenger train station based on projected DC2RVA ridership. *Refer to Section 4.5.2.*

The parking demand does not vary by Build Alternative for the stations with a single location (Alexandria, Woodbridge, Fredericksburg, Ashland, Boulevard Road, and Broad Street).

At the Staples Mill Road Station, the station sizing and type do not vary and Build Alternative 6A requires the highest daily parking space demand at 632 spaces (high), which is a 56 percent increase over the Build Alternative 6F which requires 406 spaces (high). Build Alternatives 6E and 6G require approximately 37 percent and 15 percent more parking, respectively, than Build Alternative 6F.

At the Main Street Station, the station size and type varies by Build Alternative, which has an effect on the daily parking demand. Build Alternatives 6D and 6E, in which it is defined as a large station, require the most daily parking (260 to 270 spaces, high), while Build Alternative 6E, in which Main Street is defined as a medium station, requires the least amount of parking (66 spaces, high).

In general, the high end of the range was used to develop conceptual station layouts for each Build Alternative, which are included in the limits of disturbance use for the impact analysis for the Draft EIS.

6.2 CORRIDOR-WIDE SUMMARY OF EFFECTS

The corridor-wide scale analyses determined the effects due to the Build Alternative improvements at highway-rail crossings and the roadway network connecting adjacent crossings. *Refer to Section 5 of this report.*

6.2.1 Types of Crossing Improvements in the DC2RVA Project

The following types of crossing treatments are proposed in the DC2RVA corridor. *Refer to Section 5.2.*

Existing at-grade crossings, including both public and private crossings. One of the following crossing improvements was recommended at each existing at-grade crossing for each Build Alternative: grade separation; closure; four quadrant gates; median treatment with gates; locking gates (considered for private crossings only); and no action (considered at crossings where the existing crossing treatment is sufficient to accommodate the DC2RVA Project only).

The majority of the existing public at-grade crossings would remain at-grade with the addition of four quadrant gates or gates with median treatment. Proposed grade separations and closures of existing at-grade crossings vary by Build Alternative (see below). Existing private at-grade crossings would have locking gates or four quadrant gates, unless a property is being acquired or alternate access can be provided.

Existing grade separated crossings, including rail over roadways and roadways over rail (for all public and private roadways). In all locations for all Build Alternatives, the existing structure would either accommodate the proposed improvements, or would be widened (either the existing structure or a parallel structure).

New crossings. Virginia state code restricts the creation of new at-grade crossings; this means that any new crossings of existing roadways due to the DC2RVA Project should be grade-separated, with potential roadway realignment and/or closure. The only Build Alternative that has new at-grade crossings is Build Alternative 6C, which would include two new at-grade crossings as required by he Broad Street Station conceptual layout.

Adjacent roadways. In addition to highway-rail crossings, public roadways that run parallel and generally adjacent to the railroad tracks can conflict with the design of certain Build Alternative improvements.

6.2.2 Summary of DC2RVA Public Roadway Closures and Grade Separations by Build Alternative

This section summarizes public roadway closures and grade separations by Build Alternative. Unless specified below, all other public roadway crossings would either maintain the existing at-grade condition with crossing improvements of either four quadrant gates or median treatment with gates, or do not require any action. *Refer to Section 5.2.3*

Alternative Area 1: Arlington (Long Bridge Approach). There are no public roadway closures or grade separations within this area as part of the DC2RVA Project.

Alternative Area 2: Northern Virginia. There are no grade separations and one closure for Build Alternative 2A; this crossing closure would be at Mount Hope Church Road.

Alternative Area 3: Fredericksburg. There are no proposed public roadway closures and one grade separation within Fredericksburg; this grade separation would be at Landsdowne Road for Build Alternative 3B only.

Alternative Area 4: Central Virginia. There are no proposed grade separation and one closure for Build Alternative 4A; this crossing closure would be at Colemans Mill Road.

Alternative Area 5: Ashland. Each of the Build Alternatives within Ashland contains some combination of the following closures and separations:

- Two potential grade separations (W Vaughan Road crossing and Ashcake Road crossing) for all Build Alternatives except for the bypass alignments.
- One roadway crossing closure (College Avenue crossing), for all Build Alternatives that include station platform improvements at the existing station location within town.
- One roadway closure of an adjacent (non-crossing) roadway for the Build Alternatives that add a third main track through town; Center Street/Railroad Avenue from south of England/Thompson Street to Maiden Lane would be closed.
- Six grade separations and one roadway closure along the new bypass alignment (Independence Road), for the Build Alternatives that include the bypass.

Alternative Area 6: Richmond. Each Build Alternatives within Richmond contains some combination of the following closures and separations:

- All Build Alternatives would result in a grade separation at the Hungary Road crossing and closure of the Old Lane crossing.
- All Build Alternatives that use the A-Line would result in closing crossings at the Bassett Avenue, Terminal Avenue, and Thurston Road crossing; and would also result in grade separation at the Broad Rock Boulevard and Walmsley Boulevard crossings.
- All Build Alternatives that use the S-Line would result in closing crossings at St James Street, N 2nd Street / Valley Road, Dale / Trenton Avenue, and Brinkley Road; and would also result in grade separation at the Hospital Street and E Commerce Drive crossings.
- Build Alternative 6B–S-Line would result in grade separation at the S-Line crossing at Hermitage Road. This grade separation affects the Ownby Road intersection with Hermitage Road.

6.2.3 Effects of Crossing Improvements on Connectivity and Accessibility

Roadway. Closing an existing traffic movement requires a permanent detour of vehicular traffic to one or more adjacent crossings; this permanent detour not only affects the vehicles that are making the detour, but also, to some degree, the traffic operations and vehicles along the alternate route. The crossing improvements that are anticipated to have the greatest effect on the existing accessibility and connectivity of the transportation network are related to either closures of existing public at-grade highway-rail crossings or closures of public roadways located adjacent and parallel to the railroad tracks that are required based on engineering designs of other improvements. *Refer to Section 5.3.2 through 5.3.4.*

There are 14 public roadway closures within the different Build Alternatives:

- Mount Hope Church Road crossing, Stafford County: Build Alternative 2A
- Colemans Mill Road crossing, Caroline County: Build Alternative 4A

- College Avenue / Henry Clay Road crossing Town of Ashland: Build Alternative 5A, 5B, and 5C
- Railroad Avenue / Center Street between England Street and Maiden Lane, Town of Ashland: Build Alternative 5B, 5B–Ashcake, and 5D–Ashcake
- Independence Road intersection with W Patrick Henry Road, Hanover County: Build Alternative 5C and 5C–Ashcake
- Bassett Avenue crossing, City of Richmond: Build Alternative 6A, 6B–A-Line, 6C, and 6E
- Terminal Avenue crossing, City of Richmond Build Alternative 6A, 6B–A-Line, 6C, and 6E
- Thurston Road crossing, Chesterfield County: Build Alternative 6A, 6B–A-Line, 6C, and 6E
- Brinkley Road crossing, Chesterfield County: Build Alternative 6B–S-Line, 6D, 6F, and 6G
- Old Lane crossing, Chesterfield County: All Richmond Area Build Alternatives
- Ownby Lane intersection with Hermitage Road, City of Richmond: Build Alternative 6B–S-Line
- St James Street crossing, City of Richmond: Build Alternative 6B–S-Line, 6D, 6F, and 6G
- N 2nd Street/Valley Road crossing, City of Richmond: Build Alternative 6B–S-Line, 6D, 6F, and 6G
- Dale Avenue/Trenton Avenue crossing, City of Richmond: Build Alternative 6B–S-Line, 6D, 6F, and G

The following types of crossing improvements were determined to have minor effect on existing accessibility and connectivity of the roadway network:

- Grade separation of public crossings, which were designed to maintain existing functional characteristics
- Additional crossing treatments on public crossings that maintain the existing at-grade condition, including four quadrant gates and median treatment with gates
- All improvements at private at-grade crossings
- All improvements at existing grade-separated crossings

Relevance to Quiet Zones. The proposed actions for existing at-grade highway-rail crossings for the DC2RVA Project fully align with the FHWA's definition of Supplemental and Alternative Safety Measures (SSMs), which are engineering improvements that compensate for the absence of the train horn safety requirement at at-grade crossings. Therefore, this project would not negatively affect the ability of local public authorities to obtain Quiet Zones within their jurisdictions. Because local jurisdictions initiate and manage the process for implementing Quiet Zones, the noise reduction benefits that derive from removing the requirement for trains to routinely sound horns are dependent on locality actions; the DC2RVA Project would support local jurisdictions should they seek to establish Quiet Zones. FRA Office of Safety authorizes quiet zones on a site-specific basis, which are voluntary by the operating railroad. *Refer to Section 5.3.5.*

Bicycle and Pedestrian Connectivity. All existing bicycle and pedestrian facilities would be maintained (provided in kind) as part of all DC2RVA Build Alternatives and would be designed to current safety standards. Opportunities for additional bicycle and pedestrian accessibility improvements, including updates to Americans with Disabilities Act (ADA) facilities, would be incorporated during final design in coordination with FRA after the Draft EIS. *Refer to Section 5.3.6*

6.2.5 Effects of Crossing Improvements on Roadway and Intersection Traffic Operations

Quantitative traffic operations analysis was performed for the fourteen public roadway closures that were identified as having a potential effect (see above). The analysis determined potential diversion route(s) for each closure and estimated changes in daily traffic volumes, intersection capacity, and associated levels of service along the diversion route(s) as a result of the DC2RVA Project. *Refer to Section 5.4.*

The majority of the proposed crossing and roadway closures are anticipated to have a minimal effect on roadway and intersection operations in the vicinity of each closure, with the exception of the following:

- All Build Alternatives that include the closure of the College Avenue/Henry Clay Road crossing (Build Alternatives 5A, 5B, and 5C) are anticipated to experience a reduction in roadway level of service on Thompson Street (from LOS D in No Build to LOS E in Build conditions). Additionally, the intersection of England/Thompson Street at Center Street is anticipated to operate near capacity in Build conditions (compared to under capacity in No Build conditions).
- In the Richmond area, all Build Alternatives are projected to have similar effects to both roadway operations and intersection capacity due to the proposed Old Lane crossing closure.
  - Centralia Road: LOS B (No Build) to LOS E (Build)
  - Hopkins Road: LOS B (No Build) to LOS C (Build)
  - Centralia Road at Chester Road intersection: Under Capacity (No Build) to Near Capacity (Build)
- Additionally, the Build Alternatives that use the S-Line are projected to have an additional impact due to the closure of Brinkley Road:
  - Kingsland Road: LOS A (No Build) to LOS B (Build)

6.2.4 Effects of Crossing Improvements on Daily Vehicle Delay

The total vehicle delay per day is the amount of time that vehicles spend queuing at a public at-grade crossing over the course of a day (24 hours) based on the number of trains that are expected to pass through the crossing. Any combination of more trains, slower trains, and more motor vehicles would result in increases in resulting daily vehicle delay. *Refer to Section 5.5.*

Different crossing treatments that are proposed as part of the DC2RVA Build Alternatives would have different effects on the total daily delay. The type of crossing improvement that can have the largest effect on the daily delay calculation is crossing elimination, as it fully removes the delay condition of vehicles queueing at an at-grade crossing. Crossing elimination is defined as either grade-separation or crossing closure: grade separation "zeros out" the daily delay since the at-grade condition is removed, whereas crossing closure diverts motor vehicles to adjacent crossings that are either at-grade or grade-separated.

Overall, the results indicate the following:

- The 40-hour FHWA threshold for total daily delay at an individual at-grade crossing is not met or exceeded by the crossing conditions for any Build Alternative as part of the DC2RVA Project with the exception of one crossing: the England Street/Thompson Street crossing exceeds the 40-hour FHWA threshold in Build Alternative 5A and 5B, with 41.85 total daily hours. The total daily delay at this crossing is 37.37 hours in No Build conditions.
- The daily delay due to intercity passenger trains represents a fraction of the total daily delay experienced at at-grade crossings. The delay from the freight trains represents most of the total delay experienced throughout all Build Alternative areas (averages more than 90 percent of the total delay, corridor-wide).
- Corridor-wide, the Build Alternatives with the greatest reductions in total vehicle delay hours are represented by the areas with the most at-grade crossing eliminations (i.e., grade separation or crossing closure) or those with service changes (i.e., the bypass alignments that reduce the daily number of trains through existing at-grade crossings or service line changes on the A- and S-Lines in Richmond).
- The DC2RVA Project is anticipated to reduce vehicle delay for each Build Alternative with the exception of Build Alternative 3A, which maintains existing crossing conditions. This reduction in delay indicates that the overall proposed grade separations and operating conditions that reduce delay (i.e., improved train speeds) outweigh the proposed changes that would increase delay (i.e., number of daily vehicles and trains, length of train). While vehicles at crossing closures will divert to adjacent crossings, the majority of diverted vehicles would utilize adjacent grade-separated crossings (thus removing the daily delay of those vehicles) and/or are relatively not high volumes of vehicles that are detoured.
- For crossings that remain at-grade and experience increases in delay in the Build condition, the change in total daily delay is less than 8 percent for most crossings; less than ten individual crossings that are located within Fredericksburg, Ashland, and Richmond will experience higher total daily delay.

7 REFERENCES

Amtrak.

2013. Station Program Planning Guidelines. https://spportal.my-techub.com/Sites/DC2RVA/Project%20Communication/Reference%20Material/amtrak-station-planning-and-program-guidelines.pdf. 2013.

Arlington County.

2007. Master Transportation Plan: Goals and Policies Summary. Arlington, VA.

2011. Five-Year Review of Arlington County's Comprehensive Plan: 2005-2010. Arlington, VA.

Caroline County.

2010. Caroline County Comprehensive Plan 2030. Bowling Green, VA.

Chesterfield County.

2012. Moving Forward: The Comprehensive Plan for Chesterfield County. Chesterfield, VA.

Code of Virginia.

Nd. Crossing of a railroad or public highway by another railroad; crossing of a railroad by a public highway. https://vacode.org/56-363/.

City of Fredericksburg, VA.

2007. Fredericksburg Comprehensive Plan. Fredericksburg, VA.

2014. Draft Comprehensive Plan. Fredericksburg, VA.

City of Alexandria, VA.

2008. City of Alexandria Comprehensive Transportation Master Plan. Alexandria, VA.

City of Richmond, VA.

2000. Master Plan, Richmond. Richmond, VA.

Fairfax County.

2014. Policy Plan: The Countywide Policy Element of The Comprehensive Plan for Fairfax County, Virginia. Fairfax, VA.

Federal Highway Administration (FHWA).

2007. *Railroad-Highway Grade Crossing Handbook – Revised Second Edition* (August 2007). http://safety.fhwa.dot.gov/xings/com_roaduser/07010/

Federal Railroad Administration (FRA).

Nd. Crossing Inventory Forms (Form FRA 6180.71). Accessed October 2015, manually queried by Crossing Number. http://safetydata.fra.dot.gov/OfficeofSafety/PublicSite/Crossing/Crossing.aspx

Nd. FRA GIS Web Application. http://fragis.fra.dot.gov/GISFRASafety/

2009. *Vision for High-Speed Rail in America, High-Speed Rail Strategic Plan.* April 2009. https://www.fra.dot.gov/eLib/Details/L02833.

2016. Office of Safety Analysis. Web Accident Prediction System. Accessed July 2016. http://safetydata.fra.dot.gov/webaps/

2016. Office of Safety Analysis. Query Accident / Incident Trends for Highway-Rail Crossings. Accessed July 2016. http://safetydata.fra.dot.gov/OfficeofSafety/publicsite/query/gxrtally1.aspx

2016. Quiet Zone FRAWeb Report. Accessed July 2006. https://www.fra.dot.gov/eLib/details/L05204.

2016. U.S. DOT Crossing Inventory. Accessed 2016. http://fragis.fra.dot.gov/GISFRASafety/.

Fredericksburg Area Metropolitan Planning Organization.

2013. 2040 Long Range Transportation Plan. Fredericksburg, VA.

2014. Transportation Improvement Program (TIP). Fredericksburg, VA.

Hanover County.

2012. Comprehensive Plan Hanover County, VA, 2012-2032. Hanover, VA.

Henrico County.

2009. Henrico County: Vision 2026. Henrico, VA.

May, Adolf D.

1990. *Traffic Flow Fundamentals.* 1990. ISBN 0-13-92607202

Metropolitan Washington Council of Governments (MWCOG).

2014. Regional Transportation Priorities Plan for the National Capital Region. Washington, D.C.

National Capital Region Transportation Planning Board.

2014. Transportation Improvement Program (TIP). Washington, DC.

Prince William County.

2008. Comprehensive Plan 2008. Prince William, VA. Updates to individual chapters through 2014.

Richmond Area Metropolitan Planning Organization (RAMPO).

2012. plan2035. Richmond, VA.

2014. Transportation Improvement Program (TIP). Richmond, VA.

Spotsylvania County.

2013. Spotsylvania County Comprehensive Plan. Spotsylvania, VA.

Stafford County.

2014. Stafford County Virginia Comprehensive Plan 2010-2030. Stafford, VA.

Town of Ashland.

2011. The Town of Ashland 2011 Comprehensive Plan. Ashland, VA.

Transportation Research Board (TRB).

2010. Transportation Research Board. *Highway Capacity Manual* Fifth Edition (HCM 2010).

http://hcm.trb.org/?qr=1

Virginia Department of Transportation (VDOT).

Nd. Traffic Data, Official AADT and VMT Publications, Years 2001 through 2015 and Historical Traffic Data. Accessed January 2016.

http://www.virginiadot.org/info/ct-trafficcounts.asp

2014. Annual Average Daily Traffic with Vehicle Classification for 2014, GIS online database. Richmond, VA. 2014. Accessed January 2016.

http://www.arcgis.com/home/item.html?id=cd4d084cccc84cea9e77a08e3de20fa2

2016. VDOT Six Year Improvement Plan. Accessed June 2016. http://www.virginiadot.org/projects/syp-default.asp

2016. VDOT Statewide Transportation Plan. Accessed July 2016. http://www.virginiadot.org/about/stip.asp

Unites States Department of Transportation (USDOT).

[1] These estimates of roadway (centerline) miles and vehicle-miles traveled (VMT) comprise all Interstate and US highways, as well as major state routes. Secondary and urban roads that serve primarily as access to individual properties were not included.

[2] A revenue trip is a trip that carries paying passengers. A non-revenue trip is a trip that does not carry paying passengers, for example for the purposes of moving crew or empty trains.

[3] https://www.fra.dot.gov/eLib/Details/L17371

[4] Train accidents that do not affect the public highway system, the causes of which range from human operation factors to mechanical/track and electrical failures. These types of train-only accidents are not included in the data presented in this section; however, in the state of Virginia from 2013 to November 2016, there were a total of 33 train (non-highway) accidents.

[5] FHWA's *Railroad-Highway Grade Crossing Handbook – Revised Second Edition* provides guidance criteria and details physical and operational improvements for highway-rail at-grade crossings to enhance the safety and operation of both roadway and rail traffic through the crossings. The "expected accident frequency" is criterion number ten, and is calculated based on the US DOT Accident Prediction Model using a five-year accident history. The model is intended to predict, in absolute terms, the likelihood of a collision occurring over a given period of time given conditions at the crossing, and can be used to identify potential high-accident locations for further review. The expected accident frequency provides a comparative estimate of the number of collisions per year; therefore, a lower number is more desirable.

[6] The Fiscal Year 2017 (FY 2017) document (http://www.virginiadot.org/projects/syp-default.asp) was reviewed to identify relevant SYIP projects. For the STIP, projects for Fiscal Years 2015 to 2018 were reviewed (http://www.virginiadot.org/about/stip.asp).

[7] Additional information on Virginia's Highway Safety Improvement Program (HSIP) is available here: http://www.virginiadot.org/business/ted_app_pro.asp.

[8] The extents of the Peninsula Subdivision rail line, which serves passenger trains between Richmond and Newport News, that are located within the DEIS limits were included in the preliminary identification of roadway crossings. It was the intent of the at-grade crossing evaluation methodology (refer to Appendix OO of the Alternatives Technical Report) to evaluate all public roadway crossings and any private roadway crossings that could have an effect on the public (either through public use of a private crossings or private ownership by a citizen of a parcel that has and/or needs crossing access). Within the DEIS limits on the Peninsula Subdivision rail line, there is a single at-grade roadway crossing that functions as private exclusive railroad access as well as several existing grade-separated crossings. However, the DC2RVA Project was not anticipated to have Build Alternative features that would affect roadway crossings to the same levels as along the RF&P line, A-Line, and S-Line since the Peninsula Subdivision rail line is not proposed to have an additional track and does not serve trains to the same level through the entire corridor between Washington, D.C. and Richmond. Accordingly, the short segment of the Peninsula Subdivision rail line was not included in further transportation affected environment or environmental consequences. This does not, however, preclude the addition of any safety measures at the existing crossings, in coordination with FRA.

[9] The applicable state law can be found at: https://vacode.org/56-363/

[10] There are a total of 28 Quiet Zone locations in Virginia per the *Quiet Zone FRAWeb Report* (https://www.fra.dot.gov/eLib/details/L05204). Individual crossings that are included as part of the Quiet Zone designation verified per the US DOT Crossing Inventory Form for each crossing (accessed per http://fragis.fra.dot.gov/GISFRASafety/).

[11] 49 CFR; Part 222; Part 229 can be found in its entirety on the FRA website at: http://www.fra.dot.gov/eLib/Details/L02809.

[12] Changes in the number and operating characteristics (type, speed, and length) of trains can have a direct effect on individual at-grade highway-rail crossings in terms of delay experienced while trains are

traversing the crossing. These analyses are provided on the Corridor Scale, which are included in Section 4.1.2.

[13] The links to the VDOT GIS database and associated count book publications are provided on the VDOT Traffic Data webpage: http://www.virginiadot.org/info/ct-trafficcounts.asp The GIS database was accessed in January 2016; at that time, the most updated data was available for 2014. Since that time, an updated GIS file has been posted (data updated May 2016, with data through 2015); however, that dataset was reviewed and determined to be incomplete for the needs of the DC2RVA analysis.

[14] Based on the known growth rates and assuming that the growth rate for the primary and interstate roads in Fredericksburg are comparable to the growth rate for the primary and interstate roads in all other jurisdictions, a ratio was applied to solve for the yearly growth rate from 1975 all the way through 2014. This ratio and the calculations are shown below:

$$\frac{2000-2014\ \mathit{Interstate}\ \&\ \mathit{Primary}\ (\mathit{excluding\ Fred.})\ \mathit{Growth\ Rate}}{1975-2014\ \mathit{Interstate}\ \&\ \mathit{Primary}\ (\mathit{excluding\ Fred.})\mathit{Growth\ Rate}} = \frac{2000-2014\ \mathit{Interstate}\ \&\ \mathit{Primary\ Growth\ Rate\ for\ Fred.}}{1975-2014\ \mathit{Interstate}\ \&\ \mathit{Primary\ Growth\ Rate\ for\ Fred.}}$$

$$\frac{1.267\%}{2.230\%} = \frac{0.498\%}{1975-2014\ \mathit{Interstate}\ \&\ \mathit{Primary\ Growth\ Rate\ for\ Fred.}}$$

$$\mathbf{1975-2014}\ \boldsymbol{Interstate}\ \&\ \boldsymbol{Primary\ Growth\ Rate\ for\ Fred.} = \mathbf{0.876}\%$$

[15] Based on the known growth rate and assuming that the growth rate for secondary roads are comparable to the growth rate for the primary and interstate roads, a ratio was applied to estimate yearly growth rates from 1975 to 2014. This ratio and the calculations are shown below:

$$\frac{2000-2014\ \mathit{Interstate}\ \&\ \mathit{Primary\ Growth\ Rate}}{1975-2014\ \mathit{Interstate}\ \&\ \mathit{Primary\ Growth\ Rate}} = \frac{2000-2014\ \mathit{Secondary\ Growth\ Rate}}{1975-2014\ \mathit{Secondary\ Growth\ Rate}}$$

$$\frac{1.267\%}{2.230\%} = \frac{1.382\%}{1975-2014\ \mathit{Secondary\ Growth\ Rate}}$$

$$\mathbf{1975-2014}\ \boldsymbol{Secondary\ Growth\ Rate} = \mathbf{2.431}\%$$

[16] A vehicle-mile is a measure of total travel on a particular roadway or within an overall area; it is calculated by multiplying the number of vehicles traveling on a particular roadway by the total length of that roadway.

[17] This value represents trips going to, from, and through the study corridor.

[18] Based on annual ridership divided by 320 (accounts for daily variation); assumed auto occupancy of 1.3 persons per vehicle; and corridor length of 123 miles.

[19] Adjacent roadway(s) at stations were defined as those that vehicles (including personal motor vehicle, transit, or drop-off service such as taxis) could use to access the station.

[20] The annual ridership from the model used in this analysis represents the DC2RVA Project. It excludes passengers on VRE, the auto train, and the long distance trains to Florida. The difference between the No Build and Build conditions, therefore, represent the increases due to the DC2RVA Project trains.

[21] The applicable state law can be found at: https://vacode.org/56-363/

[22] FRA's 2009 High Speed Passenger Rail Safety Strategy guidance states for track speeds between 80mph and 110mph, private highway-rail grade crossings should be treated with "automated warning or locked gate with signal interlock". Other types of private gates were considered during the alternatives development process, but from a safety standpoint, the locked gate treatment was considered to be the better candidate by restricting access to the crossing to the private crossing owner and allowing access only for a specific set of conditions as opposed to being open 24 hours a day excluding train events.

[23] The crossing elimination screening analysis identified 5 crossings that met or exceeded at least one FHWA condition threshold in 2015, and 21 crossings that met or exceeded at least one FHWA condition threshold by 2025. While 2045 conditions were evaluated, only the 2015 and 2025 conditions were used as part of the proposed action determination.

[24] Documentation was based on project site visits, aerial and/or street-view photography, and VDOT and FRA online databases. The level of detail documented for the site-specific conditions was intended to support identification of feasibility considerations for each proposed action at the crossing location.

[25] For example, for Hermitage Road (S-Line crossing), DRPT recommended additional median treatment as part of the original at-grade crossing evaluation; however, during the design of Build Alternative 6B–S-Line, it was determined that the potential for risk to motorists at this crossing increases significantly with passenger trains accelerating and decelerating towards the proposed Boulevard Station, as well as proximity to Acca Yard and the train station. As train decelerate on approach to the proposed station or Acca Yard, the multiple track condition increases the probability of a gate violation by a motorist to occur when either a passenger train or a slow moving freight train clears the crossing and the signal activation is held from another train traveling in the opposite direction that is obscured by the train on the closest track. Accordingly, the Hermitage Road crossing was proposed to be grade-separated as part of that Build Alternative.

Additionally, during the conceptual engineering phase within the Ashland Area, the crossing elimination screening analysis was performed for the specific Build Alternatives under consideration to determine if the original proposed crossing improvement of grade separation at the W Vaughn and Ashcake Road crossings were applicable. It was determined that Build Alternative 5C (2-Track West Bypass) did not trigger any of the FHWA threshold criteria, and the proposed crossing improvements were modified to Four-Quadrant Gates.

[26] Railroad Avenue / Center Street operates as two one-way roadways (one on each side of the rail line) through the Town of Ashland. Based on inventory of physical street signage, the Railroad Avenue designation is generally used closest to the center of town (near England Street) and the Center Street designation is used elsewhere. For ease of reference, these roadways will be designated as "Railroad Avenue / Center Street" with callouts to the appropriate side of the tracks, as necessary, as well as to/from limits, in place of any "N" or "S" designation in the transportation analysis for the Draft EIS.

[27] FHWA Rail-Roadway Crossing Handbook can be found here: http://safety.fhwa.dot.gov/xings/com_roaduser/07010/07010.pdf

[28] Traffic counts were performed in June 2016 at 34 locations through the DC2RVA corridor, in support of potential crossing closure analysis, air and noise environmental analysis, and station design. For details, refer to Attachment A of this technical report.

[29] The analysis area consists of the closure crossing, logical alternative crossing locations, and the roadway network connecting the closure and alternative crossings.

[30] The process described here represents a simplified approach to synthesizing a trip table. Because of the large and varied nature of the DC2RVA study area, this simplified approach allows for flexibility and a level of detail appropriate to the required analysis.

[31] These estimates were made on a daily basis, so equal volumes and patterns were assumed for both directions (i.e. the volume of traffic crossing the railroad in one direction was matched with an equal volume in the opposite direction).

[32] *2010 Highway Capacity Manual (Fifth Edition)*, Transportation Research Board, Transportation Research Board, Washington DC 20001, 2010 (including Errata through 2014)

[33] *Transit Capacity and Quality of Service Manual (Third Edition),* TCRP Report 165, Transit Cooperative Research Program, Transportation Research Board, Washington DC 20001, 2013

[34] http://www.dot.state.fl.us/planning/systems/programs/SM/los/pdfs/2013%20QLOS%20Handbook.pdf

[35] A useful comparison of the HCM and CLV analysis techniques is available here: http://www.sabra-wang.com/assets/clvversushcmtrafficsignalanalysismethodologiessabraandriniker.pdf

[36] The source of the daily volume data in this section are the same as those used throughout the transportation analyses, but here are presented rounded to the nearest 100 vehicles.

[37] The existing crossing is verified to operate with gated access across Trenton Avenue to restrict public access into the industrial area; since vehicles cannot use this as a normal thoroughfare, there are no vehicles to detour.

[38] While private vehicles may experience additional delay due to either train service improvements or crossing improvements as part of the DC2RVA Project, it is not quantified as part of this analysis.

[39] *Traffic Flow Fundamentals,* 1990 (ISBN 0-13-92607202).

[40] Further details on the FHWA handbook are provided in Section 5.1 of this report. FHWA Rail-Roadway Crossing Handbook can be found here: http://safety.fhwa.dot.gov/xings/com_roaduser/07010/07010.pdf

[41] http://www.arcgis.com/home/webmap/viewer.html?webmap=3eca6c9adb6649c988d98734f85baddb (accessed January 2016).

[42] The data of one-way trips through individual at-grade crossings may seem to differ from the data in other sections of the Draft EIS, which summarize daily train data on a corridor-wide scale by round trips. However, the source data are consistent and the difference is in the presentation of the data (one-way versus round trip; corridor-wide versus by crossing).

[43] Intercity Passenger Trains are comprised of Northeast Regional, Interstate Corridor, Long Distance, and Auto Train passenger train types. Trips for each passenger train type were calculated separately for this delay analysis.