DC TO RICHMOND
SOUTHEAST HIGH SPEED RAIL

2 ALTERNATIVES

D.C. TO RICHMOND SOUTHEAST HIGH SPEED RAIL

2 ALTERNATIVES

2.1 INTRODUCTION

This chapter describes the process used by the Virginia Department of Rail and Public Transportation (DRPT) to develop the alternatives evaluated in the Tier II Draft Environmental Impact Statement (EIS) for the Washington, D.C. to Richmond Southeast High Speed Rail (DC2RVA) Project. The following sections summarize the Southeast High Speed Rail (SEHSR) Tier I EIS alternatives and the Tier II Draft EIS planning dates.

The remainder of Chapter 2 summarizes the Tier II Draft EIS alternatives development and evaluation process, including alternatives considered but dismissed and descriptions of the Build Alternatives evaluated in detail in the Tier II Draft EIS. Further details on the development and screening of the Tier II Draft EIS alternatives are in the Alternatives Technical Report in Appendix A.

2.1.1 SEHSR Tier I EIS Alternatives Summary

The DC2RVA Tier II EIS builds on the decisions the Federal Railroad Administration (FRA) and the Federal Highway Administration (FHWA) made as part of the SEHSR Tier I EIS and Record of Decision, completed in 2002 (Figure 2.1-1). The SEHSR Tier I EIS addressed the development, implementation, and operation of higher speed passenger rail service in the approximately 500-mile travel corridor from Washington, D.C. through Richmond, VA and Raleigh, NC to Charlotte, NC[1]. The SEHSR Tier I EIS considered the no build option and nine alternatives utilizing combinations of existing track sections. The study area for each SEHSR Tier I alternative was a six-mile wide corridor, centered on existing rail rights-of-way, between Washington, D.C. and Charlotte, NC. Proposed improvements for these alternatives generally included track upgrades, adding an additional main track to single-track lines, additional sidings, curve straightening, signal improvements, and grade crossing safety.

The 2002 SEHSR Tier I EIS evaluated and dismissed advanced high speed rail (trains with average operating speeds of 185 to 200 mph) because it would require the construction of an entirely new and separate passenger-only railroad system, which would not meet the need of the project to connect major urban centers. Building a new, separate rail system would involve substantially higher costs and longer implementation time and result in substantially greater community and environmental impacts. Electrified systems also were dismissed in the SEHSR Tier I EIS because they have substantial initial costs (both monetary and environmental) that made them infeasible

[1] The SEHSR Tier I EIS and 2002 Record of Decision addressed high speed passenger rail service in the Washington, D.C. to Charlotte, NC corridor. Subsequent studies have extended the bounds of the SEHSR program from Richmond, VA to Hampton Roads, VA, and from Charlotte, NC to Atlanta, GA and south to Florida.

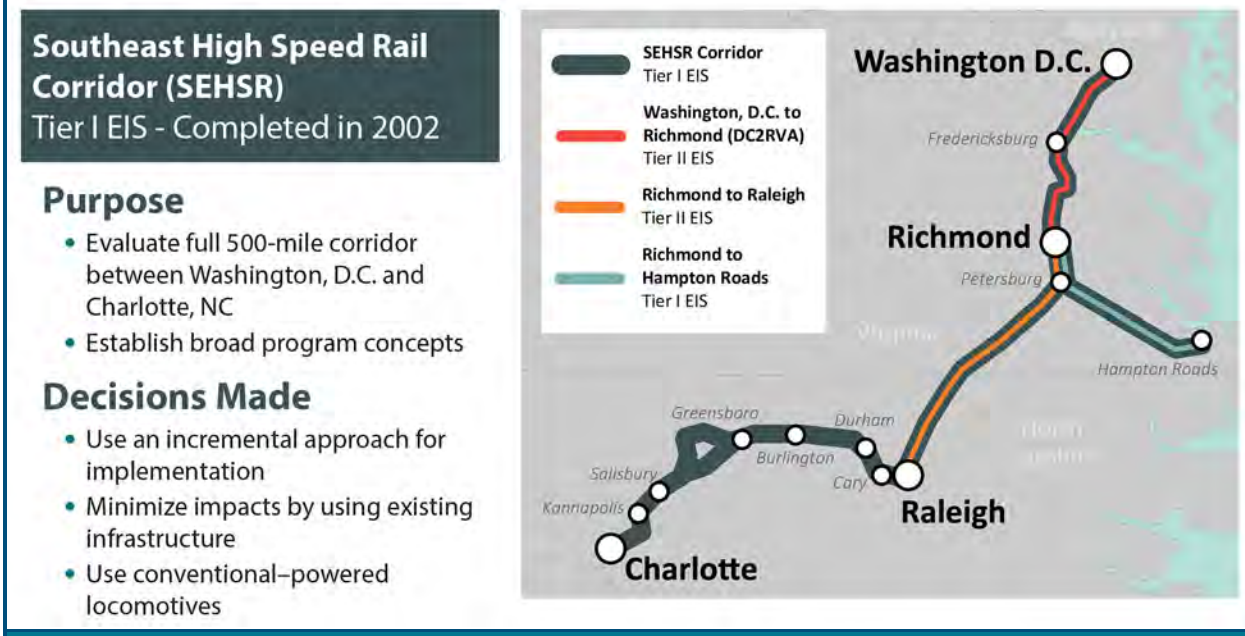


Figure 2.1-1: Southeast High Speed Rail Corridor – Tier I EIS

at the time, relative to the ridership/revenue projections for the SEHSR corridor. The door-to-door travel time needed to attract positive ridership/revenue was determined in the SEHSR Tier I EIS to be met by conventional fossil-fuel powered trainsets.

In the SEHSR Tier I EIS, NCDOT and DRPT conducted a comparative evaluation of the nine SEHSR Tier I alternatives (Figure 2.1-2) and recommended a preferred alternative based on the physical and operational characteristics of each alternative and the potential for environmental impacts. This evaluation specifically considered public and agency comments on the proposed SEHSR and evaluative criteria based on the SEHSR project's Purpose and Need. Each SEHSR Tier I alternative was ranked based on these criteria that are explained in further detail in the SEHSR Tier I EIS. The criteria included:

- Annual Ridership/Revenue
- Annual Diversions in 2025 for air and auto
- Net Energy Reduction (fuel gallons/year)
- Number of At-Grade Crossings
- Air Quality – Reduction in Nitrogen Oxides
- Average Total Travel Time
- Net Operating Contribution
- Capital Cost Efficiency Factor
- Environmental Complexity Index
- Engineering and Operations Complexity Index

Alternative A ranked the highest of the nine alternatives for five of the ten assessment criteria, namely annual ridership, annual air to rail diversions in 2025, net operating contribution, capital cost efficiency, and areas of engineering complexity.

The SEHSR project's "business case" required the preferred alternative to be economically viable. In order to determine relative economic viability among the different alternatives, the SEHSR Tier I comparative evaluation examined alternatives based on their potential net operating contribution and their conceptual capital cost. Alternative A and Alternative B showed the strongest potential for economic vitality.

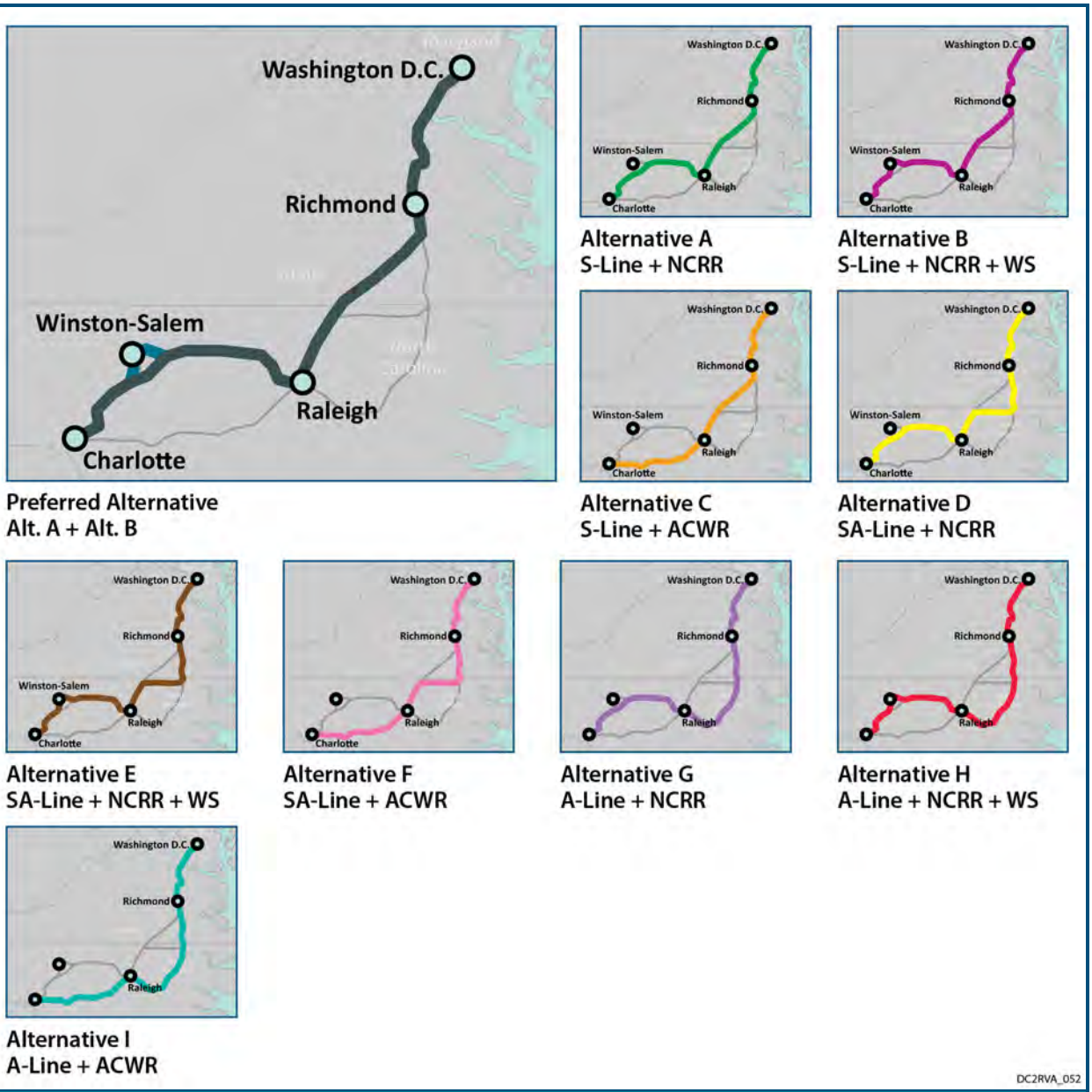


Figure 2.1-2: SEHSR Tier I EIS Build Alternatives (Reproduced from the 2002 Tier 1 EIS)

The comparative evaluation of the SEHSR Tier I alternatives also reviewed which alternative would cause the least potential environmental and social impacts. NCDOT and DRPT found that Alternative A and Alternative B minimized potential wetland impacts. Given the complexity of avoiding and/or mitigating impacts to significant wetland acreage, substantial numbers of protected species, and prime farmlands, Alternatives A and B were the least environmentally damaging among those candidate alternatives, which satisfied the Purpose and Need criteria and economic viability requirements.

The SEHSR Tier I no Build Alternative, which encompasses the travel corridor's existing transportation network and planned infrastructure improvements for the network, was also evaluated and compared to the nine Build Alternatives. NCDOT and DRPT found the impacts of the no Build Alternative to be similar to the impacts for Build Alternatives due to the projected growth of freight and passenger rail expected in the corridor over time. The difference, however, is that without SEHSR program improvements, freight and passenger services along the corridor from Washington, D.C. to Charlotte, NC were projected to experience greater delays and congestion over time. The no Build Alternative lacked the positive benefits of improved air quality and net energy reduction per passenger mile traveled in the corridor. It also failed to meet the other Purpose and Need factors such as offering additional transportation choices, easing congestion, improving overall transportation system safety, and minimizing environmental impacts. Due to the factors listed above, FRA and FHWA concluded that the no Build Alternative did not meet the SEHSR project's Purpose and Need.

In the ROD, FRA and FHWA determined that the alternative that best satisfied the stated Purpose and Need, met the business model requirements, and minimized environmental impacts was a combination of Alternatives A and B.

The preferred alternative identified in the SEHSR Tier I EIS consists of Alternative A (utilizing the S-line and the North Carolina Railroad rights-of-ways) modified to include passenger-connectivity to Winston-Salem, NC plus Alternative B via the Winston Salem South Bound (WSSB) and the K-line railroad rights-of-ways (Figure 2.1-3).

Figure 2.1-3: SEHSR Tier I EIS Selected Alternative

The combination of Alternatives A and B best satisfied the SEHSR project's Purpose and Need while minimizing environmental impacts, and received the highest level of public and agency support. The combination of Alternative A and Alternative B has:

- Minimum potential impacts to wetlands and threatened and endangered species
- Moderate levels of potential environmental complexity
- Strongest agency support
- Highest level of service
- Highest projected annual ridership

- Largest combined trip diversions from auto and air to rail, with competitive total travel time
- Second best net reduction in NO_x emissions and overall net energy use reduction
- Best potential operating cost recovery
- Highest level of public support

The preferred alternative selected as part of the SEHSR Tier I EIS process forms the basis of the alternatives developed and evaluated for the DC2RVA Project.

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, 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 SERVICE PLAN

Alternatives developed as part of the DC2RVA Project include two elements: physical improvements along the rail alignment (see Section 2.3), and the proposed train service that would run throughout the corridor. This section summarizes the latter, describing the service plan inputs that DRPT will use to prepare the Service Development Plan, which will occur at the conclusion of the NEPA process.

2.2.1 Existing Intercity Passenger Rail Service

2.2.1.1 Types of Service

Amtrak trains operating in the DC2RVA corridor can be divided into the following four types:

- **Northeast Regional (Virginia)**. Northeast Regional (Virginia) trains provide a travel alternative to driving I-95. Northeast Regional (Virginia) trains are southward extensions of Amtrak regional trains operating on the Northeast Corridor between Boston, New York, and Washington to endpoint stations in Virginia. The trains' trips are extended south of Washington, D.C. on four different routes through Virginia that terminate at Norfolk, Newport News, Richmond, and Lynchburg, providing passengers with a one-seat ride to destinations throughout the Northeast. Northeast Regional (Virginia) trains serve all Amtrak passenger rail stations located in the DC2RVA corridor with the exception of the Auto Train terminal at Lorton, VA. The Commonwealth of Virginia funds the operation of Northeast Regional (Virginia) passenger trains as required under Section 209 of the Passenger Rail Investment and Improvement Act of 2008 (PRIIA).
- **Interstate Corridor (Carolinian)**. The Carolinian operates one daily round trip between New York, NY and Charlotte, NC. Carolinian Service is similar to Northeast Regional (Virginia) Service, in that it operates as an extension of Northeast Corridor service south of Washington, but in this case to an endpoint station in North Carolina and with funding provided solely by the state of North Carolina. The Carolinian serves Alexandria, Quantico, Fredericksburg, Richmond Staples Mill Road, and Petersburg stations in Virginia.
- **Long Distance**. Long Distance trains are trains that operate on routes greater than 750 miles. States are not required to provide operating support for Long Distance trains. As of 2015, Amtrak operated five Long Distance round-trip trains in the DC2RVA corridor: three round-trip trains use the full length of the DC2RVA corridor continuing through Virginia to Georgia and Florida, and two round-trip trains use only the portion of the DC2RVA corridor between Washington and Alexandria. Long Distance trains in the DC2RVA corridor serve Washington Union Station, Alexandria, Fredericksburg, and Staples Mill Road Station. All but one of these trains operates nonstop between Alexandria and Richmond.
- **Auto Train**. Amtrak's Auto Train is a separate Long Distance service that is unique both among trains in the DC2RVA corridor and the entire Amtrak system. It exclusively serves passengers with an accompanying motor vehicle and operates as a daily nonstop, overnight train between dedicated station facilities in Lorton, VA and Sanford, FL.

2.2.1.2 Frequency of Service

In 2015, Amtrak operated 24 daily trains and 2 tri-weekly trains in the DC2RVA corridor north of Alexandria. Of those trains, four daily trains and two tri-weekly trains only operate on the corridor 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.

South of Alexandria, 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 (VA) state supported regional trains (5 round-trip trains supported by Virginia), 2 interstate corridor (NC) 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.

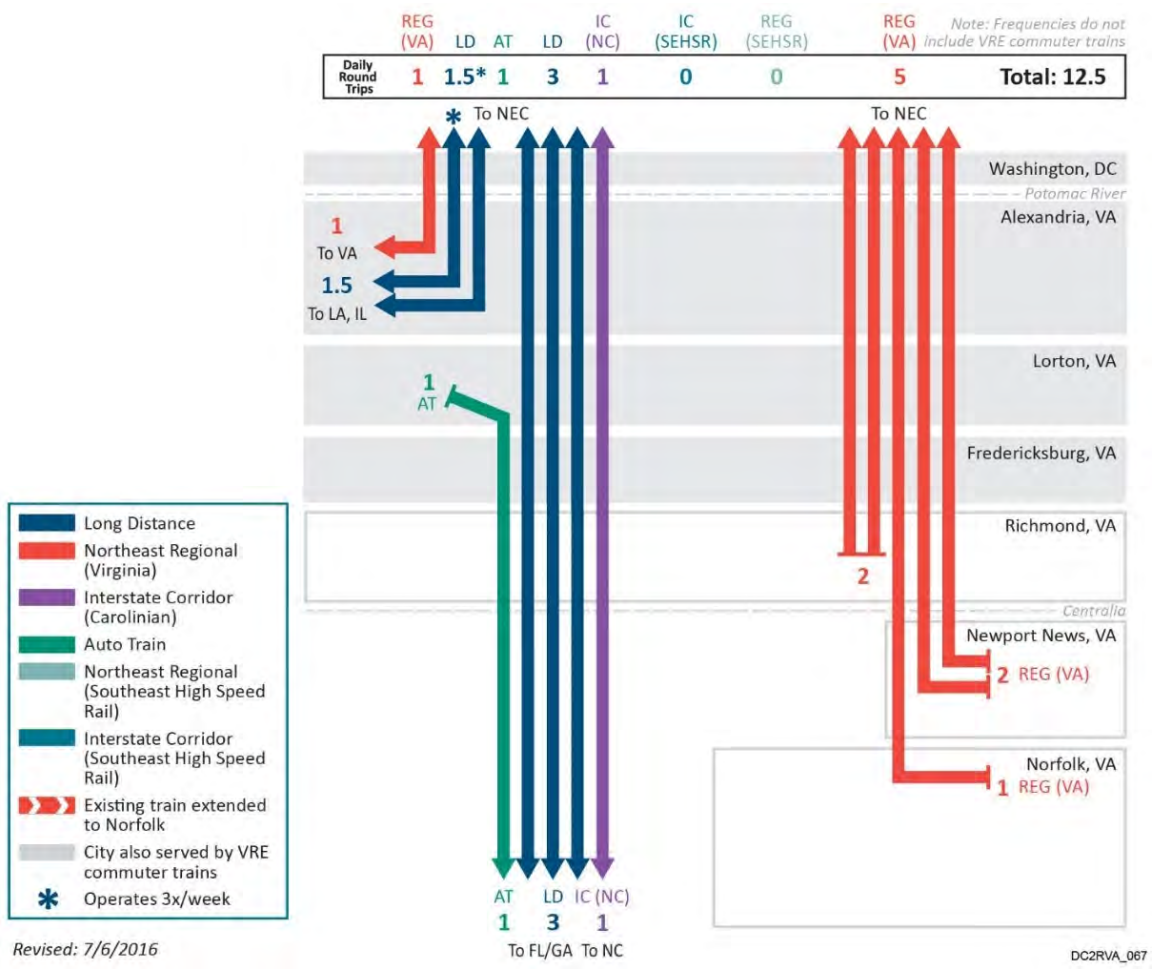


Figure 2.2-1: Existing Passenger Train Frequencies in the DC2RVA Corridor

Figure 2.2-1 (above) illustrates the type and frequencies of current Amtrak intercity passenger rail services operating in the DC2RVA corridor.

2.2.2 Future Intercity Passenger Rail Service

2.2.2.1 No Build Alternative

Section 2.5.1 describes the 2025 passenger-rail service assumptions for the No Build Alternative. In the northern section of the DC2RVA corridor, between Arlington and Alexandria, planned infrastructure improvements will support the operation of one additional Amtrak Northeast Regional (Virginia) round-trip passenger train, operating between Washington, D.C. and Lynchburg, VA via Alexandria, VA. In the southern section of the corridor, south of Richmond, planned infrastructure improvements will support the extension of two Amtrak Northeast Regional (Virginia) round-trip passenger trains from Richmond to Norfolk, VA via Petersburg, VA.

Figure 2.2-2 illustrates the type and frequencies of Amtrak intercity passenger rail services operating in the DC2RVA corridor in the No Build Alternative.

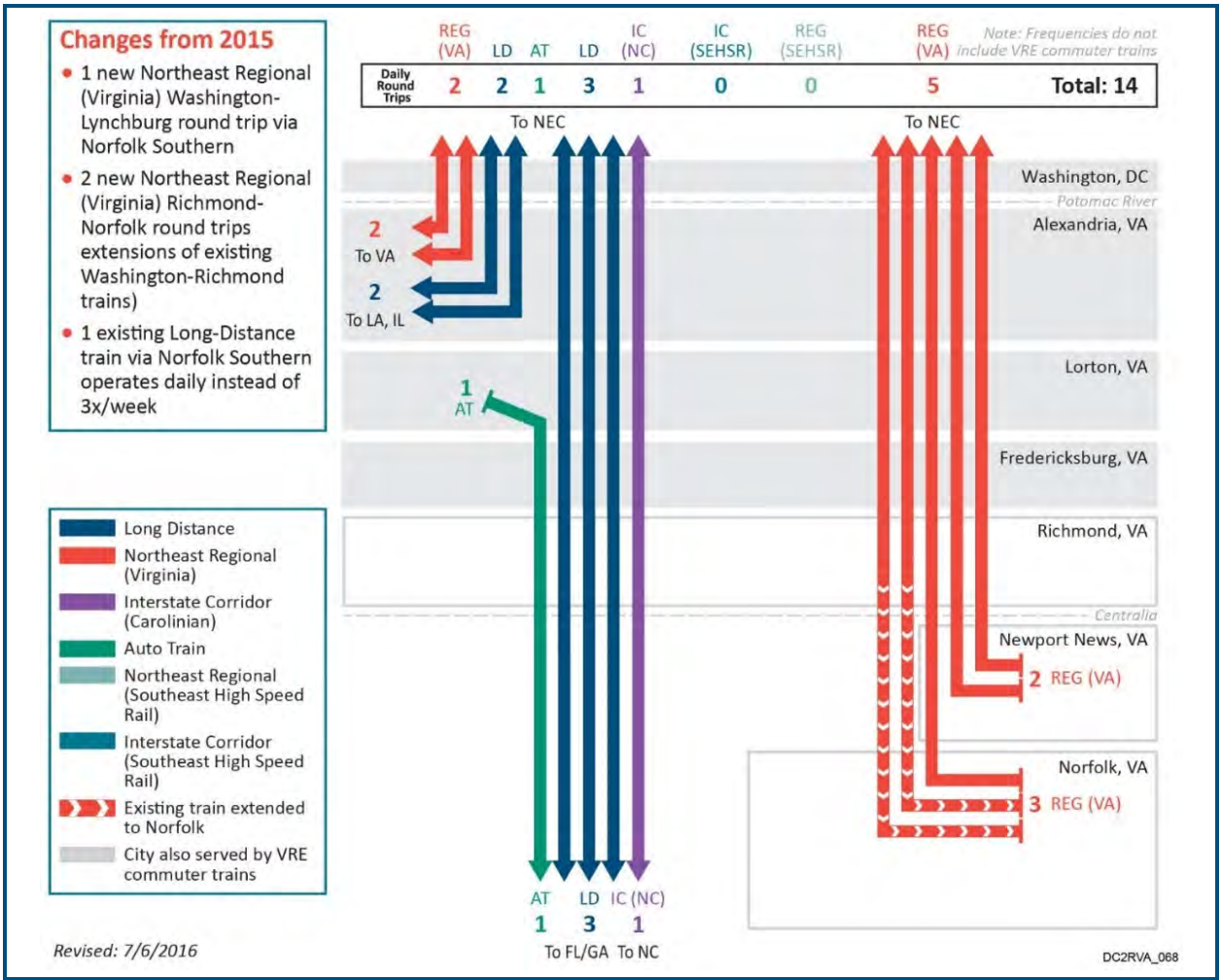


Figure 2.2-2: No Build Alternative Passenger Train Frequencies in the DC2RVA Corridor

2.2.2.2 Build Alternative

The DC2RVA Project proposes to add rail infrastructure to support the following proposed intercity passenger rail service increases between Washington, D.C., Richmond, VA, and Centralia, VA:

- Four new Interstate Corridor (SEHSR) round-trip passenger trains operating between New York and Raleigh or Charlotte, NC.
- Five new Northeast Regional (SEHSR) round-trip passenger trains operating between Boston, New York, or Washington, D.C. and destinations in Virginia. Three of the new round-trip passenger trains will operate to Norfolk. One new round-trip passenger train will operate to Newport News, and one to Richmond.

As part of the Project, the maximum operating speed for all passenger trains on the DC2RVA corridor, with the exception of the Auto Train, will be increased from 70 mph today to 90 mph. Figure 2.2-3 illustrates the type and frequencies of proposed intercity passenger rail services operating in the DC2RVA corridor in the Build Alternative. It is important to note that the implementation of the proposed intercity passenger rail service increases described above are not

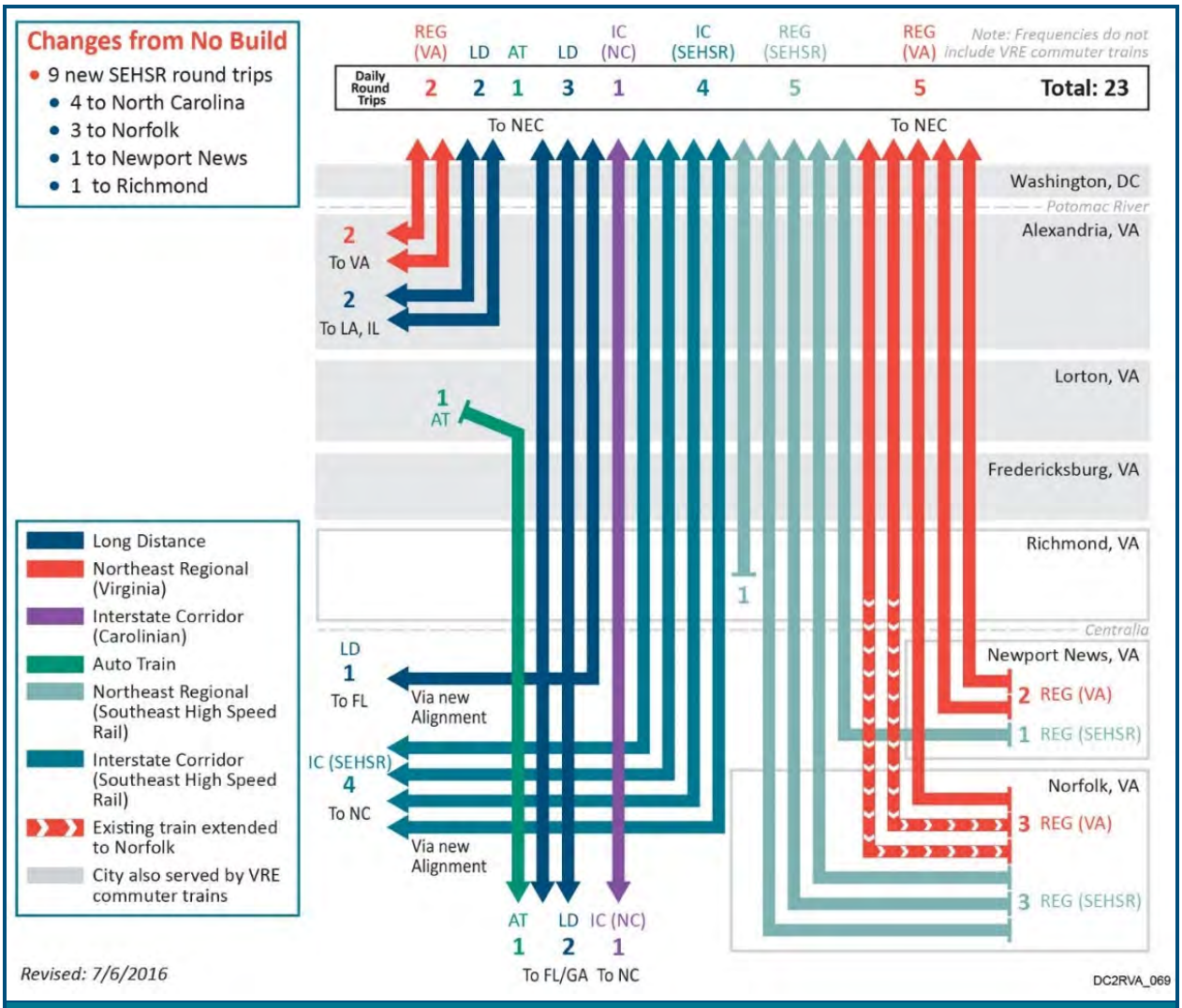


Figure 2.2-3: Proposed Passenger Train Frequencies in the DC2RVA Corridor

solely dependent on rail infrastructure improvements made within the DC2RVA corridor, but also depend on additional rail improvements made in adjoining rail corridors to accommodate these service increases. (Improvements made in adjoining rail corridors are outside the scope of the DC2RVA Project.)

2.2.3 Service Plan Development

2.2.3.1 Sources Used to Determine Future Passenger Train Frequencies

The additional passenger train frequencies proposed in the DC2RVA Project are determined primarily by previously signed federal Records of Decision governing the development of high-speed intercity passenger rail service in the federally designated SEHSR corridor. The proposed DC2RVA Project service frequency increases would add 9 new round trips (18 passenger trains) to the DC2RVA corridor between Washington, D.C. and Richmond, VA as follows:

- The four proposed Washington-North Carolina Interstate Corridor (SEHSR) round trips are planned to operate between the NEC and Washington, D.C. through the DC2RVA corridor to Raleigh and Charlotte, NC as defined in the Richmond to Raleigh Tier II EIS. The Interstate Corridor (SEHSR) trains do not exist today, and would be new passenger frequencies implemented under the DC2RVA Project. This new Interstate Corridor passenger service would add eight new trains per day under the DC2RVA Project. These new trains would supplement, not replace, the one Interstate Corridor (Carolinian) round trip that currently operates daily between Washington, D.C. and Charlotte, NC.
- One proposed new Northeast Regional (SEHSR) daily round trip (two trains) would be added between Washington, D.C. and Newport News, VA under the DC2RVA Project, supplementing the two daily Northeast Regional (Virginia) round trips (four trains) between Washington, D.C. and Newport News that currently operate. The DC2RVA Project will support the expansion of service between Washington. D.C. and Newport News from two round trips (four trains per day) to three round trips (six trains per day). This additional Northeast Regional (SEHSR) train to Newport News was defined in the Richmond to Hampton Roads Tier I EIS in 2012.
- Three proposed new Northeast Regional (SEHSR) daily round trips (six trains) would be added between Washington, D.C. and Norfolk, VA under the DC2RVA Project. This would supplement the one daily Northeast Regional (Virginia) round trip between Washington and Norfolk that operates today, and the two daily Northeast Regional (Virginia) round trips that currently operate between Washington and Richmond and are planned to be extended to Norfolk with the completion of capacity projects currently underway. The DC2RVA Project will support the expansion of service between Washington and Norfolk from three round trips (six trains) to six round trips (12 trains). The additional Northeast Regional (SEHSR) trains to Norfolk were defined in the Richmond to Hampton Roads Tier I EIS in 2012.
- One proposed new Northeast Regional (SEHSR) daily round trip (two trains) would be added between Washington, D.C. and Richmond, VA. This train would provide for a 6 a.m. northbound Richmond origination and a late-evening southbound arrival back in Richmond. This would allow the other trains from Newport News and Norfolk to operate at more traveler-friendly times to improve the attractiveness of the passenger rail service to those cities.

2.2.3.2 Service Patterns for DC2RVA Corridor Passenger Trains

The following general service patterns were established by DRPT for the train types proposed to operate in the DC2RVA corridor:

- New Interstate Corridor (SEHSR) trains to/from Charlotte and Raleigh make the following station stops in the DC2RVA corridor: Alexandria, Fredericksburg, and Richmond. These trains operate via the S-Line between Petersburg and Raleigh.
- The daily Interstate Corridor (Carolinian) between New York and Charlotte makes the same stops in the DC2RVA corridor as it does today: Alexandria, Quantico, Fredericksburg, and Richmond. The Carolinian continues to operate via the A-Line between Petersburg and Raleigh.

- New Northeast Regional (SEHSR) trains, as well as existing Northeast Regional (Virginia) trains make the following station stops in the DC2RVA corridor: L'Enfant (limited peak-hour departures), Alexandria, Woodbridge, Quantico, Ashland, and Richmond.
- Long Distance trains and Auto Train frequencies and stopping patterns do not change, except for the following:
  - The Silver Star (trains 91 and 92) is rerouted onto the restored S-Line between Petersburg and Raleigh.
  - The Cardinal, which uses the DC2RVA corridor between Washington and Alexandra and is currently on a tri-weekly schedule, is projected to operate as a daily train by the proposed DC2RVA 2025 implementation year.
- All trains (including Long Distance trains but not Auto Train) are scheduled to operate at a higher maximum authorized speed between Arlington and Richmond up to 90 mph where authorized.
- All new Northeast Regional (Virginia and SEHSR), Interstate Corridor (SEHSR) and Amtrak Long Distance trains are planned to operate north of Washington, D.C., with the exception of one which may terminate in Washington, D.C.

Specific station stop patterns within the DC2RVA corridor, as well as north and south of the corridor are subject to future refinement based on ridership analyses, future operating conditions, and stakeholder and public input.

Figure 2.2-4 illustrates potential service patterns of the proposed intercity passenger rail services operating in the DC2RVA corridor in the Build Alternative by identifying the specific station stop patterns for the different passenger train types. DRPT will finalize service patterns as part of the Service Development Plan.

Amtrak Silver Star Crossing Powells Creek

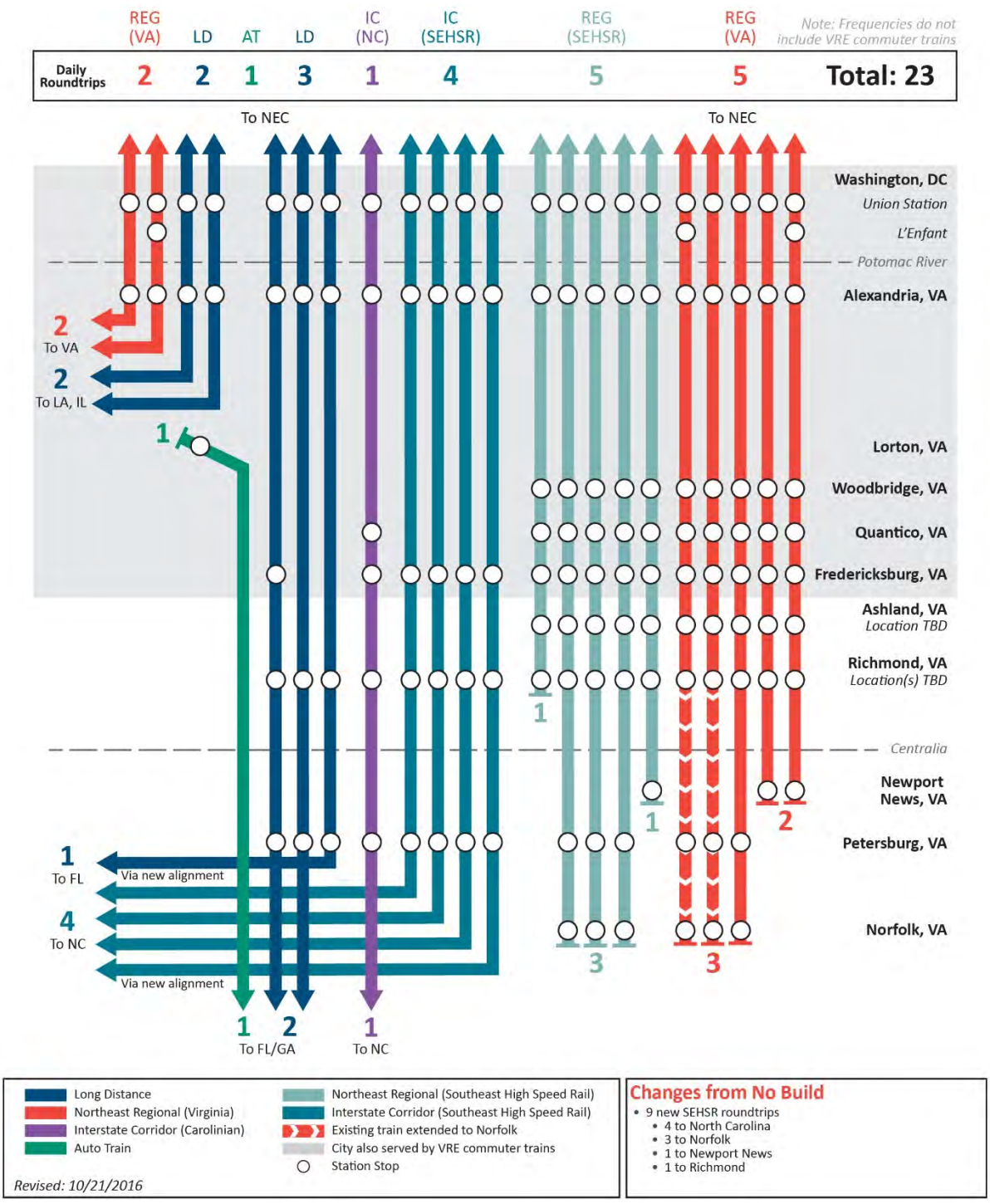


Figure 2.2-4: Service Patterns of Proposed Passenger Trains in the DC2RVA Corridor

2.3 ALTERNATIVES DEVELOPMENT AND SCREENING PROCESS

In this section is an overview of the alternatives development and screening process for the DC2RVA Project. The process established a range of alternatives for consideration and then systematically evaluated and screened the range of alternatives down to only the most reasonable alternatives for detailed analysis in the Draft EIS. Reasonable alternatives are those that meet the established Purpose and Need, are buildable and cost-effective, and are anticipated to have acceptable levels of impact to the human and natural environments.

2.3.1 Project Alternative Areas and Segments

For the development and evaluation of alternatives in the Tier II Draft EIS, DRPT initially categorized the DC2RVA Project corridor, which extends from Washington, D.C. to Richmond, into three general areas based on common rail operation characteristics and environmental conditions: Northern Virginia, Central Virginia, and Richmond. DRPT collected and evaluated data for 22 functional segments within these three areas, which were then grouped into six alternative areas that are more specific to the types of Build Alternatives that would be developed as part of the DC2RVA Project. The six alternative areas are shown in Figure 2.3-1 and the relationship between the three general areas, the six alternative areas, and the 22 segments is identified by milepost in Table 2.3-1. In addition, existing intercity passenger rail stations in the Project corridor are listed in Table 2.3-2. Note that the Build Alternatives developed in each of the six alternative areas will be linked to form a single corridor preferred alternative (see Chapter 7).

Rail Bridge Over Neabsco Creek

Table 2.3-1: Project Alternative Areas and Segments

General Area	Alternative Area	Mileposts	Segments	Reason for Grouping
Northern Virginia	Area 1: Arlington	CFP 110–CFP 109.3	01: Arlington to Alexandria (ROAF)	Alternative bridge approach alignments developed pending decision on location of Long Bridge capacity expansion
	Area 2: Northern Virginia	CFP 109.3–CFP 62	02: Alexandria to Franconia (AFFR) 03: Franconia to Lorton (FRLO) 04: Lorton to Powells Creek (LOPC) 05: Powells Creek to Arkendale (PCAR) 06: Arkendale to Dahlgren Junction (ARDJ)	Relatively similar alignment throughout this area
	Area 3: Fredericksburg	CFP 62–CFP 48	06: Arkendale to Dahlgren Junction (ARDJ) 07: Dahlgren Junction to Fredericksburg (DJFB) 08: Fredericksburg to Hamilton (FBHA) 09: Hamilton to Crossroads (HAXR) 10: Crossroads to Guinea (XRGU) 21: Fredericksburg Bypass (FBBP)	Consideration of multiple alignments through or around (bypass option) Fredericksburg
Central Virginia	Area 4: Central Virginia	CFP 48–CFP 19	10: Crossroads to Guinea (XRGU) 11: Guinea to Milford (GUMD) 12: Milford to North Doswell (MDND) 13: North Doswell to Elmont (NDEL)	Relatively similar alignment throughout this area
	Area 5: Ashland	CFP 19–CFP 9	13: North Doswell to Elmont (NDEL) 14: Elmont to Greendale (ELGN) 22: Ashland Bypass (ASBP)	Consideration of multiple alignments through or around (bypass option) Ashland
Richmond	Area 6: Richmond	CFP 9–A 011	14: Elmont to Greendale (ELGN) 15: Greendale to South Acca Yard/west Acca Yard (GNSA) 16: SAY/WAY to AM Junction (Hermitage Lead) (SAAM) 17: AM Junction to Centralia- S-Line (AMCE) 18: West Acca Yard to Centralia –A Line (WACE) 19: AM Junction to Fulton Yard (Peninsula Subdivision) (AMFY)* 20: Buckingham Branch/Hospital Wye (BBHW)**	Multiple station options for Richmond on separate alignments

*Prior to the Alternatives Development Process as described in this chapter, DRPT truncated the longer AM Junction to Beulah (AMBE) and Buckingham Branch to Doswell (BBRR) segments to the limits indicated herein. Additional information can be found in the Alternatives Technical Report in Appendix A.

Table 2.3-2: Existing Intercity Passenger Rail Stations in the DC2RVA Corridor by Area

General Area	Alternative Area	Station	Location	Existing Amtrak Passenger Services[1]	Other Rail Services
N/A		Washington Union Station[2]	Washington, D.C.	Long Distance Interstate Corridor (Carolinian) Northeast Regional (Virginia)	VRE, Maryland Area Regional Commuter (MARC), Metrorail
Northern Virginia	Area 1: Arlington	No stations			
	Area 2: Northern Virginia	Alexandria Union Station[3]	City of Alexandria	Long Distance Interstate Corridor (Carolinian) Northeast Regional (Virginia)	VRE, Metrorail
		Lorton Auto Train	Lorton (Fairfax County)	Auto Train	None
		Woodbridge	Woodbridge (Prince William County)	Northeast Regional (Virginia)	VRE
		Quantico	Town of Quantico (Prince William County)	Interstate Corridor (Carolinian) Northeast Regional (Virginia)	VRE
	Area 3: Fredericksburg	Fredericksburg	City of Fredericksburg	Long Distance Interstate Corridor (Carolinian) Northeast Regional (Virginia)	VRE
Central Virginia	Area 5: Ashland	Ashland	Town of Ashland (Hanover County)	Northeast Regional (Virginia)	None
Richmond	Area 6: Richmond	Staples Mill Road	Henrico County	Long Distance Interstate Corridor (Carolinian) Northeast Regional (Virginia)	None
		Main Street Station	City of Richmond	Northeast Regional (Virginia)—Newport News Services only	None

Notes:

1) See Section 2.2.1 for description of existing Amtrak passenger service train types

2) Washington Union Station is the northern terminus of the DC2RVA corridor for purposes of evaluating ridership and train operations but is not considered part of the corridor for purposes of station evaluation or rail improvements.

3) Alexandria Union Station is typically referred to as "Alexandria Station" so as not to be confused with Washington Union Station.

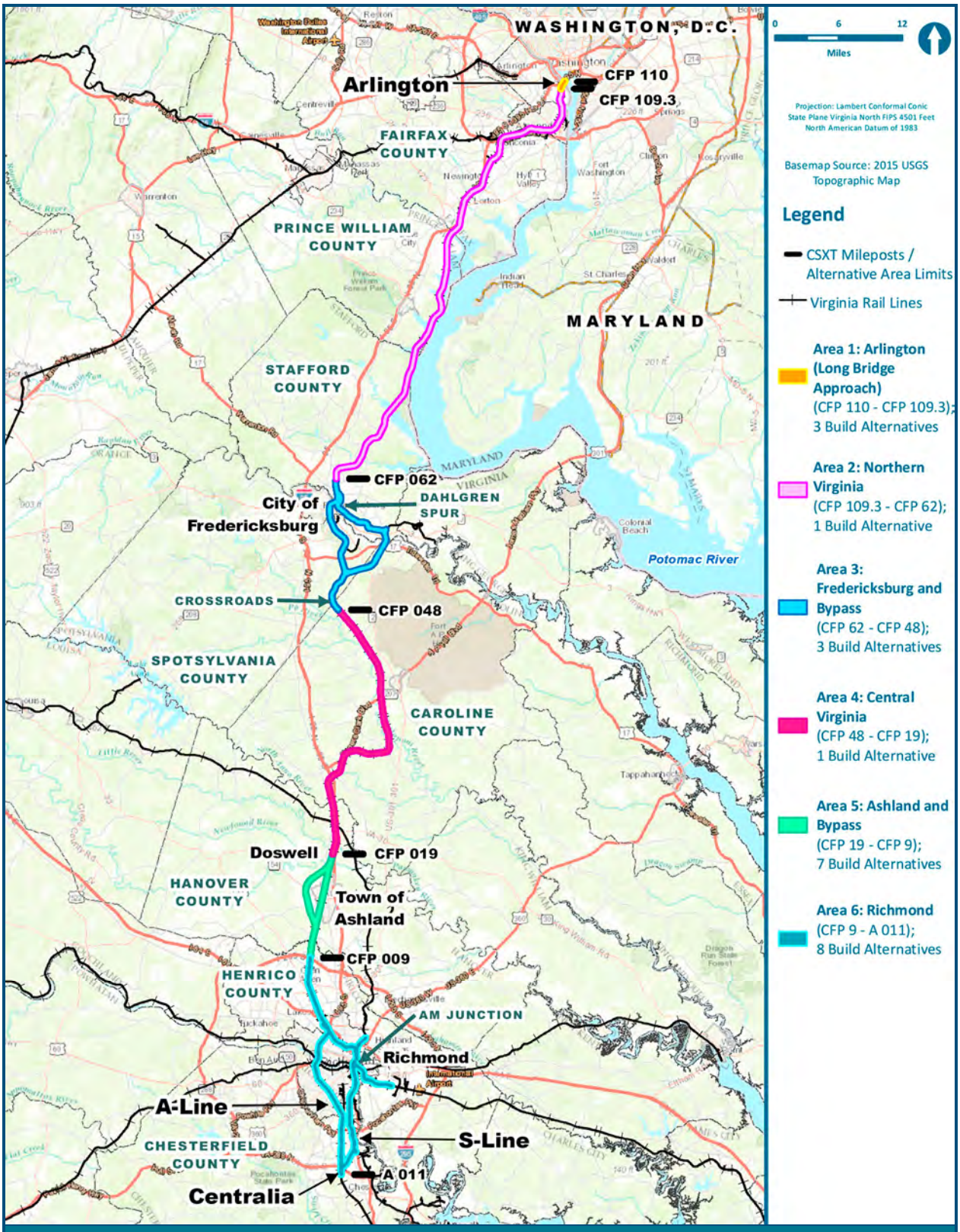


Figure 2.3-1: Alternative Areas

2.3.2 Considerations for Alternatives Development

The alternatives development process for DC2RVA began with the development of technical criteria as the basis for Project Build Alternatives. Additional considerations that guided the development of alternatives included their ability to meet the Project Purpose and Need and the presence of physical constraints, i.e., crossing infrastructure, along existing and potential rail alignments. Each of these three considerations are described below.

2.3.2.1 Technical Criteria

The engineering Basis of Design (BOD) Report (Appendix B) presents the technical criteria that were followed for conceptual and preliminary engineering on the DC2RVA Project. The BOD was developed in coordination with the major Project stakeholders: FRA, DRPT, Virginia Department of Transportation (VDOT), CSXT, Amtrak, and Virginia Railway Express (VRE).

The BOD for rail components of the Project emphasizes safety and follows accepted engineering practices used by CSXT, Amtrak, and VRE and comports with FRA track safety standards and the American Railway Engineering and Maintenance-of-Way Association (AREMA) Manual for Railway Engineering. The BOD for roadway components follows VDOT standards.

Key features of the BOD are incorporated into the alternatives described in this chapter and include the following:

- Both new and existing main line track will be designed for a maximum authorized passenger train speed of 90 mph, where practicable.
- Both new and existing main line tracks shall be designed for interoperability between all passenger and freight service.
- Track centers (distance between the centerlines of two adjacent tracks) for new main line, lead tracks, tangent tracks[2], and tracks parallel to main line tracks shall be a minimum of 15 feet between an existing track and a proposed track or between two or more proposed tracks (Figure 2.3-2).

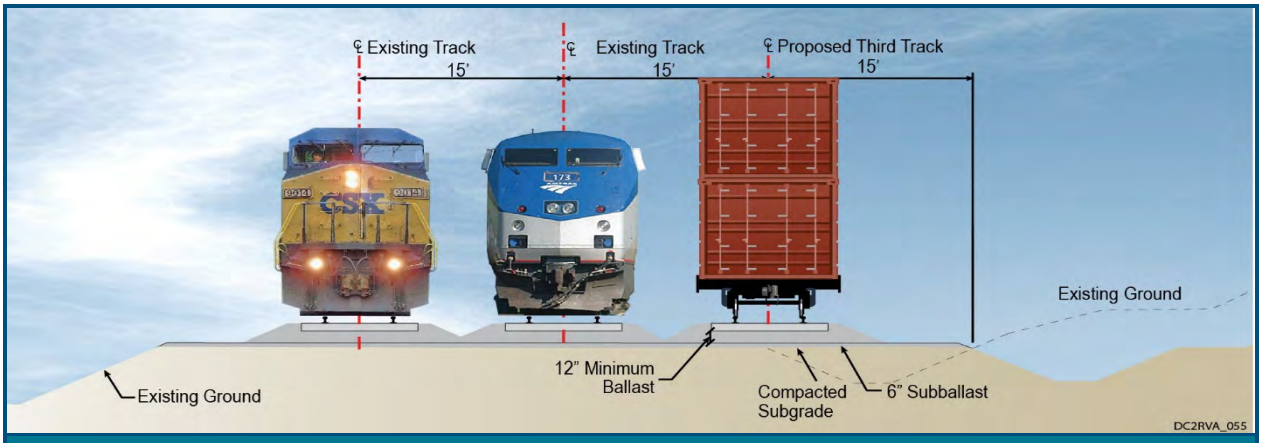


Figure 2.3-2: Typical Track Section

[2] Main line track is the primary track used for through train movements. Lead tracks connect yards or other facilities to the main line track. Tangent track are tracks that follow a straight line.

- Passenger station improvements shall include low-level side or center island platforms serving all main line tracks in accordance with FRA, Amtrak, and VRE standards[3]. Platform length should be 850 feet for platforms serving Northeast Regional and Interstate Corridor trains and VRE commuter trains, and 1,200 feet for platforms serving Long Distance trains.
- Utilization to the extent feasible and practicable of ongoing and previously completed studies, concept development, and rail improvement designs in the corridor.

The BOD and key features discussed above are applicable only to areas where new construction or major remodeling might occur. Existing tracks where improvements are not required are exempt from the design criteria as well as the approvals and design variance process in the BOD. DRPT anticipates that portions of the existing track may need to be modified or upgraded for improved rail geometrics as well as included in modifications to the signal system.

Rail alignment options include common elements such as signals, crossovers, sidings, turnouts, etc. These elements are defined and shown in Figure 2.3-3.

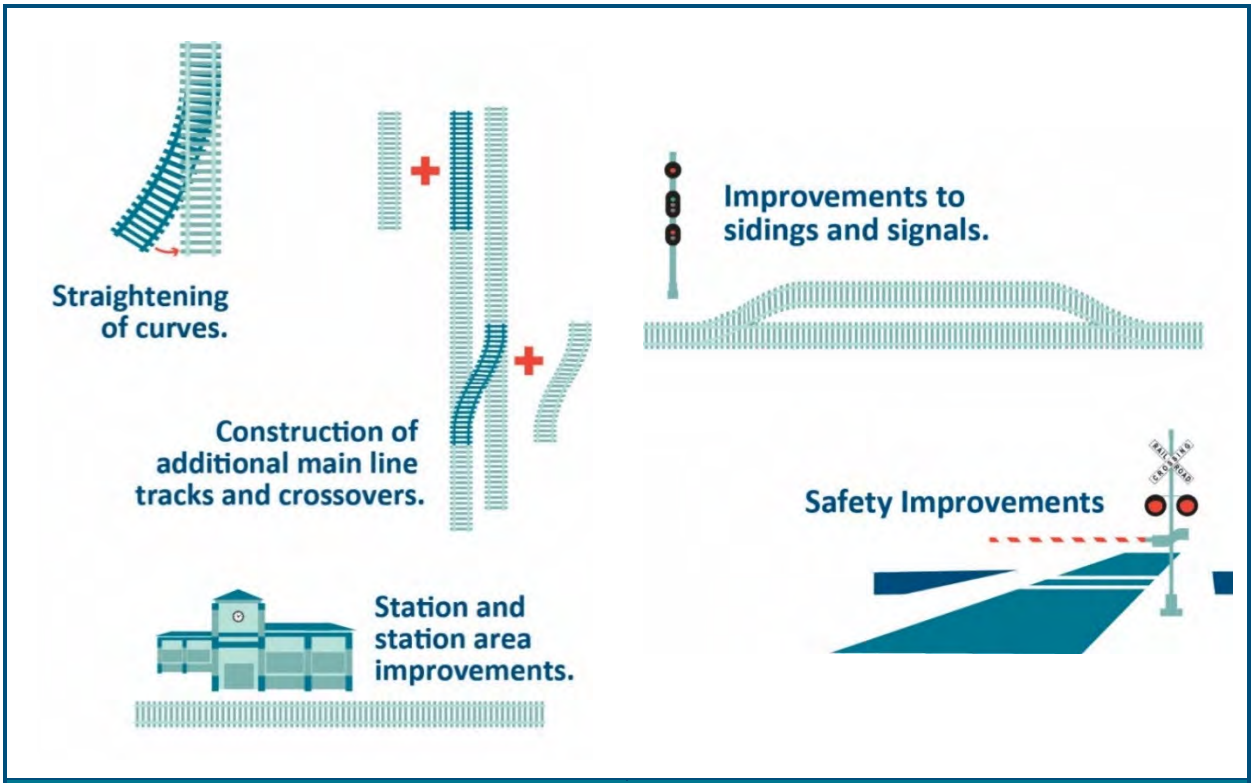


Figure 2.3-3: Typical Rail Alignment Elements

[3] Platforms are required to comply with the Americans with Disabilities Act (ADA), and those located on tracks used solely for passenger trains must have high platforms allowing level boarding with Amtrak's passenger cars. FRA waives this requirement for platforms on tracks where freight trains are commingled with passenger trains, and instead allows a low-level platform (top of platform is 8 inches from top of rail). Where low-level platforms are used, the station must have alternate means of providing level access to Amtrak's passenger cars for those with disabilities.

2.3.2.2 DC2RVA Purpose and Need

In the 2002 SEHSR Tier I EIS, FRA and FHWA established the overall purpose for the SEHSR program, which is to provide a door-to-door time-competitive transportation choice to travelers within the Washington, D.C. to Richmond, Raleigh, and Charlotte travel corridor. The SEHSR Tier I EIS concluded that adding a third track between Alexandria and Richmond was necessary to accommodate the freight and passenger growth needs of all users and institute high speed passenger service. The current DC2RVA Project carries forward the purpose of the SEHSR Tier I EIS within the Washington, D.C. to Richmond section of the larger SEHSR corridor. The purpose of the DC2RVA Project (as stated in Chapter 1) is to increase rail capacity between Washington, D.C. and Richmond 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 DC2RVA Project will enable passenger rail to be a competitive transportation choice for intercity travelers between Washington, D.C. and Richmond and destinations beyond the corridor.

The DC2RVA section of SEHSR is critical to the success of the other SEHSR sections to the south. It is the "gateway" for those future corridors to the south to access the Northeast Corridor (NEC), and their ridership/revenue is dependent upon that access. Without improvements to DC2RVA, any trains travelling north would be affected by congestion.

Current conditions experienced in the Project corridor confirm the SEHSR Tier I EIS Purpose and Need and are the foundation for the Project today. These conditions, described in detail in Chapter 1, include:

- Population growth
- Freight growth
- Congestion in the I-95 corridor
- Air travel congestion
- Limited rail capacity in the corridor
- Options for reliable and convenient movement of goods and people
- Air quality

Accordingly, in this Tier II Draft EIS, DRPT developed Project alternatives to meet the Project's Purpose and Need by considering the factors listed in Table 2.3-3.

2.3.2.3 Crossing Infrastructure Considerations

The DC2RVA corridor crosses public and private roads, pedestrian paths, other rail corridors, and major and minor waterways. Corridor crossings include both at-grade crossings of the railroad by other railroads, roads, or pedestrian paths, as well as grade-separated crossings with other railroads, roads, or pedestrian paths going over (overpasses) or under (underpasses) the railroad. DRPT's evaluation of these existing crossings identified potential constraints on rail alignment options for the Project. The evaluation of existing crossings assumed an additional main track is added along the DC2RVA corridor and addressed the following existing at-grade and grade-separated crossings:

- Roadway crossings (public and private crossings)
- Pedestrian crossings
- Rail crossings
- Waterway crossings

Table 2.3-3: Factors Considered to Develop Alternatives

DC2RVA Purpose and Need Elements	Factors Considered in the Development of Alternatives (i.e., Does the alternative…?)
Provide an efficient and reliable multimodal rail corridor	▪ Avoid, reduce, or mitigate impacts to sensitive human, natural, and physical environmental resources ▪ Avoid, reduce, or mitigate impacts to property owners ▪ Optimize capital and operation costs, including: - Ridership and revenue - Social and economic benefits - Infrastructure costs - Operations and maintenance costs ▪ Provide infrastructure and service improvements that are practicable and constructible
Increase the capacity of the multimodal rail system	▪ Provide additional main track, sidings, crossovers, yard bypasses and leads, and other capacity and reliability improvements sufficient to accommodate future volumes of passenger, commuter, and freight train traffic
Improve the frequency of passenger rail operations	▪ Increase passenger train frequency by up to nine round trips per day ▪ Provide a passenger train schedule suitable to ridership demand within the corridor and beyond
Improve the reliability of passenger rail operations	▪ Improve on-time performance by reducing the likelihood of passenger train delays within the corridor
Improve the travel time of passenger rail operations	▪ Reduce the current passenger train trip time between Washington, D.C. and Richmond ▪ Provide a passenger train trip time competitive with auto travel between Washington, D.C. and Richmond based on ridership demand
Accommodate VRE commuter rail service operations	▪ Accommodate VRE future growth ▪ Accommodate VRE commuter train schedules ▪ Accommodate VRE non-revenue train movements and yard access ▪ Accommodate VRE platform designs, including alignment, length, and number of platform edges served ▪ Accommodate existing and planned VRE station locations, including sharing platform space and other facilities at Amtrak passenger stations
Accommodate freight rail service operations	▪ Reduce freight train delays from passenger and commuter train operations ▪ Improve average freight train running time based on track design speed ▪ Accommodate rail freight future growth ▪ Accommodate yard operations ▪ Accommodate access to local customers ▪ Accommodate sidings for crew changes and layovers
Improve modal connectivity with other public transportation systems	▪ Develop an intercity passenger train schedule meeting ridership demand ▪ Accommodate a commuter train schedule suitable to ridership demand ▪ Provide passenger stations that accommodate commuter trains and other transit providers ▪ Provide station locations consistent with FRA guidelines ▪ Enhance station accessibility - Primary road access - Other public transit connections/access - Pedestrian/bicycle access/facilities - Parking facilities ▪ Provide station facilities consistent with Amtrak station guidelines ▪ Provide station locations consistent with state and local plans
Improve multimodal rail operations safety	▪ Improve road at-grade crossing safety warning systems ▪ Grade separate or close crossings with unacceptable safety risks ▪ Provide platform and station improvements ▪ Provide upgrades to signals and communication systems
Improve air quality and reduce greenhouse gas emissions	▪ Divert passenger trips by automobile and air to passenger train ▪ Divert movement of freight by trucks to rail ▪ Reduce fuel usage

DRPT's assessment of constraints on rail alignments for each crossing depended on the location and the specific type of crossing. The evaluation of existing overpasses addressed spatial limitations that could constrain the ability to add an additional main track beneath the overpass. The evaluation of underpasses addressed existing geometry and the configuration of the rail structure for potential constraints on the rail alignment. The evaluation of at-grade crossings addressed physical impacts to the public and private road infrastructure with the addition of a single track either to the east or west of the existing track(s). Finally, the locations of rail bridges over roads, rails, and waterways were evaluated for constraints that could limit where an additional bridge to carry the proposed new track could be constructed.

DRPT identified proposed crossing improvements for each at-grade roadway crossing in accordance with FHWA grade crossing guidance and the site-specific conditions for each crossing. The proposed improvements for the DC2RVA Project include crossing elimination (grade separation or closure) or safety improvements (including four quadrant gates or center median treatment with gates), and were identified to enhance the safety and operations of both roadway and rail traffic through the at-grade crossings. Refer to Chapter 4.15 for details.

2.3.3 Alternatives Development

The SEHSR Tier I EIS and 2002 Record of Decision (ROD) recognized the need for an additional main track on the corridor to provide capacity for more passenger trains, improve reliability of passenger train service, and improve travel time. The alternatives development process for DC2RVA therefore began with DRPT developing preliminary rail alignments. These preliminary rail alignments defined the general location and configuration of existing and additional main line tracks required to meet the Project's Purpose and Need. DRPT developed these preliminary rail alignments, including improving existing track and any new track, in accordance with the Project's BOD, described above in Section 2.3.2.1. The BOD was developed to incorporate applicable engineering elements and design criteria supporting the Purpose and Need into the Project's track and roadway designs.

Preliminary rail alignments are the initial basis for Project Build Alternatives, recognizing that adding a main line track and/or the potential realignment of the existing main line tracks is the driver for many of the other Project-related improvements and potential impacts. The rail alignments developed for the DC2RVA Project, described below, generally include the addition of a main track following the existing CSXT Richmond, Fredericksburg, and Potomac Subdivision (RF&P) corridor and improvements to existing track to increase potential speed, accommodate platform improvements, improve roadway crossings, or make room for additional track:

- DRPT developed preliminary rail alignments, including the addition of a new main track, from approximately 250 feet south of the Potomac River in Arlington, VA to the Staples Mill Road Amtrak station in Richmond.
- From Staples Mill Road Station south through Richmond to Centralia, VA, DRPT also developed preliminary rail alignment options; however, these Richmond area rail alignment options were based on multiple station location options along the primary existing rail corridors (the A- and S-Lines) through the city.

In addition, DRPT identified three specific areas along the corridor where additional consideration was warranted—Fredericksburg, Ashland, and Richmond. In Fredericksburg and Ashland, there are challenges due to limited space within the existing CSXT right-of-way for

additional track, adjacent population density and land use, station/platform location options, and sensitive historical and cultural resources. In Richmond, two potential alignments through the city and multiple station location options were identified during Project scoping. Preliminary rail alignments developed for Fredericksburg, Ashland, and Richmond were focused less on improving passenger train speed and more on improving capacity and reliability of the passenger service.

Developing potential rail alignments was an iterative process and considered options for rail alignments, station options, and physical constraints, as shown in Figure 2.3-4.

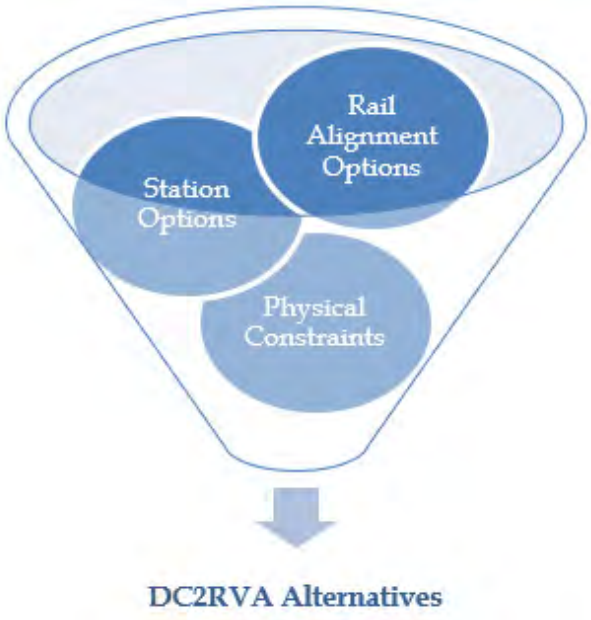


Figure 2.3-4: DC2RVA Alternatives Development Process

2.3.3.1 Rail Alignment Alternatives

DRPT developed three initial alignments to represent the range of potential Additional Track Alignments along the existing DC2RVA corridor, as shown in Figure 2.3-5 and described further below:

- Maximum Speed (Unconstrained) Alignment—adds one new track and realigns existing track to achieve the maximum authorized speed of 90 mph unconstrained by existing right-of-way.
- Improved Speed (Constrained) Alignment —adds one new track and realigns existing track to improve speed up to 90 mph to the extent possible while constrained to stay within the right-of-way. A variation on this alignment was also developed that optimizes use of existing rail infrastructure while also seeking to achieve the maximum possible speed up to 90 mph— called the Improved Speed Alignment (Hold Bridges/Tangents) Alignment.
- Existing Speed (West/East Track) Alignment —adds one new track to either side of the existing track while maintaining existing speed.

DRPT recognizes there is a trade-off between meeting the Project's Purpose and Need and impacts to human and natural resources. Adding a main track to the existing rail corridor adds capacity to the system, which removes or reduces system bottlenecks and improves passenger train performance and reliability. Improving travel time requires some combination of faster train operating speeds and/or fewer stops or delays. Designing an alignment for faster train speeds typically means straightening curves and reducing grade changes. Straightening the curves while adding new track can require additional right of way and create impacts to human and natural resources - while not improving the rail corridor or not adding track would have less impacts, but provide less improvement to the existing passenger rail system and may not satisfy the Project's Purpose and Need. Generally, where two or more alignment options exist with comparative levels of impacts, DRPT has advanced the alignment option that maximizes speed and capacity.

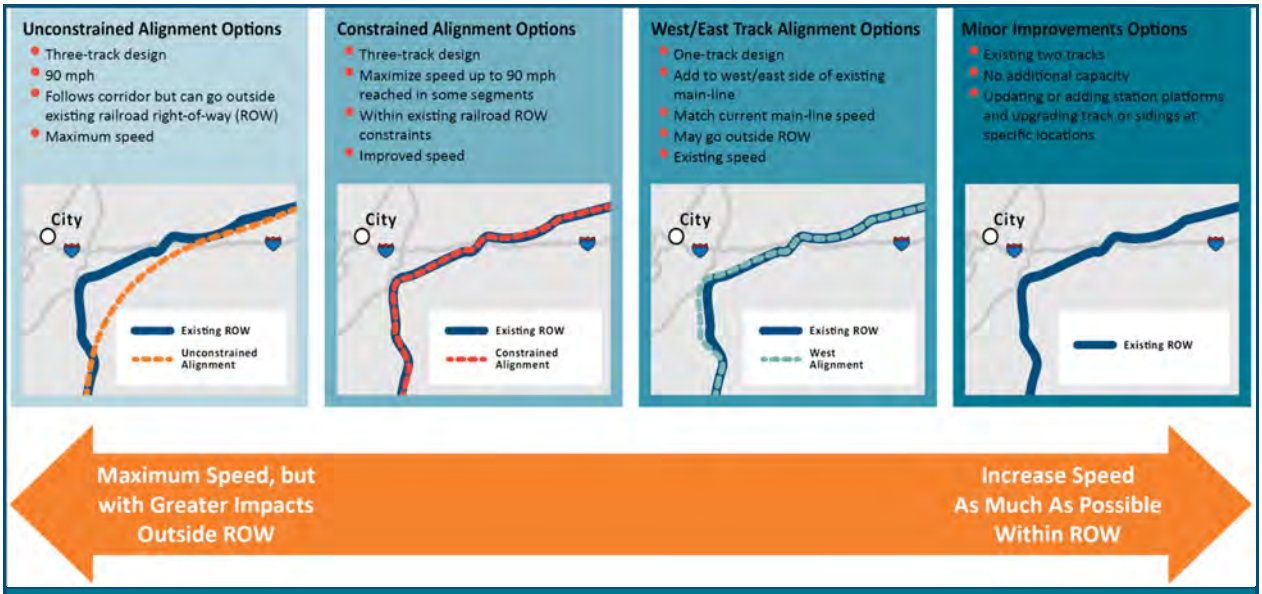


Figure 2.3-5: DC2RVA Preliminary Rail Alignment Options

In addition, a fourth alternative was developed for segments and areas where no additional track was warranted but minor improvements would be necessary to upgrade the existing rail system to meet Purpose and Need, and be compatible with alternatives north and south of the specific segment/area. For example, some segments already have three main tracks and may not require an additional main track. This fourth alternative is the No Additional Track, or Minor Improvements, Alignment.

Maximum Speed (Unconstrained) Alignment

The Maximum Speed Alignment was designed by DRPT to show what the rail alignment would look like if the primary criterion was to design track capable of the maximum allowable speed of 90 mph for passenger trains along the entire corridor, without being constrained by the limits of the existing right-of-way. Track alignment would generally follow the line of the existing rail corridor, but would include areas outside of the existing right-of-way where required to achieve a 90 mph track design speed. While optimizing track design speed, the unconstrained alignment would require substantial acquisition of new right-of-way and would generally have greater

impacts to environmental resources and infrastructure. The Maximum Speed Alignment includes the following characteristics:

- Addition of a main track designed to allow 90 mph for passenger trains.
- Reconfiguration of existing main line tracks to allow 90 mph for passenger trains.
- Replacing most, if not all, of the existing rail bridges over roads and waterways; existing rail bridges would not be used unless they fit the design alignment for 90 mph.
- Replacing most, if not all, of the existing road overpasses; existing road overpasses would not be used unless the design alignment for 90 mph fit underneath them.

Improved Speed (Constrained) Alignment

The Improved Speed Alignment was designed by DRPT to maximize passenger train speed up to 90 mph where possible while keeping all tracks (new and reconfigured) within the limits of the existing right-of-way. A track design to reach 90 mph is not achievable within all sections of existing right-of-way due to existing curves and limited distances of straight (tangent) track between curves. The Improved Speed Alignment includes the following characteristics:

- Addition of a main track within the existing right-of-way designed to allow the maximum possible speed up to 90 mph for passenger trains where possible.
- Reconfiguration of existing main line tracks to allow the maximum possible speed up to 90 mph for passenger trains where possible.
- Track alignment for the redesigned tracks is constrained to fit within the existing right-of-way.

This constrained option would increase track design speed for many segments and partial segments on the corridor, while limiting impacts and property acquisition outside of the right-of-way.

A variation on this constrained alignment was developed to optimize use of existing rail infrastructure while also seeking to achieve the maximum possible speed up to 90 mph—called the Improved Speed Alignment (Hold Bridges/Tangents). This design variation maintains existing tangent (e.g., straight) tracks and continues to use the existing rail bridges and alignment over roads and waterways. New bridges would be required alongside the existing rail bridges to carry the additional main track, and the existing track would be realigned through some curves to increase track design speed. Where the potential environmental effects of the two improved speed alignments are comparable, the Improved Speed Alignment (Hold Bridges/Tangents) would be preferred due to lower infrastructure impacts and anticipated cost savings from continuing use of existing rail bridges and tangent track alignments.

Existing Speed (West/East Track) Alignment

The Existing Speed Alignment adds one additional main line track to the existing alignment and matches the existing track alignment's curvature and operating speed. The Existing Speed Alignment would add capacity to the system but would minimally increase design speed using track superelevation. This alignment includes the following characteristics:

- Addition of a main track that matches the existing track alignment's curvature and design speed.
- No change to existing main line track alignment.

- Addition of a main track could require additional right-of-way.
- Existing track would continue use of existing rail bridges over roads or waterways; new rail bridges would be added to carry the additional main track.

The addition of a new main track and associated track bed would generally fit within the existing right-of-way. There may be some areas, however, where the slope of the track bed and associated cut/fill line, utility relocations, replacement of existing access roads, or other related improvement extend outside the existing right-of-way.

There are two versions of the Existing Speed Alignment option:

1) **West Track Addition** adds one new track to west side of existing main line, leaving existing tracks as is.
2) **East Track Addition** adds one new track to east side of existing main line, leaving existing tracks as is.

The Existing Speed Alignment would add track capacity but does not attempt to achieve a track design capable of supporting passenger trains at 90 mph Maximum Authorized Speed (MAS).

Alignment Options Based on Prior Studies

In addition to the rail alignments described above, several rail alignments were identified in prior corridor studies and were considered by DRPT in the alternatives development process (previous studies are further described in the Alternatives Technical Report in Appendix A). These alignments included those from studies by DRPT and CSXT for the addition of a main track and/or third track for portions of the DC2RVA corridor. The rail alignments developed in prior studies used varying design criteria; therefore, these alignment options were reconfigured by DRPT at the conceptual sketch level following the DC2RVA BOD. Once reconfigured to match the DC2RVA BOD, DRPT realized that the prior rail alignment options generally overlapped the East Addition or West Addition versions of the Existing Speed Alignment and in many segments were indistinguishable from the Existing Speed Alignments.

Considerations from Scoping/Public Input

Agency and public input during the scoping process also identified several alternatives for consideration (see Chapter 6 for more information on the scoping process). Comments that were potentially consistent with the Project's Purpose and Need were considered and incorporated into the development of Project alternatives. Others that were inconsistent with the Project's Purpose and Need were considered but not carried further for evaluation.

Suggested alternatives and infrastructure options that were potentially consistent with the Project's Purpose and Need included:

- New track alignments along the corridor (including a bypass at Ashland and a bypass at Fredericksburg)
- Various operating modes or service levels (to be addressed as part of the service planning effort for the Project)
- The concept that the Richmond area be served by only one rail station
- The potential for a new station in the vicinity of the former Broad Street Union Station (now housing the Science Museum of Virginia) in Richmond

Additional alternatives that were suggested during Project scoping and determined by DRPT to be inconsistent with the Project's Purpose and Need included extending passenger rail service to Bristol, VA, or developing a bicycle trail or greenway along the corridor. DRPT, along with Amtrak and Norfolk Southern, is exploring the possibility of new passenger service between Bristol, Roanoke, and Washington, D.C. along the Norfolk Southern Heartland Corridor. However, this service would exist largely outside the DC2RVA corridor and was therefore considered inconsistent with the Project's Purpose and Need to provide improved passenger rail service between Washington, D.C. and Richmond on the existing CSXT alignment. Public comment received in support of establishing a bicycle/walking path or greenway alongside the DC2RVA corridor also was considered but likewise determined to be inconsistent with the Project's Purpose and Need. CSXT does not allow recreational use of its right-of-way; therefore, any greenway would require additional right-of-way to be acquired outside of the existing CSXT right-of-way along the 123-mile corridor. Developing a greenway on new right-of-way would create impacts to historical resources, wetlands and waterways, neighborhoods, road crossings, and other natural and man-made resources. Providing a greenway does not support or enhance passenger rail service, nor does it provide a reasonable transportation choice for corridor travel, and therefore this suggestion was not evaluated further.

Alternatives Development in Fredericksburg (Build Alternative Area 3) and Ashland (Build Alternative Area 5)

DRPT, based on prior corridor studies and in coordination with FRA, has assumed an additional main track is necessary in the corridor to meet the Project's Purpose and Need. DRPT evaluated the Maximum Speed, Improved Speed, and Existing Speed additional track alignments in Fredericksburg and Ashland; however, all of the alignments that add a main track would affect historic or other resources in the areas. DRPT therefore considered two additional options within each of these areas:

- No Additional Track—This option would not add any additional track through Fredericksburg or Ashland. There would be minor improvements to existing crossings and upgrades to signals and communications systems. Future train traffic, including all passenger, commuter, and freight trains, would continue on the existing corridor.
- Two-track Bypass—This option would add a two-track bypass, either east or west of Ashland or Fredericksburg. DRPT anticipated these bypass alignments would be used primarily by freight trains, the Auto Train, and possibly some long-distance passenger trains; regional passenger trains and VRE commuter trains (Fredericksburg only) would continue to utilize the existing tracks and pass through the existing station.

2.3.3.2 Station Location Alternatives

DRPT evaluated both existing and potential passenger rail stations in the DC2RVA corridor. The DC2RVA Project proposes to generally maintain existing intercity passenger rail service patterns while increasing the frequency and reliability of service on the corridor. DRPT anticipates that the existing intercity passenger rail stations in the corridor (see Table 2.3-2), if not replaced by a new station, would continue to receive some level of intercity passenger rail service via Interstate Corridor (Carolinian and SEHSR) and/or Northeast Regional (Virginia and SEHSR) trains. The Project may modify existing train schedules to accommodate the proposed new passenger services provided by DC2RVA. The Project does not preclude future changes to service patterns and intercity passenger rail station locations, nor does it preclude development of new stations in the future.

Intercity passenger rail stations may be affected by the Project as follows:

- Existing intercity passenger stations may be improved or expanded in accordance with Amtrak's station facility guidelines and ridership service requirements, including new station buildings, parking, and other facilities to meet ridership demand and increased service frequency.
- New passenger stations may be established and existing stations re-located or closed to meet ridership demand and/or to improve passenger service and rail operational efficiency.
- Amtrak station platforms may be reconfigured and new island platforms added to meet new track alignments and the Project's BOD. Track alignments at VRE stations will accommodate expanded platforms and new island platforms in accordance with the Project's BOD. The Project does not include construction of new platforms for stations that will only be served by VRE[4], although it does not preclude VRE from pursuing such improvements.
- Future passenger service frequency and schedules may change; stations may receive more or less Long Distance, Interstate Corridor (SEHSR), or Northeast Regional (SEHSR) train services than they do now; or stations may receive more or less funding for improvements from public or private sources.

Several locations for potential new or replacement intercity passenger stations were identified during Project scoping and from prior corridor studies. These potential new station locations, which include some VRE stations and new station locations, are identified in Table 2.3-4.

2.3.3.3 Richmond Area Rail Alignment–Station Service Options

While rail improvements and even additional track can be added within the existing right-of-way in many segments in Richmond, the dense urban environment and potential impacts precluded a focus on higher speed. Instead, station locations were identified and used as the basis for identifying sets of rail improvements in Richmond for increased capacity to form alternatives.

Station location alternatives in Richmond were developed using the following FRA station location guidance, and associated rail improvements were identified to serve both intercity passenger rail needs and to alleviate freight rail movements and bottlenecks that could adversely affect passenger service:

- Intercity passenger rail stations should be located in or near the central business district.
- For larger metro areas, there should be one or more suburban stations.
- Stations should be readily accessible and cater to business and leisure travel.

Refer to Section 2.4.3 below for details.

[4] DRPT evaluated the existing and planned VRE stations and VRE's planned platform expansions to ensure the Project's track alignments at the VRE stations accommodated 850 feet long platforms and island platforms where possible. Descriptions of these VRE stations/locations and their existing facilities and attributes are provided in the Alternatives Technical Report. VRE existing commuter rail stations and those under construction or planned were also evaluated to ensure DC2RVA track alignments could accommodate expanded commuter platforms and new island platforms in accordance with the Project's BOD. The Project does not include construction of new platforms for stations that will only be served by VRE.

Table 2.3-4: Potential Locations for New Passenger Stations in the DC2RVA Corridor

Station	Location/DC2RVA Build Alternative Area	Status/Origination	Potential Other Passenger Rail Service
Crystal City/National Airport	Arlington County/Area 2: Northern Virginia	Potential new station location identified during public scoping	VRE, Metrorail
Spotsylvania	Spotsylvania County/Area 4: Central Virginia	Potential new station combined with existing VRE station	VRE
Carmel Church	Caroline County/Area 4: Central Virginia	Potential new station location identified from prior studies and public scoping	None
Vaughan Road	Town of Ashland/Area 5: Ashland	Potential new station location to replace existing Ashland Station identified during public scoping	None
Patrick Road	Town of Ashland/Area 5: Ashland	Potential new station location to replace existing Ashland Station identified during public scoping	None
Ashcake Road	Hanover County/Area 5: Ashland	Potential new station location to replace existing Ashland Station identified during public scoping.	None
Cedar Lane	Glen Allen, Henrico County/Area 6: Richmond	Potential new station location based on DRPT review of rail alignment	None
Greenwood Road	Glen Allen, Henrico County/Area 6: Richmond	Potential new station location based on DRPT review of rail alignment	None
Mountain Road	Glen Allen, Henrico County/Area 6: Richmond	Potential new station location based on DRPT review of rail alignment	None
Parham Road	Henrico County/Area 6: Richmond	Potential new station location identified from prior studies	None
Boulevard	City of Richmond/Area 6: Richmond	Potential new station location identified during public scoping	None
Broad Street	City of Richmond/Area 6: Richmond	Potential redevelopment of historic train station (currently Science Museum of Virginia) identified during public scoping	None
Hull Street Road	South Richmond/Area 6: Richmond	Potential new station location based on DRPT review of rail alignment	None
Warwick/Bells Road	South Richmond/Area 6: Richmond	Potential new station location based on DRPT review of rail alignment	None
Walmsley Boulevard	South Richmond/Area 6: Richmond	Potential new station location based on DRPT review of rail alignment	None
Chester Road	Chester/Area 6: Richmond	Potential new station location based on DRPT review of rail alignment	None

2.4 OPTIONS CONSIDERED AND DISMISSED

DRPT's determination of which alternatives were considered and dismissed versus those carried forward for further evaluation and/or inclusion in the Draft EIS was the outcome of a systematic evaluation and screening process. Accordingly, this section begins with a description of the screening process, followed by a summary of the outcome of the application of that process.

2.4.1 Screening Process

2.4.1.1 Rail Alignment Screening Process

The rail alignment screening process evaluated potential rail alignments for effectiveness in meeting the Project's Purpose and Need. The overall rail alignment screening process is summarized in Table 2.4-1 and includes the following:

- **Stage I.** Evaluation of rail alignments outside the existing right-of-way for potential impacts to key environmental resources.
- **Stage II.** Evaluation of rail alignments for order-of-magnitude impacts on additional environmental resources, within and outside the existing right-of-way. During this stage, DRPT eliminated alignment options with greater impacts and carried forward alignment options with fewer impacts. Where there are two or more alignment options with similar levels of impacts, DRPT has carried forward the option that provides the higher train design speed
- **Stage III.** Evaluation of rail alignments for effects on existing infrastructure, including at-grade crossings, roadway overpasses, and rail bridges over roads or waterways.
- **Stage IV.** Evaluation of additional rail alignments, including bypasses, in areas of special concern (Fredericksburg, Ashland, and Richmond). Options that were identified in each area during Stage IV were also evaluated against the Stage I, II, and III screening elements.

At the northern end of the DC2RVA corridor in Arlington, the CSXT tracks continue across the Potomac River on a two-track rail bridge, known as the Long Bridge. The Washington, D.C. District Department of Transportation (DDOT), in coordination with FRA, DRPT, VRE and CSXT, is completing a comprehensive study for the replacement of the Long Bridge to increase the rail capacity across the Potomac River.[5]

The DDOT Long Bridge study is separate from the DC2RVA Project and addresses a critical bottleneck to rail operations where the DC2RVA corridor connects to the NEC. DRPT developed multiple alignments for the southern approach to the bridge in coordination with the Long Bridge study and subjected those options to the same Stage I, II, and III screening as described above for the corridor rail alignments. The development of multiple alignments ensures that a DC2RVA alignment would be available to coordinate with any of the three alternatives being considered in the study of the potential Long Bridge improvements.

[5] The DDOT Long Bridge Study project website is: https://ddot.dc.gov/page/long-bridge-study-phases-i-and-ii

Table 2.4-1: Rail Alignment Screening Process

Screening Stage	Screening Criteria	Evaluation Factors
Stage I Direct effects on key environmental resources	Direct effects to: ▪ Historic resources listed on or eligible for listing on the National Register of Historic Places ▪ Federal, state, or local parks and recreation areas ▪ Federal or state wildlife and waterfowl refuges ▪ Military bases	Alignment options eliminated if adding a new main track would have direct effects to key resources outside of existing right-of-way.
Stage II Order of magnitude impacts on readily identifiable environmental characteristics not addressed in the first stage screening	Direct effects to: ▪ Area outside of right-of-way - Urban/developed land use - Agricultural land use ▪ Registered hazardous material or waste site(s) under Superfund ▪ Registered hazardous material or waste site(s) ▪ Conservation lands/easements ▪ State-listed agricultural or forestal districts ▪ Areas on the National Wetlands Inventory or other mapped wetland areas ▪ Cemeteries	Alignment option(s) eliminated if adding a new main track would have direct impacts on environmental characteristics that are substantively greater than options with comparable design speed.
Stage III Infrastructure constraints on rail operations and track design	Direct effects to: ▪ Existing rail bridges over roads, railroads, and waterways ▪ New rail bridges over roads, railroads, and waterways ▪ Existing and new roadway overpasses ▪ Existing roadway at-grade crossings ▪ Existing station platforms ▪ Track design speed/capacity	Alignment option(s) eliminated if adding a new main track would have direct impacts on existing infrastructure or require new infrastructure substantively greater than options with comparable or improved track design speed/capacity.
Stage IV Evaluation of bypass alignments and areas of special concern (Fredericksburg, Ashland, and Richmond)	Direct effects to: ▪ Stage I criteria ▪ Stage II criteria ▪ Stage III criteria	Alignment option(s) eliminated in accordance with Stage I, II and III evaluation factors described above.

2.4.1.2 Station Location Screening Process

DRPT developed functional criteria for station evaluations by identifying key characteristics of stations that support demand for intercity passenger rail service, including station location, existing site conditions, surrounding population density and commercial activity, multimodal connectivity,[6] and distance between station stops. These criteria are based on guidelines from the FRA and standards developed by Amtrak, AREMA, and other local and national rail station studies.

Screening of existing and potential stations considered: station location; potential ridership/revenue; station type; multimodal service; station configuration; station access; and parking. DRPT anticipates that the existing intercity passenger rail stations in the corridor, if not replaced by a new station, would continue to receive some level of intercity passenger rail service via Interstate Corridor and/or Northeast Regional (Virginia and SEHSR) trains. Potential new

[6] Multimodal connectivity refers to the ability for passengers to transfer between multiple modes of transportation, such as passenger rail, commuter rail, subway or streetcar service, bus service, private vehicles, bicycles, and pedestrian modes.

stations that are less able to meet the criteria will not be considered further as part of the DC2RVA Project; however, this does not preclude these or other station locations from being developed in the future, independent of DC2RVA.

2.4.2 Screening Results for Northern Virginia (Build Alternative Areas 1, 2, and 3) and Central Virginia (Build Alternative Areas 4 and 5)

2.4.2.1 Rail Alignments

DRPT identified Northern Virginia and Central Virginia rail alignment options based on the opportunity to improve track design speed.

The cumulative results of Stage I, II, and III screening of rail alignments in Northern and Central Virginia are shown in Table 2.4-2. The options that are carried forward by DRPT are indicated in the tables with an open circle (○); those that DRPT are not carrying through for further evaluation are represented by a closed circle (●). Refer to the Alternatives Technical Report (Appendix A) for detailed screening tables for each stage by segment. Detailed graphics illustrating the specific improvements for segments within Northern Virginia and Central Virginia are in Appendix D and F, respectively.

Northern Virginia Screening Outcome

In Segment 01: Rosslyn to Alexandria (ROAF), DRPT considered the following alignments, none of which were dismissed:

- Add two tracks east of existing corridor
- Add two tracks west of existing corridor
- Add one track east and one track west of existing corridor

This less than one-mile-long section of the DC2RVA corridor provides the transition between the DC2RVA corridor and the approach to the Long Bridge across the Potomac River. DRPT considered the environmental, social, and economic impacts of each of the three Build Alternatives, in addition to each alternative's ability to meet the Project Purpose and Need. DRPT determined that each of the three alternatives are very similar in their impacts, and that lacking overriding issues, DRPT would not select one alternative over the other at this time.

In the remainder of Northern Virginia, DRPT eliminated the Maximum Speed Alignment options during screening due to their relatively high levels of impacts to the human and natural environment.

The Improved Speed Alignment option (Hold Bridges/Hold Tangents) was advanced by DRPT as the reasonable and feasible track alignment for most segments in the Northern Virginia area. The objective of the Improved Speed Alignment is to attain a track design speed of 90 mph where practical within the existing right-of-way. However, there are portions of many segments in the Northern Virginia area where it is not practical to design track for 90 mph, due to limited right-of-way, site constraints, or rail operational constraints.[7] In these portions of track, the Improved Speed Alignment seeks to improve speed up to the limiting speed on either end.

[7] For example, a section of track with multiple curves and limited tangent track between curves may not be capable of supporting 90 mph train operations, particularly if the limiting speed in the curves is less than 90 mph and there is insufficient distance between curves for a passenger train to accelerate to 90 mph and then decelerate to the limiting speed without wasting fuel.

Table 2.4-2: Summary of Stages I, II, and III Screening by Segment (Northern and Central Virginia)

Segment	Max Speed	Improved Speed			Existing Speed			No Additional Track
		Constrained	Hold BR	Hold BR/Tan	East	West	2006	
Northern Virginia								
01: Rosslyn to Alexandria (ROAF)	●	●	●	○	●	●	n/a	n/a
02: Alexandria to Franconia (AFFR)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	○
03: Franconia to Lorton (FRLO)	●	●	●	○	●	●	●	n/a
04: Lorton to Powells Creek (LOPC)	●	●	●	○	●	●	●	n/a
05: Powells Creek to Arkendale (PCAR)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	○
06: Arkendale to Dahlgren Junction (ARDJ)	●	●	●	○	●	○	●	n/a
07: Dahlgren Junction to Fredericksburg (DJFB)	●	●	●	○	○	●	n/a	n/a
08: Fredericksburg to Hamilton (FBHA)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	○
09: Hamilton to Crossroads (HAXR)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	○
Central Virginia								
10: Crossroads to Guinea (XRGU)	●	●	●	○	○	●	●	n/a
11: Guinea to Milford (GUMD)	●	●	○	○	●	○	●	n/a
12: Milford to North Doswell (MDND)	●	○	○	○	●	○	●	n/a
13: North Doswell to Elmont (NDEL)	●	○	○	○	○	○	●	n/a
14: Elmont to Greendale (ELGN)	●	○	○	○	○	○	●	n/a

Notes: ●Alignment eliminated from further evaluation during screening. ○Alignment carried forward for further evaluation

Detailed graphics illustrating the specific improvements for segments within Northern Virginia and Central Virginia are in Appendix D and F, respectively.

In some segments in the Northern Virginia area, a third main track is already available or under construction, and an additional main track may not be needed. In these segments, a No Additional Track Option was advanced. The No Additional Track Option includes shifting track in some curves to improve speed.

Taking into consideration the Improved Speed (Hold Bridges/Hold Tangents) Alignment and No Additional Track Option, most of the Northern Virginia area would have track improved for speeds of 79 mph, with some sections designed for up to 90 mph (current track speeds top out at 69 mph.) The Existing Speed (West/East Track) Alignment options one segment on each side that advanced through these screenings. However, the Existing Speed Alignments do not accommodate improving speed on the curves in the corridor.

Based on the results of the Stage I, II, and III screening, DRPT advanced the Improved Speed Alignment options with modifications to the curves where possible within the existing right-of-way to improve rail operating speed.

Central Virginia Screening Outcome

DRPT eliminated the Maximum Speed Alignment options during the screening due to their relatively high levels of impacts to the human and natural environment outside the right-of-way.

The Improved Speed Alignment option was advanced as the reasonable and feasible track alignment for the Central Virginia area.

The Existing Speed (West/East) Alignments were eliminated from further consideration because they did not accommodate improving speed.

2.4.2.2 Station Locations

As indicated above, DRPT anticipates that the existing intercity passenger rail stations in the corridor (see Table 2.3-2), if not replaced by a new station, would continue to receive some level of intercity passenger rail service. DRPT evaluated possible new or replacement station locations for their suitability to serve as intercity passenger rail stations, as shown in Table 2.4-3, but ultimately determined that no new stations are needed in the Northern and Central Virginia areas to meet the Purpose and Need for service. This, however, does not preclude future stations along the corridor.

Table 2.4-3: Station Screening Summary, Northern and Central Virginia

Station	Location/DC2RVA Build Alternative Area	Status	Station Notes
Crystal City/ National Airport	Arlington County/Area 2: Northern Virginia	Potential new location. Dismissed from further consideration.	Platform configuration constraints, parking constraints, and proximity to Alexandria Station.
Spotsylvania	Spotsylvania County/Area 4: Central Virginia	Potential new location. Dismissed from further consideration.	Proximity to Fredericksburg Station, and interference with VRE operations.
Carmel Church	Spotsylvania County/Area 4: Central Virginia	Potential new location. Dismissed from further consideration.	Access to I-95 and US-1. Lack of development and relatively low population and ridership in the area.

▶ Continued.

Table 2.4-3: Station Screening Summary, Northern and Central Virginia

Station	Location/DC2RVA Build Alternative Area	Status	Station Notes
Vaughan Road	Caroline County/Area 4: Central Virginia	Potential new location. Dismissed from further consideration.	Limited connectivity to east-west primary roadways, possible conflicts with local land use, and distance from Ashland's central urban area.
Patrick Road	Town of Ashland/Area 5: Ashland	Potential new location. Dismissed from further consideration.	Land acquisition and occupying space currently designated for use by the College for expansion.
Ashcake Road	Town of Ashland/Area 5: Ashland	Potential new location. Carried forward based on potential conflicts of existing station location in the Town of Ashland with DC2RVA improvements.	South of Ashcake Road, on the eastern side of tracks.

2.4.3 Screening Results for Richmond (Build Alternative Area 6)

In Richmond, the existing dense urban development, grade changes, and historic rail ROW configuration limit opportunities to improve travel time. Additionally, there are multiple rail lines, including two CSXT-owned north-south lines (A-Line and S-Line, see below), to consider. Because of these factors, DRPT developed preliminary rail alignments and other improvements for the Richmond area primarily based on the ability to serve passenger train routes and potential station locations. **Rail Lines through Richmond.** In Richmond, the A-Line and S-Line railroads diverge at the south end of Acca Yard forming two routes through the city. The westward of the two routes is the A-Line, which arcs around Richmond as the double-track North End Subdivision, CSXT's principal freight route between Richmond and points south toward North Carolina. The eastward of the two routes is the S-Line, which passes through the center of Richmond as the Bellwood Subdivision, used primarily by local freights to serve industries and passenger train service to Newport News. The double-track A-Line runs through the median of I-195 south of Acca Yard and has limitations for expanding capacity. The single-track S-Line has limited vertical and horizontal clearance in the vicinity of Main Street Station caused by I-95 bridge pillars and the Triple Crossing of three railroad lines, of which the S-Line is the middle-level track in the crossing.

2.4.3.1 Rail Alignment—Station Service Options

Rail alignment options in Richmond were driven by station service options. DRPT identified a range of existing and possible station locations, developed a set of track and rail infrastructure improvements specific to each station location option, and then screened the rail infrastructure improvements following the screening process described in this chapter.

As described in Section 2.4.3.2, DRPT's evaluation of potential new station locations in Richmond identified two station locations for further consideration. Together with the two existing stations in the Richmond area, the following four stations were carried forward as part of either a single-station or two-station option:

- Staples Mill Road Station—existing Amtrak station in Henrico County

- Boulevard Station—new station location adjacent to the Boulevard Street overpass and northeast of the CSXT track in Richmond
- Broad Street Station—new station location near the historic Broad Street Station building (now the Science Museum of Virginia) in Richmond
- Main Street Station—existing Amtrak station in downtown Richmond

DRPT identified multiple options based on combinations of the existing rail alignments through the city (the A-line and the S-Line) and existing and potential station locations, as shown in Figure 2.4-1. Options based on station service were developed by DRPT for single-station options and two-station options at the four station locations. Each station location option includes a corresponding set of rail alignments and improvements.

The single-station options include rail service along either the S-Line or A-Line to existing and proposed stations in Richmond:

- Staples Mill Road Station Only (via A-Line)
- Boulevard Station Only (via A-Line)
- Boulevard Station Only (via S-Line)
- Broad Street Station Only (via A-Line)
- Main Street Station Only (via S-Line)
  - Via S-Line/Peninsula Subdivision
  - Via S-Line/Peninsula Subdivision + Freight Connector Bypass

The two-station options include varying rail services to both Main Street Station and Staples Mill Road Station:

- Full Service (via S-Line)— Long Distance (Amtrak), Interstate Corridor (SEHSR and Carolinian), and Northeast Regional (SEHSR and Virginia) passenger trains moving north-south through Richmond route through Staples Mill Road Station to the west side of Main Street Station and then to Centralia using the S-Line; all Northeast Regional service to Newport News continues from the east side of Main Street Station on the Peninsula Subdivision.
- Full Service (via S-Line) + Freight Connector Bypass—Similar to full service, but a freight connector bypass would be built across the James River as a means to facilitate freight movements within the Richmond area, which, in turn would facilitate passenger train movements from the Peninsula Subdivision, and between Main Street Station and Acca Yard.
- Split Service (via A-Line)—Similar to the existing service pattern, all Long Distance, Interstate Corridor, and Northeast Regional passenger trains moving north-south through Richmond route through Staples Mill Road Station to Centralia using the A-Line, bypassing Main Street Station; northeast regional service to Newport News continues from the east side of Main Street Station on the Peninsula Subdivision.

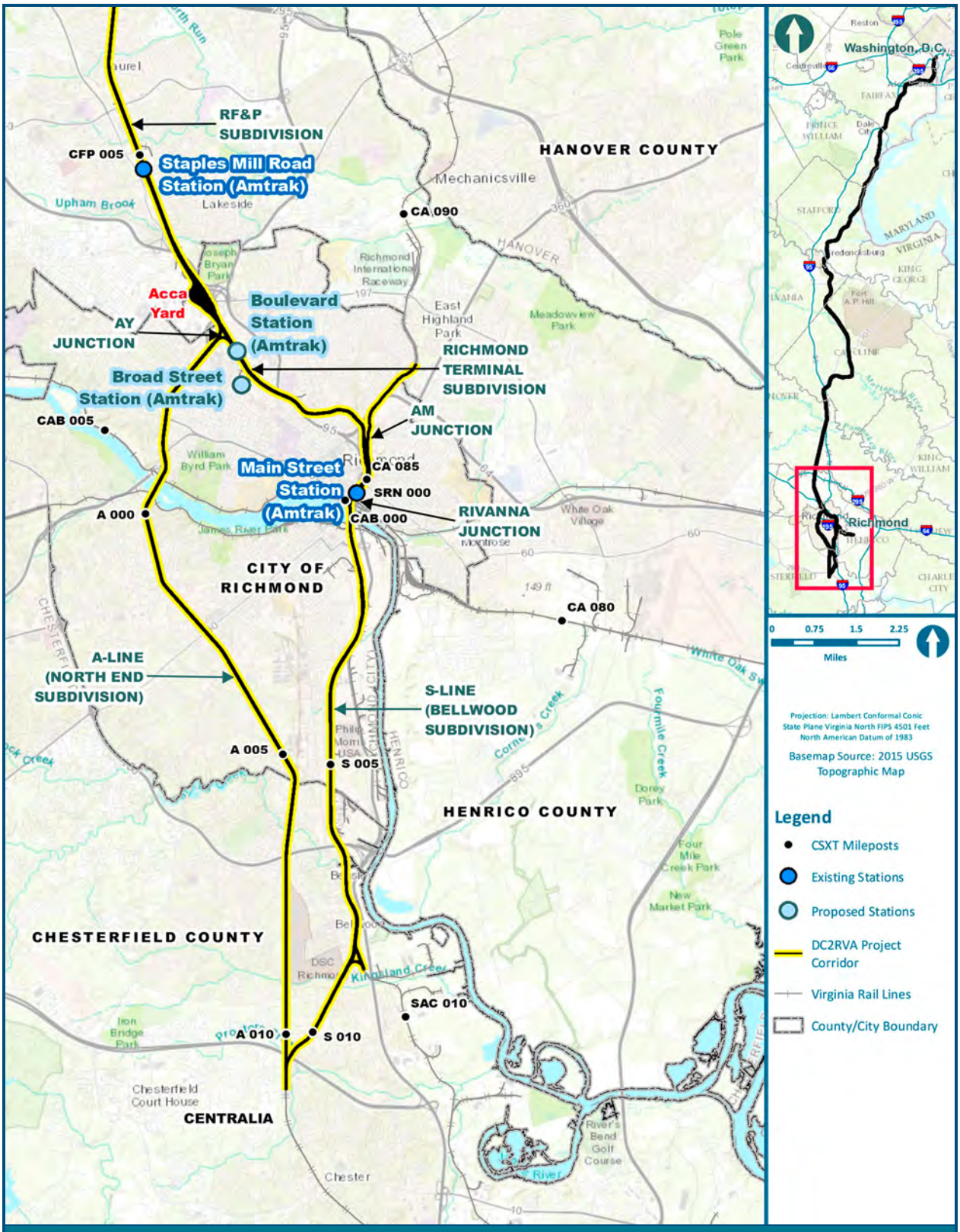


Figure 2.4-1: Richmond Area Station Options

- Shared Service (via A-line and S-Line)—All Long Distance, Interstate Corridor, and Northeast Regional passenger trains moving north-south through Richmond route through Staples Mill Road Station and then either: (a) to the west side of Main Street Station and then to Centralia using the S-Line; or (b) to Centralia using the A-Line. Northeast regional service to Newport News continues from the east side of Main Street Station on the Peninsula Subdivision.
- Shared Service (via A-Line and S-Line) + Freight Connector—Similar to shared service with the addition that a freight connector bypass would be built across the James River to facilitate freight movements within the Richmond area, which, in turn would facilitate passenger train movements from the Peninsula Subdivision, and between Main Street Station and Acca Yard.

DRPT further considered the potential for sharing service between a new Broad Street station and either the Main Street or Staples Mill Road stations, or between a new Boulevard Street Station and either the Main Street or Staples Mill Road stations. These options were dismissed due to the proximity between the stations—they are too close (within 4 miles of each other) for efficient rail operations and intercity passenger service.

All other options were moved forward into screening, which is summarized in Table 2.4-4. The station options that are carried forward by DRPT are indicated in the tables with an open circle (O); those that DRPT are not carrying through for further evaluation are represented by a closed circle (●).

Table 2.4-4: Summary of Screening by Station Location (Richmond)

Station Location Options	Stage I Screening	Stage II Screening	Stage III Screening	Summary
Staples Mill Road Station Only	O	O	O	O
Boulevard Station Only (via A-Line)	O	O	O	O
Boulevard Station Only (via S-Line)	O	O	O	O
Broad Street Station Only	O	O	O	O
Main Street Station Only	O	O	O	O
Main Street Station Only + Freight Connector Bypass	O	●	●	●
Split Service—Staples Mill Road/Main Street Stations (via A-line)	O	O	O	O
Full Service—Staples Mill Road/Main Street Stations (via S-line)	O	O	O	O
Full Service—Staples Mill Road/Main Street Stations (via S-line) + Freight Connector Bypass	O	●	●	●
Shared Service—Staples Mill Road/Main Street Stations (via A-line and S-line)	O	O	O	O
Shared Service—Staples Mill Road/Main Street Stations (via A-line and S-line) + Freight Connector Bypass	O	●	●	●

Notes: ●Alignment eliminated by DRPT during screening. OAlignment carried forward for further evaluation

The screening of Richmond station alignment options defined the rail infrastructure improvements determined to be reasonable for evaluation within the Draft EIS. Numerous options for the Richmond Freight Connector were considered but all were eliminated from consideration due to impacts to wetlands, historic resources, and/or public parks and recreations areas.

2.4.3.2 Station Locations

DRPT anticipates that the existing Amtrak stations in Richmond (see Table 2.3-2), if not replaced by a new station, would continue to receive some level of intercity passenger rail service. DRPT evaluated possible new or replacement station locations for their suitability to serve as intercity passenger rail stations, as shown in Table 2.4-5. In addition, DRPT reviewed rail alignments in the Richmond area to identify stations that had sufficient tangent track for 1,200 feet long platforms to determine if other areas not identified during scoping could be suitable for a combined Richmond station. While DRPT did identify areas with sufficient tangent track, these locations were dismissed from further consideration due to potential incompatibility with existing land uses, lack of accessibility to local primary roads and/or transit, potential historic and natural resources effects, and distance from the city center.

Main Street Station

Table 2.4-5: Station Screening Summary, Richmond

Station	Location/Build Alternative Area	Status	Reason for Elimination
Cedar Lane	Glen Allen, Henrico County/Area 6" Richmond	Potential new location. Dismissed from further consideration.	Land acquisition required for the new station, ancillary facilities and parking, and upgrades to area roads.
Greenwood Road	Glen Allen, Henrico County/Area 6: Richmond	Potential new location. Dismissed from further consideration.	Land acquisition required for the new station, ancillary facilities and parking, and upgrades to area roads.
Mountain Road	Glen Allen, Henrico County/Area 6: Richmond	Potential new location. Dismissed from further consideration.	Land acquisition required for the new station, ancillary facilities and parking, and upgrades to area roads.
Parham Road	Henrico County/Area 6: Richmond	Potential new location. Dismissed from further consideration.	Proximity to existing station infrastructure just south at Staples Mill Road station and Henrico County's statement that a rail station at Parham Road was not in keeping with the County's plans for the area.
Boulevard	City of Richmond/Area 6: Richmond	Potential new location. Carried forward.	--
Broad Street	City of Richmond/Area 6: Richmond	Potential new location. Carried forward.	--
Hull Street Road	South Richmond/Area 6: Richmond	Potential new location. Dismissed from further consideration.	Lower population density in the southern part of the Richmond region, potential land use conflicts, limited access to primary roads, and train operational concerns.
Warwick/Bells Road	South Richmond/Area 6: Richmond	Potential new location. Dismissed from further consideration.	Lower population density in the southern part of the Richmond region, limited access to primary roads, and train operational concerns.
Walmsley Boulevard	South Richmond/Area 6: Richmond	Potential new location. Dismissed from further consideration.	Lower population density in the southern part of the Richmond region and concerns about train operations.
Chester Road	Chester/Area 6: Richmond	Potential new location. Dismissed from further consideration.	Low population density in the surrounding area, distance from regional population centers, and train operational concerns.

2.4.4 Screening Results for Fredericksburg (Build Alternative Area 3, Segment 21)

In Fredericksburg, adding an additional main track at grade through the city and over the Rappahannock River along the existing corridor could impact historic resources. As a possible alternative, DRPT considered multiple bypass configurations using one track, two tracks, or three tracks along multiple routes.

Options that DRPT identified and considered during Stage IV but dismissed before evaluating them against Stage I, II, or III screening criteria because they were not feasible or practical include the following (refer to the Alternatives Technical Report in Appendix A for full details):

- Maximum Speed Alignment
- Improved Speed Alignment
- Existing Speed Alignment, West Side
- Elevated Track Concept
- Below-ground Track Concept
- Single Track Bypass
- Three-Track Bypass
- All West Bypass Alignments
- East Bypass Alignments along the Deep Run (Bowman) Spur
- East Bypass Alignments along the Massaponax Spur

The following options moved forward to Stage I, II, and III Screening:

- No Additional Track
- Existing Speed Alignment, East Side
- East Bypass Alignments that joined south of VRE Crossroads facility
- East Bypass Alignments that were developed after December 2015 public meeting, seeking to reduce impacts to potential conservation lands, developed lands, and/or historic and cultural resources

Based on the screening results, DRPT carried forward the option for No Additional Track through Fredericksburg, as well as the option of adding a track on the east side.

DRPT also identified and screened 11 two-track bypass alignments east of Fredericksburg, and the results of the screening are summarized in Table 2.4-6. The bypass options that are carried forward by DRPT are indicated in the tables with an open circle (○); those that DRPT are not carrying through for further evaluation are represented by a closed circle (●). As the table indicates, DRPT dismissed all but one bypass alignment option from further consideration.

2.4.5 Screening Results for Ashland (Build Alternative Area 5, Segment 22)

In Ashland, adding an additional main track through the town along the existing corridor could impact historic resources, affect local roads and traffic, land use, and other aspects of the human environment. As a possible alternative, DRPT considered multiple options for adding a track through town, including:

- Adding a track east or west of the existing two tracks at-grade
- Adding a track at-grade and shifting the existing tracks to center the alignment of all three tracks along the street axis
- Elevating one or more tracks through town
- Placing one or more tracks below grade in a cut-and-cover or deep bore tunnel

Table 2.4-6: Summary of Stages I, II, and III Screening of Bypass Options for Fredericksburg

Bypass Option	Stage I	Stage II	Stage III	Eliminating Factor(s)
FEB 1A	○	○	●	Impacts to Existing Infrastructure, inefficient rail operations, possible conflicts with VRE operations
FEB 1B	○	○	●	Impacts to Existing Infrastructure, inefficient rail operations, possible conflicts with VRE operations
FEB 2	●	●	●	Impacts to Historic Resources, inefficient rail operations, possible conflicts with VRE operations
FEB 2A	●	●	●	Impacts to Historic Resources, inefficient rail operations, possible conflicts with VRE operations
FEB 4C	●	●	●	Impacts to Historic Resources, inefficient rail operations, possible conflicts with VRE operations
FEB 5	●	●	●	Impacts to Parks & Public Recreation Areas
FEB 5A	●	●	●	Impacts to Parks & Public Recreation Areas
FEB 5B	●	●	●	Impacts to Parks & Public Recreation Areas
FEB 6A	●	●	●	Impacts to Parks & Public Recreation Areas
FEB 6B	●	●	●	Impacts to Parks & Public Recreation Areas
FEB 6C	○	○	○	Option carried forward for further evaluation in the Draft EIS
FEB 6D	○	○	●	Impacts to Existing Infrastructure

Notes: ●Alignment eliminated by DRPT during screening. ○Alignment carried forward for further evaluation

DRPT also considered multiple bypass configurations using one track, two tracks, or three tracks along multiple routes east and west of the town.

Options that DRPT identified and considered during Stage IV but dismissed before evaluating them against Stage I, II, or III screening criteria because they were not feasible or practical include the following (refer to the Alternatives Technical Report in Appendix A for full details):

- Maximum Speed Alignment
- Improved Speed Alignment, and Existing Speed, Add Track on West
- Elevated Tracks (of any number) through Ashland
- Three-track Tunnel, cut-and-cover or deep bore, through Ashland
- Single-track Tunnel, deep bore through unconsolidated material
- Single-track Bypass, either east or west
- Three-track Bypass, either east or west

DRPT evaluated the following options against Stage I, II, and III screening criteria:

- No Additional Track (Minor Improvements). This option does not include the construction of an additional mainline track through the Town, but incorporates a third track north and south of town. The existing two tracks through Ashland are used by freight and passenger trains similar to current conditions, and are connected to three

tracks north of Vaughan Road and south of Ashcake Road. DRPT determined to carry this alternative forward to the Draft EIS.

- Adding a Track At-grade. This option adds a third main track parallel to the existing two tracks using one of the following configurations:
  - Add a track on the east of existing tracks. DRPT determined to carry this alternative forward to the Draft EIS.
  - Add a track and center all three tracks. DRPT determined to carry this alternative forward to the Draft EIS.
- Adding a Track Below Grade (Tunnel). DRPT evaluated two options:
  - Add a track on the east of existing tracks using a cut and cover tunnel.
  - Add a track on the west of the existing tracks using a deep bore tunnel in the bedrock.
  - Both tunnel options would have some permanent impacts to historic resources in the town of Ashland, primarily from the multiple ventilation and emergency access structures or pop-up doors. Additional information on these and other tunnel elements can be found in the Alternatives Technical Report in Appendix A. Both tunnel options have impacts on wetlands, primarily from the areas occupied by the tunnel portals and ramps to the surface south of Ashcake. The cut-and-cover tunnel option and the north and south cut-and-cover sections of the deep bore tunnel would likely have substantive, albeit temporary, impacts on existing infrastructure in Ashland during construction. Constructing the cut-and-cover tunnels while maintaining rail operations and ensuring road access through Ashland would be problematic. Overall, the tunnels themselves would be expensive to build and operate compared to developing a new track(s) on the surface. Each tunnel would require multiple surface structures for ventilation systems and emergency access along Center Street, adversely affecting historic resources. Therefore, DRPT dismissed the tunnel options from further consideration.
- Adding a Two-Track Bypass. The results of the screening process for the bypass alignments evaluated by DRPT for five options east of town and four options west of town are summarized in Table 2.4-7. As indicated in the table, DRPT dismissed all but one bypass option from further evaluation. Additionally, DRPT dismissed all Doswell "wye" bypass options due to impacts to wetlands and/or infrastructure, and because a new wye at Doswell is not necessary with a west bypass.
- Buckingham Branch Freight Diversion. DRPT evaluated the option of diverting through freight trains onto the Buckingham Branch Railroad (BBRR) between Doswell and AM Junction in Richmond to open capacity on existing track through Ashland. DRPT dismissed this option from further evaluation due to substantial impacts to wetlands along the BBRR alignment, and the incompatibility with existing infrastructure and freight and passenger operations in Richmond.

As indicated in each of the options described above, the screening results for the Ashland area were used to develop the Build Alternatives that are presented in Section 2.5.2.5. In addition, DRPT also met with the Town of Ashland, Hanover County, the public, and other stakeholders, which provided input into the development of the Build Alternatives as presented in that section.

Table 2.4-7: Summary Screening results of Bypass Options for Ashland

Bypass Option	Stage I	Stage II	Stage III	Eliminating Factor(s)
AEB1 (Ashland East Bypass)	●	●	●	Impacts to parks & public recreation areas
AEB 2 (Ashland East Bypass to Buckingham Brand Railroad)	●	●	●	Impacts to parks & public recreation areas; impacts to I-95 infrastructure
AEB 3 (Ashland East Bypass that does not Cross I-95)	○	●	●	Impacts to wetlands, acquisition of urban/developed lands
AEB 4 (Ashland East Bypass in the I-95 Median)	○	●	●	Impacts to wetlands, impacts to I-95 infrastructure
AEB 5 (Ashland East Bypass White Paper)	○	●	●	Impacts to wetlands, potential acquisition of urban/developed lands, impacts to I-95 infrastructure
AWB 1 (Ashland West Bypass)	○	●	●	Impacts to wetlands, acquisition of urban/developed lands
AWB 2 (Ashland West Bypass Revision #1 per Public Comment)	○	●	●	Impacts to wetlands and acquisition of agricultural lands and community (church)
AWB 3 (West Ashland Bypass)	○	●	●	Impacts to wetlands and l acquisition of agricultural lands and community (church)
AWB 4 (West Ashland Bypass)	○	○	○	Option carried forward for further evaluation in the Draft EIS
BBRR Freight Diversion	○	●	●	Impacts to wetlands and incompatibility with passenger and freight movements in Richmond

Notes: ● Alignment eliminated by DRPT during screening. ○ Alignment carried forward for further evaluation

2.5 ALTERNATIVES EVALUATED IN THE TIER II DRAFT EIS

2.5.1 No Build Alternative

The No Build Alternative defines the future (2025) 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. The No Build Alternative provides a basis for comparing and contrasting the potential impacts of different DC2RVA Build Alternatives.

Information about planned physical improvements and rail service additions in the corridor was gathered from fiscally constrained Metropolitan Planning Organization (MPO) planning documents, Commonwealth multi-year 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 by DRPT to be complete by 2025 for the purposes of this evaluation. This includes, for example, projects in the VRE 2040 System Plan, which was adopted by the VRE Operations Board in 2014, and has received support from VDOT and other state agencies.

2.5.1.1 Infrastructure Improvements in the No Build Alternative

Table 2.5-1 summarizes the infrastructure improvements that are assumed by DRPT to be in place by 2025 that are already programmed, and is followed by a detailed description of each infrastructure improvement project included in DC2RVA's No Build Alternative.

Table 2.5-1: No Build Infrastructure Assumptions

Mode	Project	Source for Inclusion
Rail	Washington Union Station Capacity upgrade	Amtrak Washington Union Station Master Plan
	Virginia Avenue Tunnel expansion	CSXT National Gateway Program
	VRE 4th Track: CP Virginia–CP L'Enfant	VRE 2040 System Plan
	Long Bridge Expansion	FRA/DDOT Pre-NEPA Study
	RF&P Franconia–Featherstone improvements (CSXT "Fast Track agreement")	DRPT FY2016 Six Year Improvement Program
	RF&P Powells Creek–Arkendale improvements	DRPT FY2016 Six Year Improvement Program
	Main Line Relocation Project at Acca Yard and Crossovers South of the James River	DRPT FY2016 Six Year Improvement Program
	Richmond-Petersburg segment improvements for service expansion to Norfolk	DRPT FY2016 Six Year Improvement Program
	Franconia to Occoquan third mainline track improvements	DRPT FASTLANE Grant
	VRE Broad Run/Crossroads Yard expansion	VRE 2040 System Plan
	VRE Gainesville/Haymarket Extension	VRE 2040 System Plan
	VRE Station Platform Expansion Program	VRE 2040 System Plan
	VRE Potomac Shores Station	VRE 2040 System Plan
Transit	GRTC Broad Street Bus Rapid Transit Implementation (The Pulse BRT)	Greater Richmond Transit Company
	WMATA Silver Line Phase II Implementation	Washington Metropolitan Area Transportation Authority/Metropolitan Washington Airport Authority
	DDOT DC Streetcar	District Department of Transportation
	Crystal City BRT (Metroway)/Streetcar Corridor	Washington Metropolitan Area Transportation Authority

No Build Infrastructure Improvements: Rail

Washington Union Station Capacity Upgrade—Union Station has two track levels. The upper level consists of mostly high-level platforms serving stub-end tracks and is utilized by MARC and Amtrak trains terminating in Washington, D.C. The lower level consists of four low-level platforms located along eight through-running tracks that lead to the First Street Tunnel, which serves VRE and Amtrak trains that continue south to Virginia. The Union Station Master Plan has identified improvements to the lower track level that will proceed in the first phase of the master plan project. A new low-level side platform will be added on the easternmost track, for a total of five platforms serving the eight lower tracks. Two of the existing lower level platforms will be

upgraded as high-level platforms to provide level boarding on four tracks for faster boarding and alighting of Amtrak trains. The new side and other two existing platforms will remain low-level providing four tracks to accommodate VRE's rolling stock, which is incompatible with high-level platforms. Construction began January of 2017 with completion in **2021.**

Virginia Avenue Tunnel Expansion—CSXT began construction on an expansion of the Virginia Avenue Tunnel in Washington, D.C. in 2015. CSXT uses the current single-track Virginia Avenue Tunnel to bypass Union Station as freight trains travel through Washington, D.C. between Virginia and Maryland. The single-track tunnel is a bottleneck for CSXT, as freight trains must wait for authorization to travel through the tunnel at slow speeds, causing delays for freight movements along the DC2RVA corridor. When freight delays occur, freight trains may be held along the DC2RVA corridor, causing passenger trains to wait behind freight trains, or operate in both directions on the remaining free track. The expansion will add a second track to the tunnel and increase its height to provide clearance for double-stack[8] freight trains to travel through the tunnel. CSXT opened the first of two tracks for double-stack operation in 2016, with completion of both tracks planned for 2017.

VRE 4th Track CP Virginia–CP L'Enfant—VRE has allocated funding under its capital program to construct a 4th track between Control Point (CP) Virginia and CP L'Enfant in Washington, D.C. The track extension, identified in the 2040 System Plan adopted by the VRE Board in 2014, will provide four tracks through the VRE L'Enfant Plaza station and generally separate intercity passenger and commuter traffic from CSXT freight traffic in southwest Washington, D.C.. The CP Virginia–CP L'Enfant section is outside the limits of the DC2RVA Project, but affects the operation of intercity passenger, commuter and freight operations continuing south to Virginia.

Long Bridge Expansion—DDOT and FRA are preparing a separate EIS for the expansion of rail capacity from CP Virginia in Washington, DC across the Potomac River to CP RO in Alexandria, VA through an expansion of the Long Bridge. The existing Long Bridge is a two-track bridge completed in 1903 and owned and operated by CSXT. The Long Bridge is a bottleneck for train traffic capacity between Virginia and Washington, D.C. DDOT is considering alternatives that would add additional capacity to the bridge to accommodate planned growth in intercity passenger, commuter and freight train traffic travelling across the river. As part of the Atlantic Gateway Program, the Commonwealth of Virginia, in cooperation with VRE and the FRA, has begun program development to advance engineering, stakeholder agreements, and outreach in support of the construction of a new bridge. VRE is in the process of identifying funding in its capital program to support the Long Bridge Expansion program.

RF&P Subdivision, Franconia–Featherstone Improvements—DRPT is advancing improvements to the DC2RVA corridor in Northern Virginia between Franconia and Featherstone, south of Woodbridge, VA. The improvements are focused around the Auto Train station in Lorton, VA, where the daily Auto Train service originates and runs non-stop to Sanford, FL. The Auto Train station is located on a spur from the DC2RVA corridor. The improvements will provide improved switches to support faster train movements through Lorton. Construction began in the spring of 2016 and is planned for completion in 2020.

[8] "Double-stack freight trains" are trains in which containers are stacked two high on railroad cars.

Franconia to Occoquan Third Mainline Track Improvements—As part of the Atlantic Gateway Project, DRPT is advancing 8 miles of new third main-line track from the Franconia-Springfield Station south to a location just north of the Occoquan River. The additional third track would connect with the existing third main-line track constructed between Alexandria and Franconia in 2009, to provide approximately 20 miles of continuous three main-line track railroad from Arlington, VA to the Occoquan River. DRPT will prepare a draft Categorical Exclusion (CE) worksheet for FRA review and approval prior to construction of this project. Construction is planned to begin in the spring of 2017 with completion in early 2020.

RF&P Subdivision, Arkendale–Powells Creek Improvements—Construction is underway on approximately 9 miles of third track constructed adjacent to existing tracks in the CSXT right-of-way. Construction encompasses additional track, siding, turnouts, a new platform at Quantico station, and the Bauer Road Bridge near Marine Corps Base Quantico. This capacity project was pursued by DRPT as the first part of SEHSR corridor to begin construction. Construction began in 2014 and is planned for completion in 2020.

Main Line Relocation Project at Acca Yard—Acca Yard, CSXT's major freight yard in the Richmond area, creates freight-passenger rail conflicts for trains traveling south of Richmond's Staples Mill Road station. The activities in the yard require passenger trains to travel at slow speeds and often require passenger and/or freight trains to wait as freight trains clear the active tracks. Construction is underway on a project that will remove all main-line tracks from inside the yard and relocate them to the western edge of the yard and signal them, enabling through passenger and freight trains to bypass yard operations and move through the terminal area more smoothly and at a higher speed. The project will also add a fourth main-line track between Staples Mill Road station and the north throat of Acca Yard, and rebuild interlockings at the south throat of the yard so through trains can pass by at a higher operating speed. This will reduce passenger train delays and reduce trip time through Acca Yard. In exchange for these improvements, CSXT has provided DRPT with the right to operate an additional round trip of Amtrak's Northeast Regional service between Washington, D.C. and Lynchburg, VA, and extend the two Northeast Regional (Virginia) trains currently terminating in Richmond to Norfolk, VA. Construction began in late 2015 and is planned for completion in 2020.

Richmond–Petersburg Segment Improvements for Service Expansion to Norfolk—DRPT restored Amtrak service to Norfolk in 2012 after improvements were made to Norfolk Southern and CSXT tracks south of Petersburg. Additional improvements are to be constructed on the CSXT A-Line between Richmond and Petersburg to support the extension of the two Northeast Regional (Virginia) trains that currently terminate in Richmond to Norfolk for a total of three daily Northeast Regional (Virginia) trains to Norfolk. Construction began in 2015 and is planned for completion in 2018.

VRE Broad Run/Crossroads Yard Expansion—VRE is expanding two rail yards (the Broad Run Yard serves the Manassas Line, the Crossroads Yard serves the Fredericksburg Line) to store additional train sets needed for VRE's planned future service expansion. Each yard will be able to store eight 8-car train sets overnight. Construction began in 2015 and is planned for completion in 2018.

VRE Gainesville/Haymarket Extension—The VRE 2040 System Plan identified a VRE service expansion to serve population and job centers in Gainesville and Haymarket, Prince William County, VA. The 11-mile extension would include three stops along an existing railroad right-of-way. The service would join the Manassas Line west of Manassas station, and would join the DC2RVA corridor at AF interlocking south of Alexandria Station. VRE has identified funding in its current capital plan to

support the planning of service to Gainesville and Haymarket. On March 17, 2017 VRE canceled plans to extend service to Gainesville/Haymarket in favor of expanding and relocating the Broad Run station. The cancellation of this project, however, does not affect the modeling that was conducted for the DC2RVA Project as VRE is still increasing the number of trains on their Manassas Line as anticipated.

VRE Station Platform Expansion Program—Most VRE stations in the DC2RVA corridor consist of a single low-level platform on the east side of the tracks south of Alexandria and on the west side of the tracks between Alexandria and Washington, D.C. At these stations, all VRE trains, regardless of direction, must use the eastern track for boarding and alighting south of Alexandria, then switch to the west side north of Alexandria. This requires all other traffic passing in both directions to utilize the opposite track. Additionally, many VRE stations have platforms that can only accommodate five to six rail cars. As VRE expands to longer train consists (up to ten rail cars), the shorter platforms currently deprive VRE of the ability for simultaneous boarding and alighting passengers of all rail cars, which lengthens station dwell time. In preparation for VRE's planned fleet expansion, and to improve operational flexibility along the DC2RVA corridor, VRE is planning or implementing improvements at the stations listed below. Construction is planned to begin in 2018 with completion by 2021 or earlier.

- VRE L'Enfant Station—VRE will create an island platform serving the two westernmost tracks.
- VRE Crystal City Station—VRE will build a new island platform serving the two westernmost tracks.
- VRE Alexandria Station—VRE will lengthen and widen the existing island platform so that it can also serve Track 1. VRE will also improve the tunnel connecting the island platform to the main station for ADA accessibility.
- VRE Franconia-Springfield Station—VRE will lengthen the existing platforms and widen the east platform.
- VRE Lorton Station—VRE will lengthen the existing eastern platform, and add a side platform on the western side of the right-of-way.
- VRE Woodbridge Station—VRE will lengthen the existing eastern platform.
- VRE Rippon Station—VRE will lengthen the existing eastern platform, and add a side platform on the western side of the right-of-way.
- VRE Quantico Station—VRE is lengthening both existing platforms to accommodate longer trains, and is converting the west side platform into an island platform for operational flexibility.
- VRE Brooke Station—VRE will lengthen the existing eastern platform, and add a side platform on the western side of the right-of-way.
- VRE Leeland Road Station—VRE will lengthen the existing eastern platform, and add a side platform on the western side of the right-of-way.
- VRE Potomac Shores Station—VRE is constructing a new station at Potomac Shores, with two side platforms that accommodate eight car trains.

The track improvements through the VRE stations that are planned as part of the DC2RVA Project will accommodate the additional platforms and modifications outlined in this section.

No Build Infrastructure Improvements: Transit

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 TIGER 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. Construction began in the summer of 2016 and is planned for completion in the fall of 2017.

WMATA Silver Line Phase II—The Washington, D.C. Metro opened 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. The Silver Line will provide important transit connection for area and regional population to access intercity passenger rail. Phase II of the Silver Line is expected to be complete by 2020.

DDOT DC 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., providing a transit connection for area and regional populations to access intercity passenger rail. 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.

Crystal City BRT (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 U.S. Route 1, and consists of significant sections 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. Although Metroway does not directly serve the DC2RVA corridor, it provides important transit connection for area and regional population to access intercity passenger rail.

2.5.1.2 Rail Service Growth in the No Build Alternative

Rail service levels vary along the length of the DC2RVA corridor, and not all passenger service is continuous through the entire DC2RVA corridor (see Figure 2.2-2). The DC2RVA corridor hosts all VRE commuter rail service and Amtrak passenger rail service to points south of Washington, D.C. between CP Virginia in Washington, D.C. and AF interlocking in Alexandria. At AF Interlocking, VRE and Amtrak trains heading toward Manassas, Charlottesville and Lynchburg leave the DC2RVA corridor (presently two to three daily Amtrak round trips and nine weekday VRE round trips, including one non-revenue VRE round trip). The remaining VRE service (currently, eight weekday round trips) continues on the DC2RVA corridor south of Alexandria to Crossroads Yard south of the VRE Spotsylvania station. Approximately 20 to 30 freight trains operate on the DC2RVA corridor between Washington, D.C. and Richmond, along with five daily round-trip Amtrak Northeast Regional (Virginia) intercity passenger trains and five daily round-trip Amtrak long-distance and interstate corridor (Carolina) passenger trains.

Table 2.5-2 summarizes existing service along the DC2RVA corridor and provides the estimated 2025 and 2045 service assumptions for the No Build condition. The table is a summary of all activity on the corridor, excluding local freight trains and yard assignments. Existing service along the DC2VA corridor is an estimated 79 to 89 daily trains (depending on the volume of freight trains). Planned rail infrastructure improvements described in Section 2.5.1.1 above would support the operation of one additional Amtrak Northeast Regional (Virginia) round-trip

passenger train to Lynchburg and two additional VRE commuter train round trips, along with an estimated 2.3 percent annual growth in freight service. Additionally, Amtrak intends to increase the operations of the Cardinal (a long distance passenger train that operates via Charlottesville and Alexandria) through the corridor from three trips per week to one round trip daily. To forecast freight train growth in the corridor from existing (2015) levels, CSXT provided freight volumes for the future years 2025 and 2045 using the U.S. DOT Freight Analysis Framework projected growth rates for rail. CSXT freight growth is independent of the DC2RVA Project and will occur regardless of whether or not the DC2RVA Project is implemented. CSXT actual freight growth may be greater or less than the projected growth rates based on market demands. DRPT estimates that the total number of trains in the No Build condition in 2025 to be between 91 and 103 daily trains, and in the No Build condition in 2045 to be between 106 and 121 daily trains.

Table 2.5-2: Existing and No Build Service along DC2RVA Corridor (Daily 1-Way Trips)

Service Type	Existing Service	2025 No Build	Proposed Change in Service from Existing	2045 No Build	Proposed Change in Service from Existing
Freight	20-30 trains	25-37 trains (est.)	Increase of 5-7 trains	40-55 trains (est.)	Increase of 20-25 trains
Amtrak Long Distance	11 trains (1 train 3x a week)	12 trains	Increase of 1 train	12 trains	Increase of 1 train
Interstate Corridor (NC)	2 trains	2 trains	No change	2 trains	No change
Northeast Regional (VA)	12 trains	14 trains	Increase of 2 trains	14 trains	Increase of 2 trains
VRE	34 trains (including nonrevenue movements)	38 trains	Increase of 4 trains	38 trains	Increase of 4 trains
Total Daily Trains (est.)	79-89 trains	91-103 trains	Increase of 12-14 trains	106-121 trains	Increase of 27-32 trains

Notes:

- VRE train counts in 2015 include nonrevenue movements. Future train counts assume that nonrevenue movements are converted to revenue movements, based on data provided by VRE
- The 2 additional Northeast Regional (VA) trains in 2025 and 2044 operate between Washington and Lynchburg, and use the DC2RVA corridor only between Washington and Alexandria.
- The 4 additional VRE trains in 2025 and 2045 are comprised of 2 additional Fredericksburg Line trains operating on the DC2RVA corridor between Washington and Spotsylvania, and 2 additional Manassas Line trains that operate on the DC2RVA corridor only between Washington and Alexandria.

Intercity Rail Service Growth Outside the DC2RVA Corridor in the No Build Alternative

Intercity service levels outside the physical boundaries of the DC2RVA corridor are relevant to travel demand estimates within the DC2RVA corridor because mobility improvements that are created by potential transportation improvements would affect total travel both within and outside the DC2RVA corridor. The No Build Alternative includes two additional round-trip intercity passenger trains within North Carolina between Raleigh and Charlotte that will be introduced as a result of the state's Piedmont Improvement Program. The No Build Alternative also incorporates Amtrak's plans for future Northeast Corridor service, including planned changes to Northeast Regional services north of Washington, D.C., as additional NEC infrastructure and additional high-speed-train services are introduced.

2.5.2 Build Alternatives

From a wide range of options that were considered during the alternatives development process, twenty-one Build Alternatives, which vary in each of the six alternative areas, were carried forward for evaluation; these Build Alternatives are summarized in Table 2.5-3. All alternatives include build-alternative-specific improvements to features such as stations and crossings.

Detailed descriptions of the Build Alternatives within each area are provided in the subsequent sections. Within the descriptions, east side or west side is relative to the existing north-south CSXT track alignment.

Table 2.5-3: Summary of Build Alternatives Carried Forward

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	2A	Add One Track/Improve Existing Track
Area 3: Fredericksburg (Dahlgren Spur to Crossroads)	3A	Maintain Two Tracks Through Town
	3B	Add One Track Through Town 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 Through Town East of Existing
	5B–Ashcake	Add One Track Through Town 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

In addition, DRPT evaluated several stations in the Tier II EIS for potential rail service changes, including stations at Alexandria, Woodbridge, Quantico, Fredericksburg, Ashland, Ashcake Road, Staples Mill Road, Boulevard, Broad Street, and Main Street. A summary of station locations is provided in Table 2.5-4.

Table 2.5-4: Summary of Stations DRPT Recommends for Evaluation in the Tier II EIS

Alternative Area	Station	Location	Current Passenger Rail Service	Potential Rail Service Changes			
				No Service, Close Station[1]	Shift Long Distance Service[2]	Add Interstate Corridor Service (SEHSR)	Add Northeast Regional Service (SEHSR)
Area 2: Northern Virginia	Alexandria	City of Alexandria	Long Distance (all) Interstate Corridor (Carolinian) Northeast Regional (Virginia)			✓	✓
	Woodbridge	Woodbridge (Prince William County)	Northeast Regional (Virginia)				✓
	Quantico	Town of Quantico (Prince William County)	Northeast Regional (Virginia)				✓
Area 3: Fredericksburg (Dahlgren Spur to Crossroads)	Fredericksburg	City of Fredericksburg	Long Distance (Silver Meteor) Interstate Corridor (Carolinian) Northeast Regional (Virginia)			✓	✓
Area 5: Ashland (Doswell to I-295)	Ashland	Town of Ashland (Hanover County)	Northeast Regional (Virginia)	✓			✓
	Ashcake Road	Town of Ashland (Hanover County)	None, possible new station replacing Ashland station				✓

▶ Continued.

Table 2.5-4: Summary of Stations DRPT Recommends for Evaluation in the Tier II EIS

Alternative Area	Station	Location	Current Passenger Rail Service	Potential Rail Service Changes			
				No Service, Close Station[1]	Shift Long Distance Service[2]	Add Interstate Corridor Service (SEHSR)	Add Northeast Regional Service (SEHSR)
Area 6: Richmond (I-295 to Centralia)	Staples Mill Road	Henrico County	Long Distance (all) Interstate Corridor Northeast Regional (Virginia)	✓		✓	✓
	Boulevard	City of Richmond	None, possible new station replacing both Staples Mill and Main Street stations		✓	✓	✓
	Broad Street	City of Richmond	None, possible new station replacing both Staples Mill and Main Street stations		✓	✓	✓
	Main Street	City of Richmond	Northeast Regional (Virginia)	✓	✓	✓	✓

Notes:

1. In some station/service options, a current station may be closed (e.g., Ashland, Staples Mill Road, Main Street Station) or a new station not created (Boulevard, Broad Street).

2. The DC2RVA Project does not include any new trains providing long distance passenger service. However, some station/service options in the Richmond area include potentially shifting existing long distance service from Staples Mill Road station to other Richmond station options.

2.5.2.1 Area 1: Arlington (Long Bridge Approach) Build Alternatives

The Arlington area (CFP 110 to CFP 109.3) includes the area at the southern approach of Long Bridge, which crosses the Potomac River between Washington, D.C. and Virginia. Two tracks currently exist in this roughly one-mile-long section before crossing Long Bridge, located north of the DC2RVA corridor. DDOT, in coordination with FRA, DRPT, CSXT, and VRE, is completing a separate study for the rehabilitation or replacement of the Long Bridge over the Potomac River. The previous feasibility study for the bridge recommended expanding the crossing to accommodate two additional tracks. DRPT, as part of the DC2RVA Project, is evaluating three rail alignment options to the southern approach of Long Bridge, which will become the connection between the Long Bridge Study alternative and the DC2RVA corridor. Each DC2RVA option includes two additional tracks that provide flexibility to physically align with the Long Bridge alternatives. The improvements for the Arlington area Build Alternatives are described in Table 2.5-5 and Figure 2.5-1. Detailed graphics illustrating the specific improvements are in Appendix C.

Table 2.5-5: Area 1: Arlington (Long Bridge Approach) Build Alternatives

Build Alternative	Proposed Improvements
1A: Add Two Tracks on the East. The east alignment would add two additional tracks east of the existing tracks between CFP 110.0 to 109.3, within existing right-of-way.	Track ▪ Add two tracks south of George Washington Memorial Parkway (CFP 110.05) for approximately 1,300 feet. ▪ Shift all tracks to the east to increase speeds through the curve at CFP 109.8 to 109.4. ▪ Install additional 36- to 48-inch culverts, as required for drainage, under the rail line along the alignment. ▪ Install stormwater management facilities, as required. ▪ Install additional signal and communication facilities, as required. No station or structure modifications.
1B: Add Two Tracks on the West. The west alignment would add two additional tracks west of the existing tracks between CFP 110.0 to 109.3, within existing right-of-way.	Track ▪ Add two tracks to the west side south of George Washington Memorial Parkway (CFP 110.05) for approximately 1,100 feet. ▪ Shift tracks to the east to increase speeds through the curve at CFP 109.8 to 109.4. ▪ Install additional 36- to 48-inch culverts, as required for drainage, under the rail line along the alignment. ▪ Install stormwater management facilities, as required. ▪ Install additional signal and communication facilities, as required. No station or structure modifications.
1C: Add One Track East and One Track West. The east and west alignment would add one additional track to the east and one to the west of the existing tracks between CFP 110.0 to 109.37, within existing right-of-way.	Track ▪ Add one track to the east side and one track to the west side south of George Washington Memorial Parkway (CFP 110.05) for approximately 1,300 and 1,100 feet, respectively. ▪ Shift tracks to the east to increase speeds through the curve at CFP 109.8 to 109.4. ▪ Install additional 36- to 48-inch culverts, as required for drainage, under the rail line along the alignment. ▪ Install stormwater management facilities, as required. ▪ Install additional signal and communication facilities, as required. No station or structure modifications.

Long Bridge Over the Potomac River

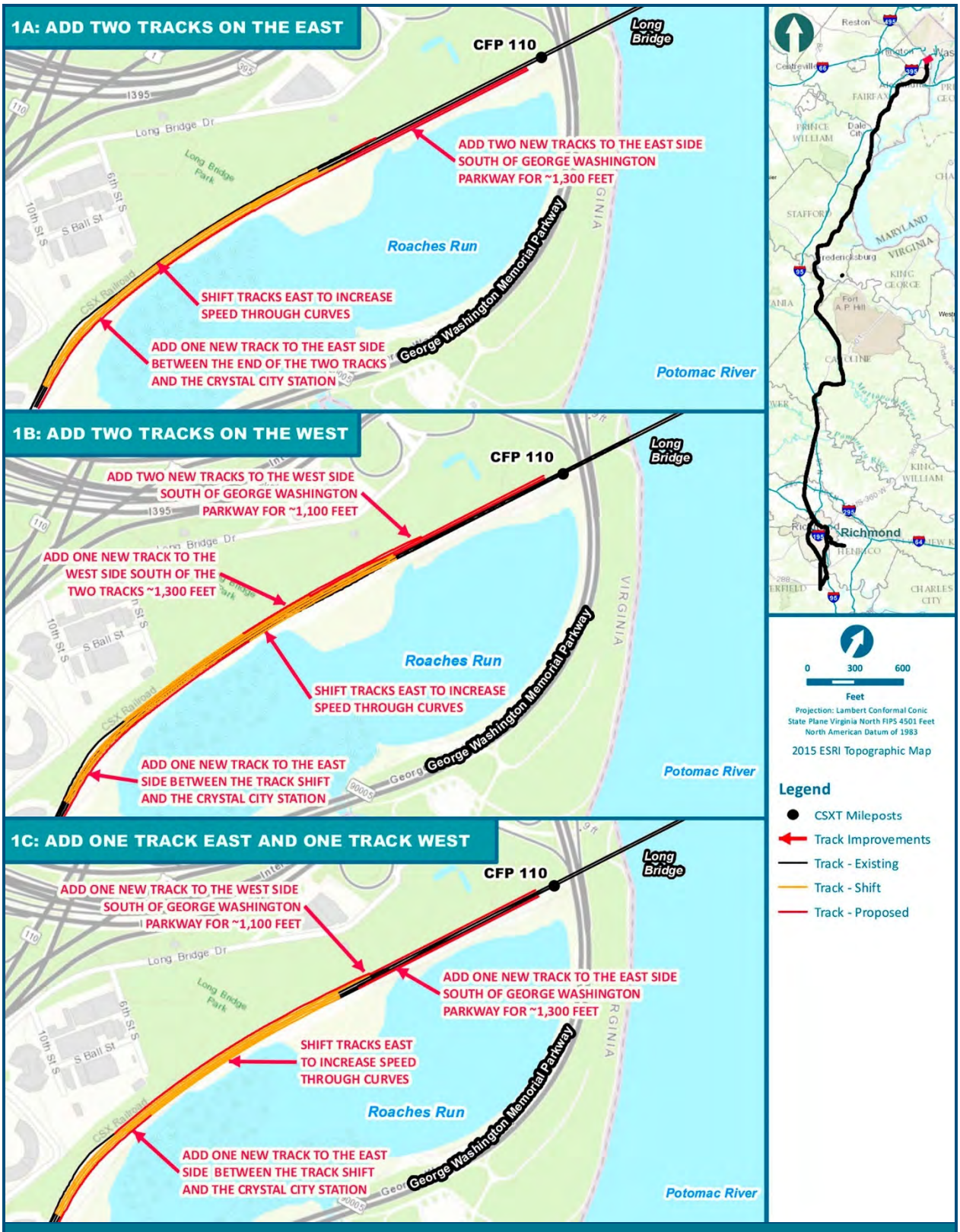


Figure 2.5-1: Build Alternatives 1A, 1B, 1C

2.5.2.2 Area 2: Northern Virginia Build Alternative

The Northern Virginia Alternative Area (CFP 109.3 to CFP 62) extends from the Crystal City station in Arlington County to Harrell Road (Route 623) north of the Dahlgren Spur near Fredericksburg (Figure 2.5-2). There is one Build Alternative in the Northern Virginia Alternative Area (Alternative 2A: Add One Track/Improve Existing Track), which is composed of sections of additional track and no additional track to provide a corridor with at least three main tracks. The build improvements to the Alexandria Station and Woodbridge Station, which are located within Area 2, are shown in Figures 2.5-3 and Figure 2.5-4, respectively.

Table 2.5-6 describes the general improvements to Build Alternative 2A. Segment-specific track, station, and structure improvements associated with Build Alternative 2A are described by segment and milepost in Table 2.5-7. Detailed graphics illustrating the specific improvements are in Appendix D. Service improvements are described in Section 2.2.2.

Table 2.5-6: Build Alternative 2A (Northern Virginia) — General Improvements

Build Alternative	Proposed Improvements
2A: Add One Track/Improve Existing Track ***Rail Alignment: Figure 2.5-2 Stations: Figure 2.5-3 and Figure 2.5-4.*** This alternative would add one additional main line track and realigns existing tracks in some curves to improve speed. The additional track would result in a fourth track from Crystal City to Alexandria, and a third track from Alexandria to Spotsylvania. The additional track would be located on either the east or west side of the existing tracks, based on rail operation considerations, site constraints, and potential impacts. Rail improvements are generally within existing right-of-way.	Track Improvements Common to all Segments in the Northern Virginia Area. Site-specific and station improvements are described in Table 2.5-7. ▪ Add one main line track and realign existing tracks in some curves to improve speed in the Northern Virginia area. ▪ Extend the existing culverts along the alignment to accommodate the new third main line track. ▪ Install 36- to 48-inch culverts, as required for drainage, under the rail line along the alignment. ▪ Install stormwater management facilities. ▪ Install signal and communication facilities. Five segments within the Northern Virginia area do not require an additional main track because either the required capacity has been added or an additional main track is under construction through an independent action. Improvements in these five segments would be limited to re-aligning existing track through the curves to improve speed. These five segments are (Figure D, Appendix D): ▪ Alexandria to Franconia (AFFR) currently has three tracks from the AF interlocking at CFP 104.5 south to CFP 98 just north of the Franconia-Springfield VRE station. ▪ Franconia to Occoquan is currently two tracks but is being designed for three tracks as part of a separate project. ▪ Powells Creek to Arkendale (PCAR) is currently under construction to add a third track. The third track construction at PCAR includes adding a track to match existing speed. Track realignment recommended to improve speed in this segment of the DC2RVA Project would require widening the roadbed in selected areas to allow for the realignment. Station improvements are included for Alexandria Station and Woodbridge Station.

Table 2.5-7: Build Alternative 2A (Northern Virginia) — Specific Infrastructure Improvements

Segment and Milepost (MP)	Figure	Proposed Improvements
Arlington to Alexandria (ROAF) CFP 109.3-103.7	Appendix D Figure D-1	Track ▪ Add one track to the east side between the Crystal City VRE Station (CFP 108.60) and Norfolk Southern rail yard (CFP 103.9). ▪ Shift tracks to the east to increase speeds through the curves at CFP 109.1 to 109.05, 109.0 to 108.9, 108.55 to 108.5, 108.3 to 108.25, 107.7 to 107.5, and 106.9 to 106.5. ▪ Shift tracks to the west to increase speeds through the curves at CFP 109.05 to 109.0, 108.9 to 108.8, 108.6 to 108.55, 108.5 to 108.3, 108.25 to 108.2, 107.8 to 107.7, 107.5 to 107.4, and 105.4 to 105.3. ▪ Shift western two tracks east and eastern track west CFP 109.1 to 108.8 to increase speeds through the curve. Stations ▪ Crystal City VRE Station (CFP 108.60) – align tracks to accommodate VRE platform updates. ▪ Alexandria Amtrak/VRE Station (CFP 105.30) – additional surface parking to accommodate approximately 150 parking spaces adjacent to the existing station building. Structures ▪ Add one track on the east side of the existing bridge over Four Mile Run Creek (CFP 107.86).
Alexandria to Franconia (AFFR) CFP 103.7-99.0	Appendix D Figure D-1	Track ▪ Shift tracks west to increase speed through the curves at CFP 103.7 to 103.4 and 103.2 to 102.7. ▪ Shift tracks east to increase speed through the curves at CFP 102.6 to 101.8 and 100.5 to 99.7. No stations occur in this segment. No structures modifications.
Lorton to Powells Creek (LOPC) CFP 92.6-83.4	Appendix D Figure D-2	Track ▪ Add one track to the east side between Furnace Road (CFP 90.0) and Rippon VRE Station (CFP 85.30). ▪ Add one track to the west side south of Rippon VRE Station (CFP 85.30) to Powells Creek (CFP 83.70). ▪ Modify at-grade crossing at Featherstone Road (CFP 86.85). ▪ Shift tracks east to increase speed through the curves at CFP 89.6 to 89.3. ▪ Shift tracks west to increase speed through the curves and transition additional track from east to west at CFP 85.6 to 85.5. ▪ Shift tracks east to increase speed through the curves and transition additional track from east to west at CFP 85.5 to 85.4. ▪ Shift tracks west to increase speed through the curves at CFP 84.5 to 83.9. ▪ Shift tracks east to increase speed through the curves and transition additional track from west to east at CFP 83.6 to 83.4. Stations ▪ Woodbridge Amtrak/VRE Station (CFP 89.10) – lengthen and widen east platform to become the center platform, and extend the pedestrian bridge to accommodate the additional track and provide vertical access to the pedestrian bridge. ▪ Rippon VRE Station (CFP 85.30) – align track to accommodate platform and extend the pedestrian bridge to accommodate the additional track and provide access to the east platform.

▶ *Continued.*

Table 2.5-7: Build Alternative 2A (Northern Virginia) — Specific Infrastructure Improvements

Segment and Milepost (MP)	Figure	Proposed Improvements
		Structures ▪ Add crash wall to accommodate the third track at the Pedestrian Bridge to Veterans Memorial Park (CFP 87.8). ▪ Construct new single-track rail bridges on the east side of the existing structures over Farm Creek (CFP 86.6) and Unnamed Creek (CFP 86.1). ▪ Plan for construction of a new two-track rail bridge (includes construction of one track on bridge plus space for a second track) on the west side of the existing bridges over Neabsco Creek (CFP 84.8) and Powells Creek (CFP 83.70). ▪ Construct a new single-track rail bridge over Furnace Road (CFP 90.0). ▪ Replace the Dawson Beach Road bridge (CFP 88.80) over the tracks to accommodate the additional third track.
Powells Creek to Arkendale (PCAR) CFP 83.4-72.9	Appendix D Figure D-2 and D-3	Track ▪ Add one track to the east side from near Powell's Creek (CFP 83.50) to Potomac Shores Station (CFP 82.95). ▪ Shift tracks west to increase speed through the curves and transition additional track from west to east at CFP 83.4 to 83.1. No station or structure modifications.
Arkendale to Dahlgren Junction (ARDJ) CFP 72.9-62.0	Appendix D Figure D-3	Track ▪ Add one track to the east side between Brent Point Road (CFP 72.34) and north of Courthouse Road (CFP 69.09), and between Claiborne Run (CFP 62.60) and White Oak Road (CFP 60.81). ▪ Add one track to the west side between Courthouse Road (CFP 69.09) and Andrew Chapel Road (CFP 68.01), between Mt Hope Church Road (CFP 67.57) and Claiborne Run (CFP 62.60), and between Potomac Creek (CFP 65.65) and Leeland Road Station (CFP 63.47). ▪ Add one track to the east side past the Brooke Station (CFP 67.91). ▪ Modify the at-grade crossing at Brent Point Road (CFP 72.34) to accommodate the additional third track. ▪ Shift tracks west to increase speed through the curves at CFP 72.9 to 72.8, 65.0 to 64.4, and 63.3 to 62.4. ▪ Shift tracks east to increase speed through the curves at CFP 70.6 to 70.0 and 67.1 to 66.7. ▪ Shift tracks west to increase speed through the curves and transition additional track from east to west at CFP 69.7 to 69.4. ▪ Shift tracks east to increase speed through the curves and transition additional track from east to west to access platform at CFP 67.9 to 67.4. ▪ Shift tracks west to increase speed through the curves and transition additional track from west to east at CFP 68.5 to 68.1, 68.1 to 68.0, and 66.0 to 65.7. Stations ▪ Brooke VRE Station (CFP 67.91) – align track to accommodate platforms. ▪ Leeland VRE Station (CFP 63.47) – align track to accommodate platforms. Structures ▪ Plan for construction of a new two-track rail bridge (includes construction of one track on bridge plus space for a second track) on the east side of the existing structure over Aquia Creek (CFP 70.9), Potomac Creek (CFP 65.3), and Claiborne Run (CFP 62.5). ▪ Replace Eskimo Hill Road (CFP 66.77), Leeland Road (CFP 63.47), and Primmer House Road (CFP 63.02) over the tracks to accommodate the additional third track. ▪ Construct a new single-track rail bridge over Andrew Chapel Road (CFP 68.01). ▪ Close Mt. Hope Church Road (CFP 67.57) and provide alternative route.

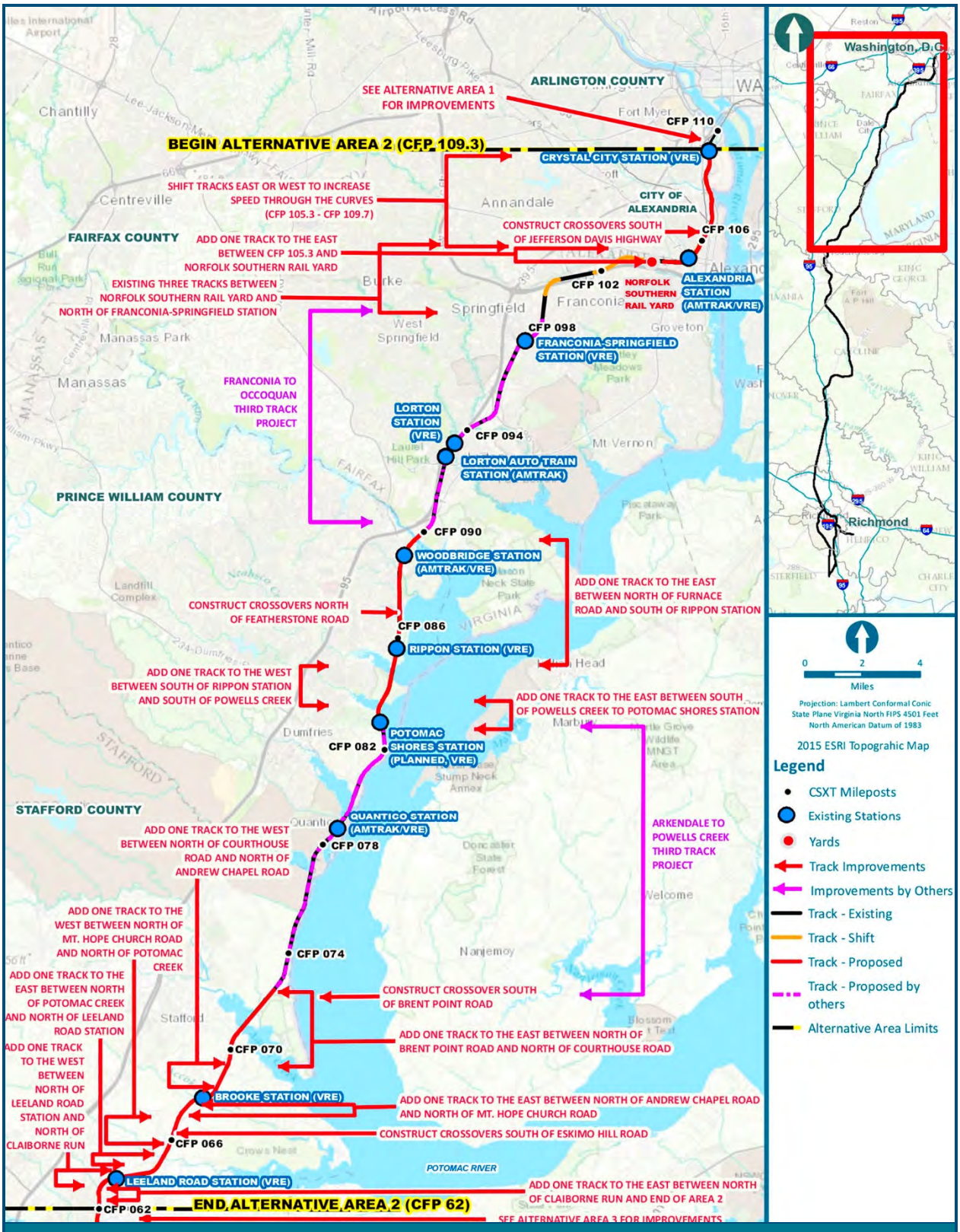


Figure 2.5-2: Build Alternative 2A–Add One Track / Improve Existing Track

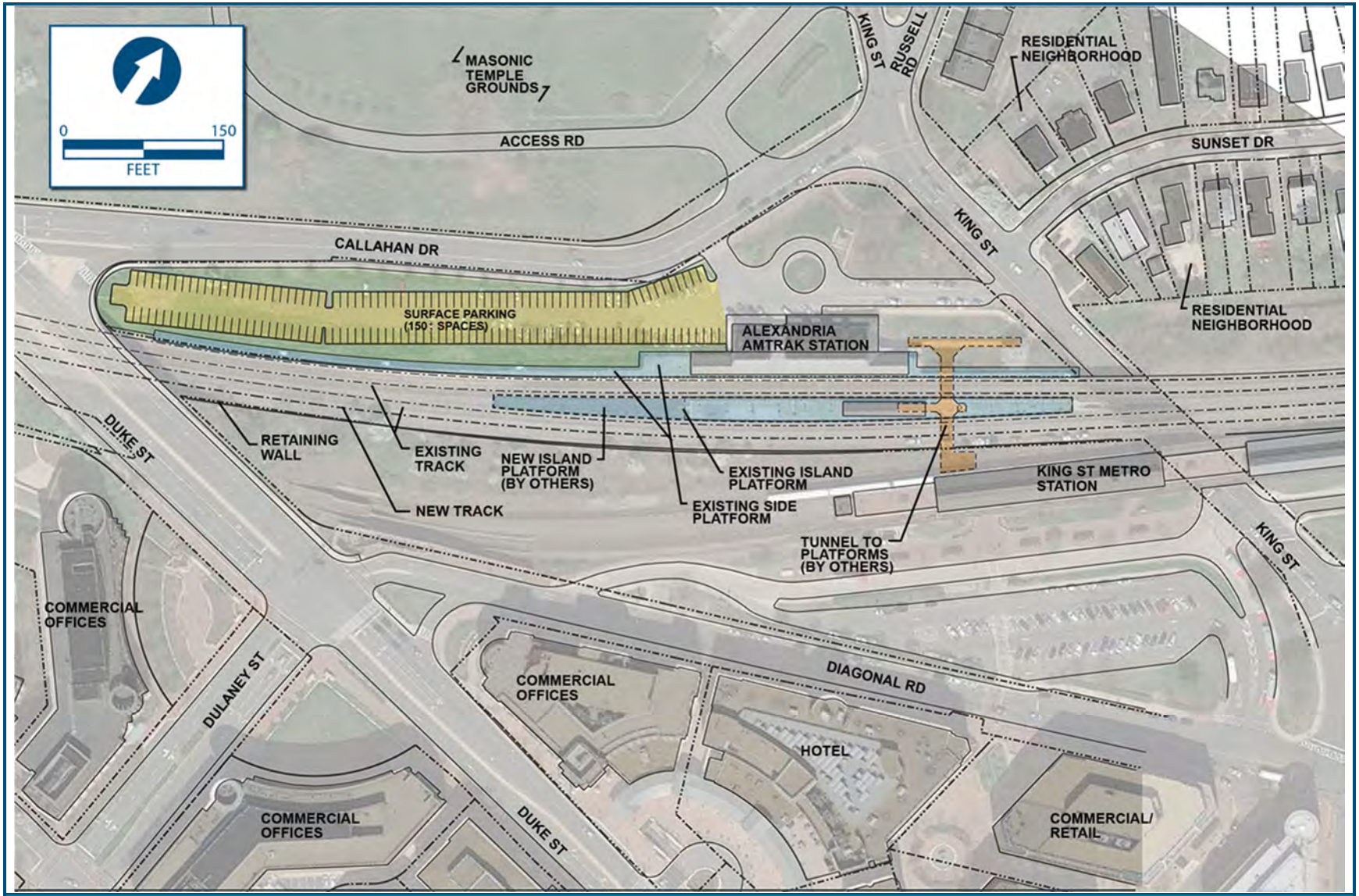


Figure 2.5-3: Alexandria Station Improvements for Build Alternative 2A

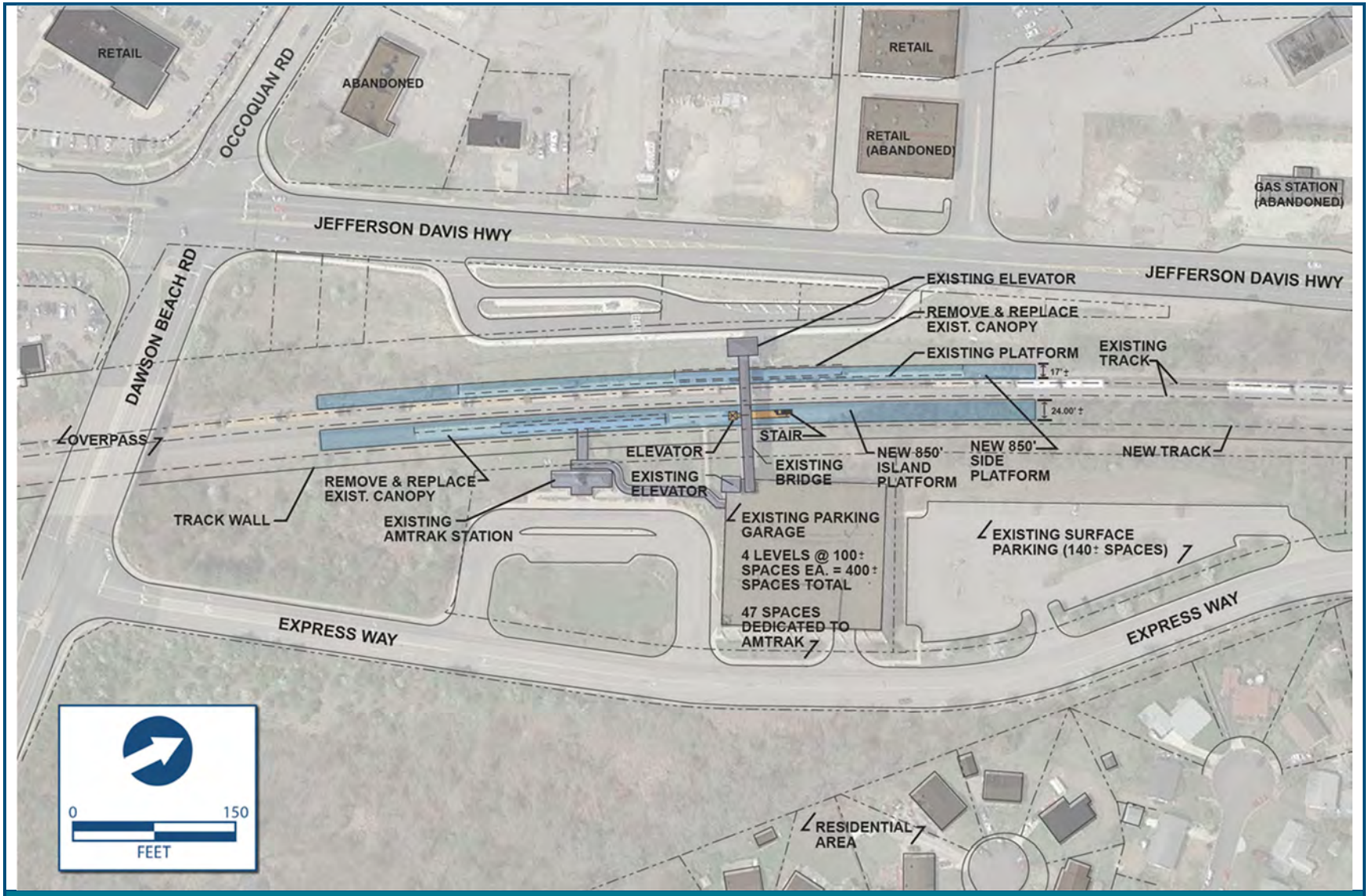


Figure 2.5-4: Woodbridge Station Improvements for Build Alternative 2A

2.5.2.3 Area 3: Fredericksburg (Dahlgren Spur to Crossroads) Build Alternatives

The Fredericksburg area (CFP 62 to CFP 48) extends from Harrell Road (Route 623) north of the Dahlgren Spur through the town of Fredericksburg to Claiborne Crossing Road (Route 660). The Fredericksburg area consists of a segment of two main tracks on an elevated structure in a relatively narrow CSXT right-of-way through a historic urban area. DRPT evaluated several alternatives to provide the required rail capacity in this area, including the evaluation of a possible bypass. These options are summarized in Table 2.5-8. Build Alternative 3A, 3B, and 3C are shown in Figure 2.5-5, Figure 2.5-6, and Figure 2.5-9, respectively. The Fredericksburg Station improvements associated with the Build Alternatives 3A and 3C, which are identical, are shown in Figure 2.5-7; the Fredericksburg Station improvements associated with Build Alternative 3B are shown in Figure 2.5-8. Detailed graphics illustrating the specific improvements are in Appendix E.

Table 2.5-8: Area 3: Fredericksburg Build Alternatives

Build Alternative	Proposed Improvements
3A: Maintain Two Tracks Through Town ***Rail Alignment: Figure 2.5-5*** ***Station: Figure 2.5-7*** This alternative would maintain the existing two tracks (i.e., no construction of new track) through Fredericksburg, which is used by freight, commuter, and passenger trains similar to current conditions. One new track would be constructed north and south of the city, and there are some shifts of existing tracks to improve speed throughout the area. Rail improvements are generally within existing right-of-way.	Track ▪ Construct turnout to tie-in new third track at Dahlgren Junction (CFP 61.1). ▪ Shift tracks west to increase speed through the curves at CFP 60.4 to 59.6. ▪ Shift tracks east to increase speed through the curves at CFP 61.7 to 61.3, 59.4 to 58.9, 58.7 to 58.5, 57.9 to 57.6, and 56.8 to 56.5. ▪ Construct crossovers at Hamilton (CFP 55.7). ▪ Add one track on the east side between VRE Spotsylvania Station (CFP 53.3) to the VRE Crossroad Layover Yard (CFP 52.5). ▪ Add one track on west side between north of Summit Crossing Road (CFP 52.5) to north of Stonewall Jackson Road (CFP 48). ▪ Add three tracks on west side and removal of existing tracks between CFP 51.3 to 51.1. ▪ Add one track on west side between MP 51.1 and 50.8. Add one track on west side between CFP 50.3 to south of Stonewall Jackson Road. ▪ Add one track to the east side between Claiborne Run (CFP 62.60) and White Oak Road (CFP 60.81). ▪ Modify the at-grade crossing at Summit Crossing Road (Route 668) (CFP 51.41) and Claiborne Crossing Road (Route 660) (CFP 48.63) to accommodate the additional third track. ▪ Shift tracks to the east and reconstruct a portion of the track to increase speeds through the curves at CFP 50.6, 49.6, and 48.8. Stations ▪ Fredericksburg Amtrak/VRE Station (CFP 59.38) - Lengthen and widen east and west side platforms to 850 feet. - Construct new station building (approximately 6,800 square feet) west of the existing tracks at the intersection of Caroline Street and Lafayette Boulevard. - Construct a new vertical access between the station building, platforms and parking structure. - Construct a three-level parking garage for approximately 225 parking spaces and modify the existing surface parking to accommodate approximately 20 parking spaces. The new parking garage and surface parking would be located east of the tracks opposite the new station where the current surface parking lot is located. Approximately nine ADA parking spaces would be installed adjacent to the new station building. Structures ▪ Construct a new single-track rail bridge over Harrell Road (CFP 61.8) and Naomi Road (CFP 60.0).

▶ Continued.

Table 2.5-8: Area 3: Fredericksburg Build Alternatives

Build Alternative	Proposed Improvements
3B: Add One Track East of Existing ***Rail Alignment: Figure 2.5-6*** ***Station: Figure 2.5-8*** This alternative would add one additional main line track in most areas and realigns existing tracks to improve speed. Through the city, the additional track would be constructed east of the existing two tracks. No improvements would be required between Fredericksburg and Spotsylvania Stations, where a third track already exists. Rail improvements are generally within existing right-of-way.	Track ▪ Add one track to east side between White Oak Road (CFP 60.81) and south of Charles Street (CFP 59.28). ▪ Shift tracks west to increase speed through the curves at CFP 60.4 to 59.6 and 59.4 to 58.9. ▪ Shift tracks east to increase speed through the curves at CFP 58.7 to 58.5. ▪ Shift tracks east to increase speed through the curves at CFP 61.7 to 61.3, 57.9 to 57.6 and 56.8 to 56.5. ▪ Add one track on the east side between VRE Spotsylvania Station (CFP 53.3) to the VRE Crossroad Layover Yard (CFP 52.5). ▪ Add one track on west side between north of Summit Crossing Road (CFP 52.5) to north of Stonewall Jackson Road (CFP 48). ▪ Add three tracks on west side and removal of existing tracks between CFP 51.3 to 51.1. ▪ Add one track on west side between CFP 51.1 and 50.8. Add one track on west side between CFP 50.3 to south of Stonewall Jackson Road. ▪ Modify the at-grade crossing at Summit Crossing Road (Route 668) (CFP 51.41) and Claiborne Crossing Road (Route 660) (CFP 48.63) to accommodate the additional third track. ▪ Shift tracks to the east and reconstruct a portion of the track to increase speeds through the curves at CFP 50.6, 49.6, and 48.8. ▪ Add one track to the east side between Claiborne Run (CFP 62.60) and White Oak Road (CFP 60.81). ▪ Install 36- to 48-inch culverts, as required for drainage, under the rail line along the alignment. ▪ Install stormwater management facilities. ▪ Install signal and communication facilities. Two segments within the Fredericksburg area do not require an additional main track because the segments already have a comparable number of main tracks. Improvements in these two segments would be limited to re-aligning existing track through the curves to improve speed. These two segments are (Figure E-1, Appendix E): ▪ Fredericksburg to Hamilton (FBHA) currently has three main line tracks from CFP 58.5 to CFP 56. ▪ Hamilton to Crossroads (HAXR) currently has three main line tracks along with the new VRE Spotsylvania Station (CFP 53.3). Stations ▪ Fredericksburg Amtrak/VRE Station (CFP 59.38) - Lengthen and widen east platform to become a center platform. Length and widen the west platform. Both platforms would be lengthened to 850 feet. - Construct new station building (approximately 6,800 square feet) west of the existing tracks at the intersection of Caroline Street and Lafayette Boulevard. - Construct a new vertical access between the station building, platforms and parking structure. - Relocate existing elevator on east platform to accommodate the new third track. - Construct a three level parking garage for approximately 225 parking spaces and modify the existing surface parking to accommodate approximately 20 parking spaces. The new parking garage and surface parking would be located east of the tracks opposite the new station where the current surface parking lot is located. Approximately nine ADA parking spaces would be installed adjacent to the new station building.

▶ Continued.

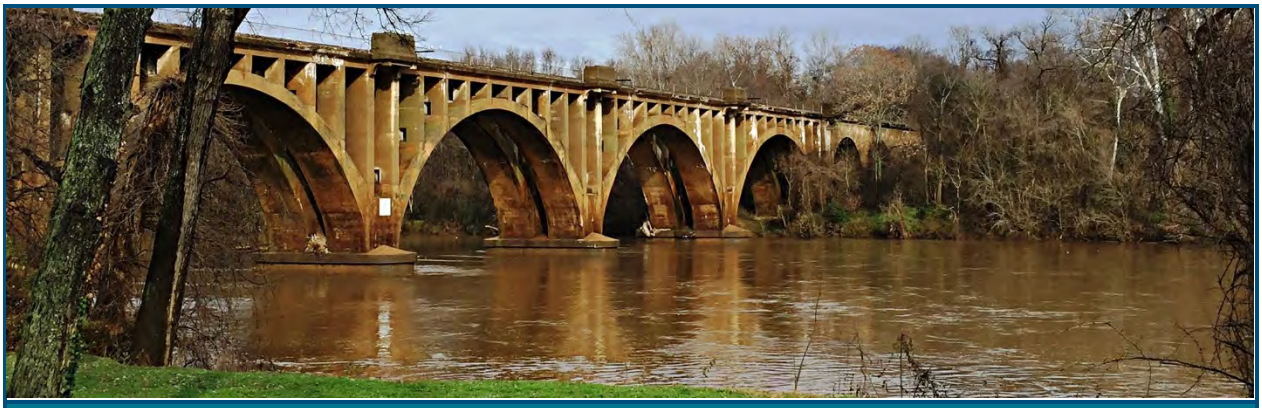
Table 2.5-8: Area 3: Fredericksburg Build Alternatives

Build Alternative	Proposed Improvements
	Structures ▪ Construct a new single-track rail bridge on the east side of the existing structure over the Rappahannock River (CFP 59.45). ▪ Construct a new single-track rail bridge on the east side of the existing structure over Claiborne Run (CFP 62.5). ▪ Replace the Butler/White Oak Road (CFP 60.81) and Kings Highway (CFP 60.04) bridges over the tracks. ▪ Construct a new single-track rail bridge at Harrell Road (CFP 61.8), Naomi Road (CFP 60.0), Sophia Street (CFP 59.40), Caroline Street (CFP 59.39), Princess Anne Street (CFP 59.35), and Charles Street (CFP 59.28).
3C: Add Two-Track Bypass East ***Rail Alignment: Figure 2.5-9*** ***Station: Figure 2.5-7*** The existing two-track corridor and station in downtown Fredericksburg would continue to serve both regional passenger and commuter rail. An 11.8-mile, two-track bypass would be constructed east of the city and would serve both freight rail and possibly long distance passenger rail trains. One new track would be added north and south of the bypass, with some track shifts to improve speed.	Track ▪ Add one track to south side between CFP Dahlgren spur junction (CFP 61.1) with CSXT main line and CFQ 4.8 and between CFQ 6.0 to 6.6 where it connects to the proposed bypass. ▪ Relocate track to northeast to increase speed from CFQ 4.8 to 6.0. ▪ Add Wye connection to existing track to the east at CFQ 6.6. ▪ Shift tracks east to increase speed through the curves at CFQ 61.7 to 61.3, 0.2 to 0.6 and CFQ 4.1 to 4.5. ▪ Shift tracks west to increase speed through the curve at CFQ 0.6 to 1.4. ▪ Add 7.1 mile two-track bypass from Dahlgren Spur 6.6 miles east of Dahlgren Junction (CFP 61.1) to CSXT main line north of Summit Crossing Road (CFP 51.41). ▪ Add wye connection to CFP 52.0 to CSXT mainline. ▪ Add one track on west side between north of Summit Crossing Road (CFP 52.5) to north of Stonewall Jackson Road (CFP 48.0). ▪ Add one track to the east side between CFP 51.53 to CFP 48 including new crossovers to accommodate the Fredericksburg bypass track and tie into existing CSXT mainline. ▪ Add four tracks on west side and removal of existing tracks between CFP 51.3 to 51.1. ▪ Add one track on west side between CFP 51.1 and 50.8. Add one track on west side between CFP 50.3 to south of Stonewall Jackson Road. ▪ Modify the at-grade crossing at Summit Crossing Road (Route 668) (CFP 51.41) and Claiborne Crossing Road (Route 660) (CFP 48.63) to accommodate the additional third track and Fredericksburg bypass tie in track. ▪ Shift tracks to the east and reconstruct a portion of the track to increase speeds through the curves at CFP 50.6, 49.6, and 48.8. ▪ Add one track to the east side between Claiborne Run (CFP 62.60) and White Oak Road (CFP 60.81). ▪ Install 36- to 48-inch culverts, as required for drainage, under the rail line along the alignment. ▪ Install stormwater management facilities. ▪ Install signal and communication facilities. Stations ▪ Fredericksburg Amtrak/VRE Station (CFP 59.38) - Lengthen and widen east and west side platforms to 850 feet. - Construct new station building (approximately 6,800 square feet) west of the existing tracks at the intersection of Caroline Street and Lafayette Boulevard. - Construct a new vertical access between the station building, platforms and parking structure. - Construct a three-level parking garage for approximately 225 parking spaces and modify the existing surface parking to accommodate approximately 20 parking spaces. The new parking garage and surface parking would be located east of the tracks opposite the new station where the current surface parking lot is located. Approximately nine ADA parking spaces would be installed adjacent to the new station building.

▶ Continued.

Table 2.5-8: Area 3: Fredericksburg Build Alternatives

Build Alternative	Proposed Improvements
	Structures ▪ Construct a new single-track rail bridge at Harrell Road (CFP 61.8). ▪ Replace the Cool Springs Road bridge (CFQ 0.0) over the tracks. ▪ Modify the at-grade crossings at Debruen Lane (CFQ 0.4), Hot Top Road (CFQ1.1), Ferry Road (CFQ 1.6), Federal Drive (CFQ 2.9), Cleek Lane (CFQ 3.36), Private Driveways (2) (CFQ 3.7), Little Falls Road (CFQ 3.8), Forest Lane Road (CFQ 4.7) to accommodate the additional second track. ▪ Construct new two-track rail bridge (includes construction of two tracks on bridge) over Rappahannock River (FBP 1.58). ▪ Roads along the existing Dahlgren Spur cross the proposed tracks at-grade and the roads crossing the tracks in the new greenfield section would be grade-separated. ▪ Close private driveway east of Federal Drive (CFQ 2.9). ▪ Close Patriot Lane (FBP 6.3) at the wye connection. ▪ Construct a new two-track rail bridge over Mills Drive/Tidewater Trail (FBP 1.95), and Unnamed Pond (FBP 3.72). ▪ Construct new bridge over tracks at Kings Highway (FBP 0.8), Fredericksburg Turnpike (FBP 4.75), and Thornton Rolling Road (FBP 5.70).



Rappahannock River Bridge

Original Fredericksburg Railroad Station

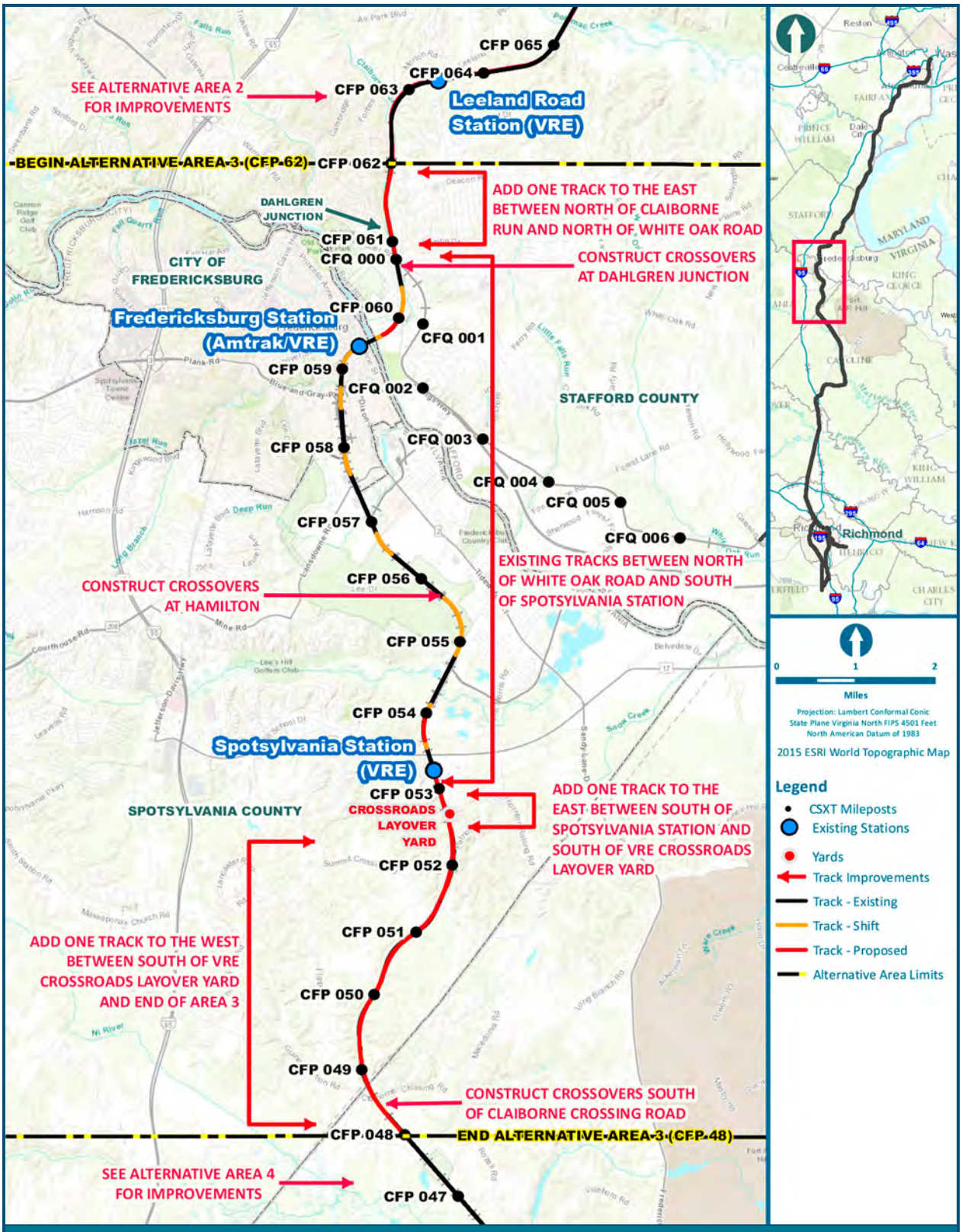


Figure 2.5-5: Build Alternative 3A – Maintain Two Tracks Through Town

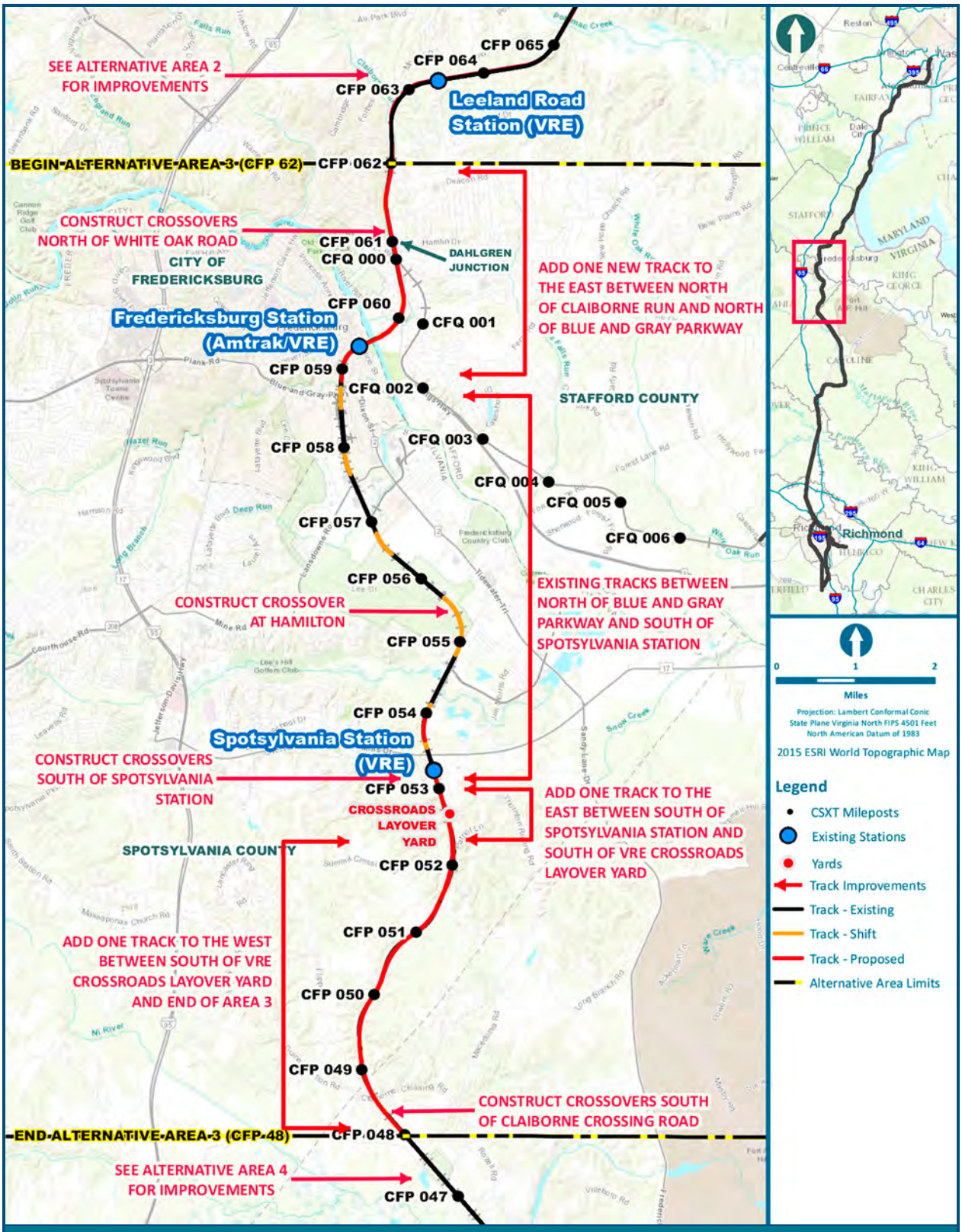


Figure 2.5-6: Build Alternative 3B – Add One Track Through Town East of Existing

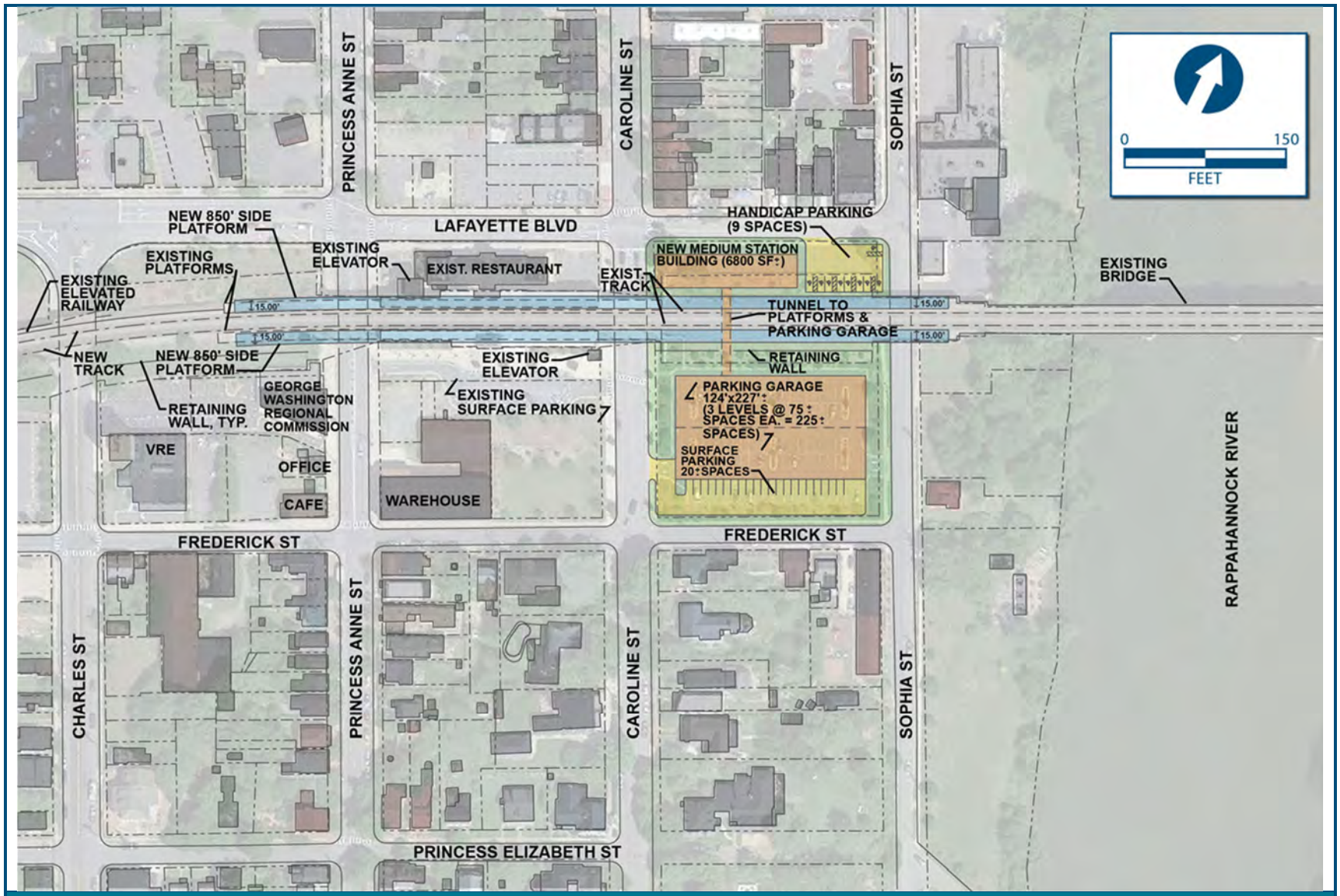


Figure 2.5-7: Fredericksburg Station Improvements for Build Alternatives 3A and 3C

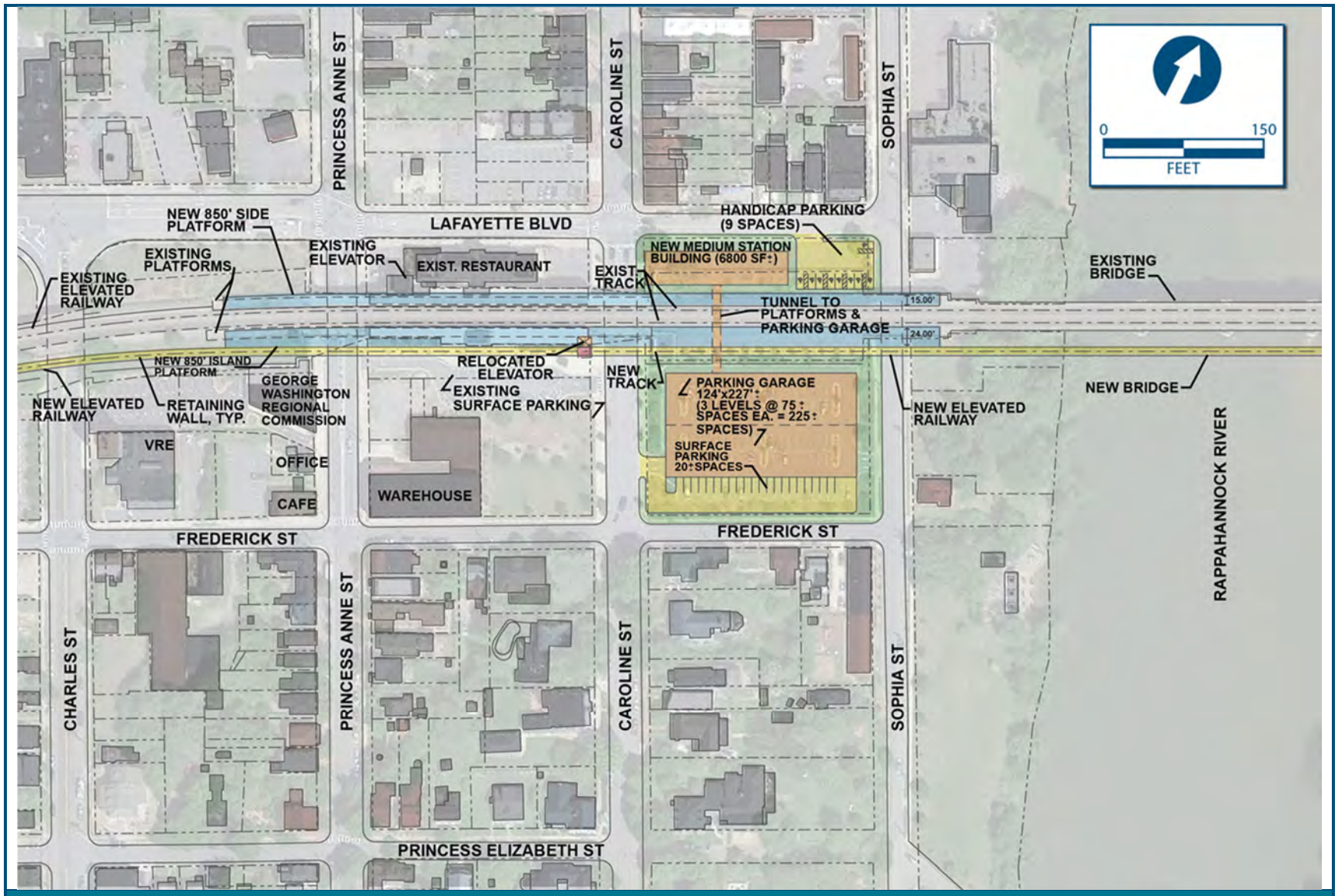


Figure 2.5-8: Fredericksburg Station Improvements for Build Alternative 3B

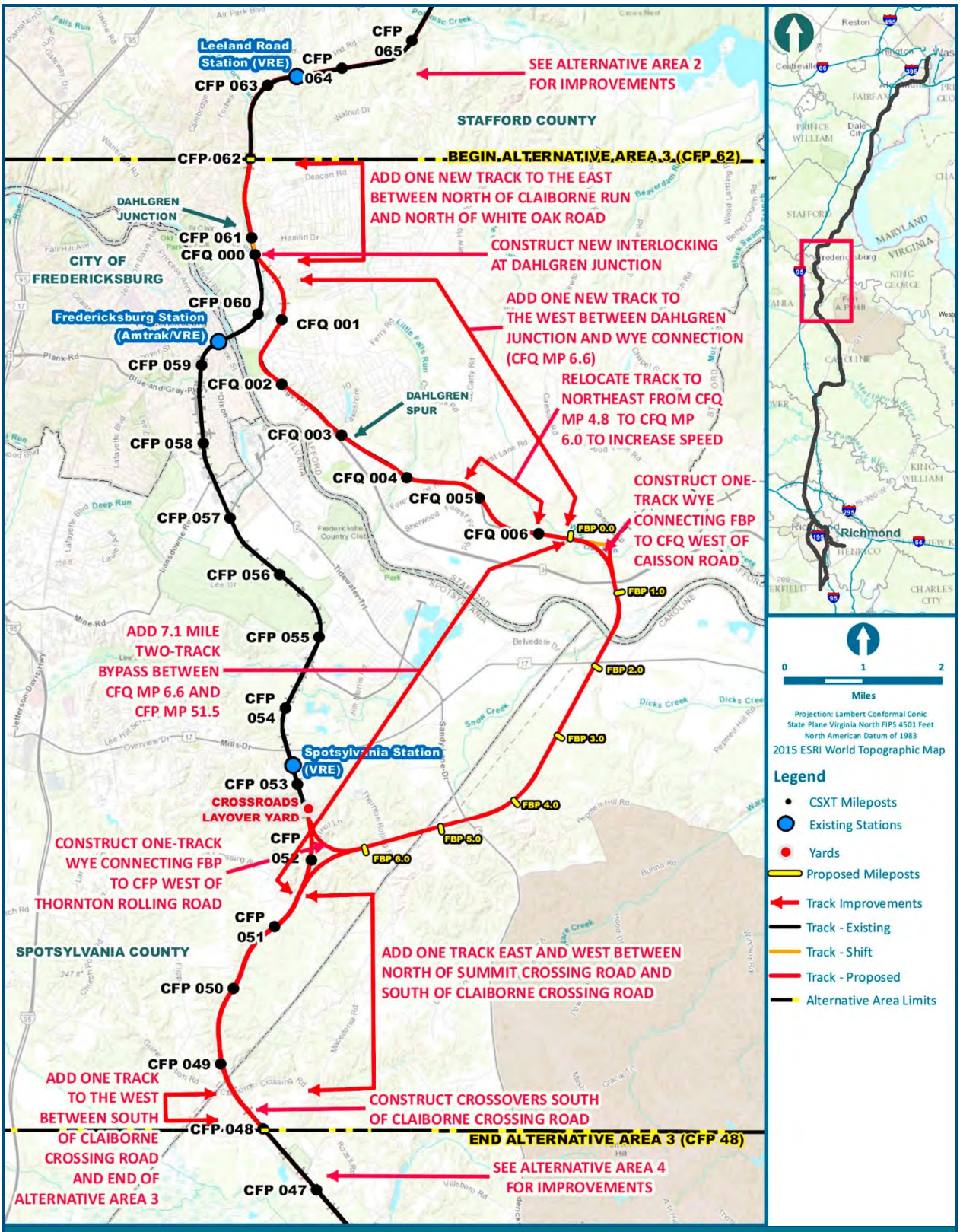


Figure 2.5-9: Build Alternative 3C – Add Two-Track Bypass East

2.5.2.4 Area 4: Central Virginia (Crossroads to Doswell) Build Alternative

The Central Virginia area (CFP 48 to CFP 19) extends from Claiborne Crossing Road (Route 660) south of Fredericksburg to the South Anna River in Henrico County (Figure 2.5-10). There is one Build Alternative in the Central Virginia area (Alternative 4A: Add One Track/Improve Existing Track) composed of sections of additional track and no additional track. Table 2.5-9 describes the general improvements to the Central Virginia alternative area. Segment specific track and structure improvements associated with the Central Virginia area Build Alternative are described by segment and milepost in Table 2.5-10. Detailed graphics illustrating the specific improvements are in Appendix F. Service improvements are described in Section 2.2.2.

Table 2.5-9: Build Alternative 4A (Central Virginia)—General Improvements

Build Alternative	Proposed Improvements
4A: Add One Track/Improve Existing ***Rail Alignment: Figure 2.5-10*** ***Station: None*** This alternative would add one additional main line track and realign existing tracks in some curves to improve speed. The additional track would be located on either the east or west side of the existing tracks based on rail operation considerations, site constraints, and potential impacts.	Track Improvements Common to all Segments in the Central Virginia Area. Site-specific improvements are described in Table 2.5-9. ▪ Add one main line track and realign existing tracks in some curves to improve speed in the Central Virginia area. ▪ Install 36- to 48-inch culverts, as required for drainage, under the rail line along the alignment. ▪ Install stormwater management facilities. ▪ Install signal and communication facilities.

Existing Corridor in Area 4: Central Virginia

Table 2.5-10: Build Alternative 4A (Central Virginia)—Specific Infrastructure Improvements

Segment and Milepost (MP)	Figure	Proposed Improvements
Crossroads to Guinea (XRGU) MP 48.0-47.0	Appendix F Figure F-1	Track ▪ Add one track to west side between CFP 48.0 and 47.0. Modify the at-grade crossing at Stonewall Jackson Road (Route 606) (CFP 47.24) to accommodate the additional third track. No stations occur in this segment. No structure modifications.
Guinea to Milford (GUMD) MP 47.0-38.0	Appendix F Figure F-1	Track ▪ Add one track to west side between south of Stonewall Jackson Road (CFP 47.24) and north of Nelson Hill Road (CFP 37.8). ▪ Modify the at-grade crossing at Jones Crossing (CFP 45.77), Woodford Road (CFP 44.50), Woodslane Road (CFP 43.50), Rixey Road (CFP 41.70), Paige Road (CFP 40.43), and Roes Crossing (CFP 38.99) to accommodate the additional third track. ▪ Shift tracks to the east to increase speeds through the curve at CFP 39.1 to 38.8. ▪ Shift tracks to the west to increase speeds through the curve at CFP 45.7 to 45.4, 41.9 to 41.5, 40.9 to 40.6, and 40.3 to 40.0. No stations occur in this segment. Structures ▪ Add crash walls to accommodate the third track at Rogers Clark Boulevard (CFP 38.50).
Milford to North Doswell (MDND) MP 38.0-23.0	Appendix F Figure F-1 and F-2	Track ▪ Add one track to west side between north of Nelson Hill Road (CFP 37.80) and south of the North Anna River (CFP 23.82). ▪ Modify the at-grade crossing of multiple private road crossings; and Penola Road (CFP 33.0) and close the crossing of Colemans Mill Road (CFP 29.72) to accommodate the additional third track. ▪ Shift tracks to the east to increase speeds through the curve at CFP 36.4 to 36.0, 30.6 to 30.2, 30.0 to 29.5, 29.4 to 28.2, 26.9 to 26.6, 26.4 to 25.5, 26.0, 26.8, 28.3, 29.1, 29.8, 30.4, and 36.2. ▪ Shift tracks to the west to increase speeds through the curve at CFP 35.0 to 34.8, 31.7 to 31.1, 27.7 to 27.1, 27.4, 31.4, and 34.9. ▪ Transition track from west to east through curve at CFP 23.5 to 23.2. No stations occur in this segment. Structures ▪ Construct a new single-track rail bridge over Mattaponi River (CFP 34.8) and North Anna River (CFP 23.9) on the west side of the existing structure. ▪ Construct a new single-track rail bridge on the west side of the existing structure over Polecat Creek (CFP 32.1). ▪ Add crash walls to accommodate the third track at Dry Bridge Road (CFP 28.37), Ruther Glen Road (CFP 26.96), and I-95 (CFP 26.54).
North Doswell to Elmont (NDEL) MP 23.0-19.0	Appendix F Figure F-2	Track ▪ Add one track to the east side south of North Anna River (CFP 23.82) to north of Kings Dominion Boulevard (CFP 20.81). ▪ Add one track to the west side north of Kings Dominion Boulevard (CFP 20.81) to Vaughan Road (CFP 15.62). ▪ Modify the at-grade crossings at Doswell Road (CFP 21.87) and Private Crossing (Excelsior Mill) (CFP 21.66) to accommodate the additional third track. ▪ Shift tracks to the west to increase speeds through the curve at CFP 20.5 to 19.9. No stations occur in this segment. Structures ▪ Construct a new single-track rail bridge on the west side of the existing structure over Taylorsville Road (Route 689) (CFP 19.58). ▪ Construct a new single-track rail bridge over Little River (CFP 19.5).

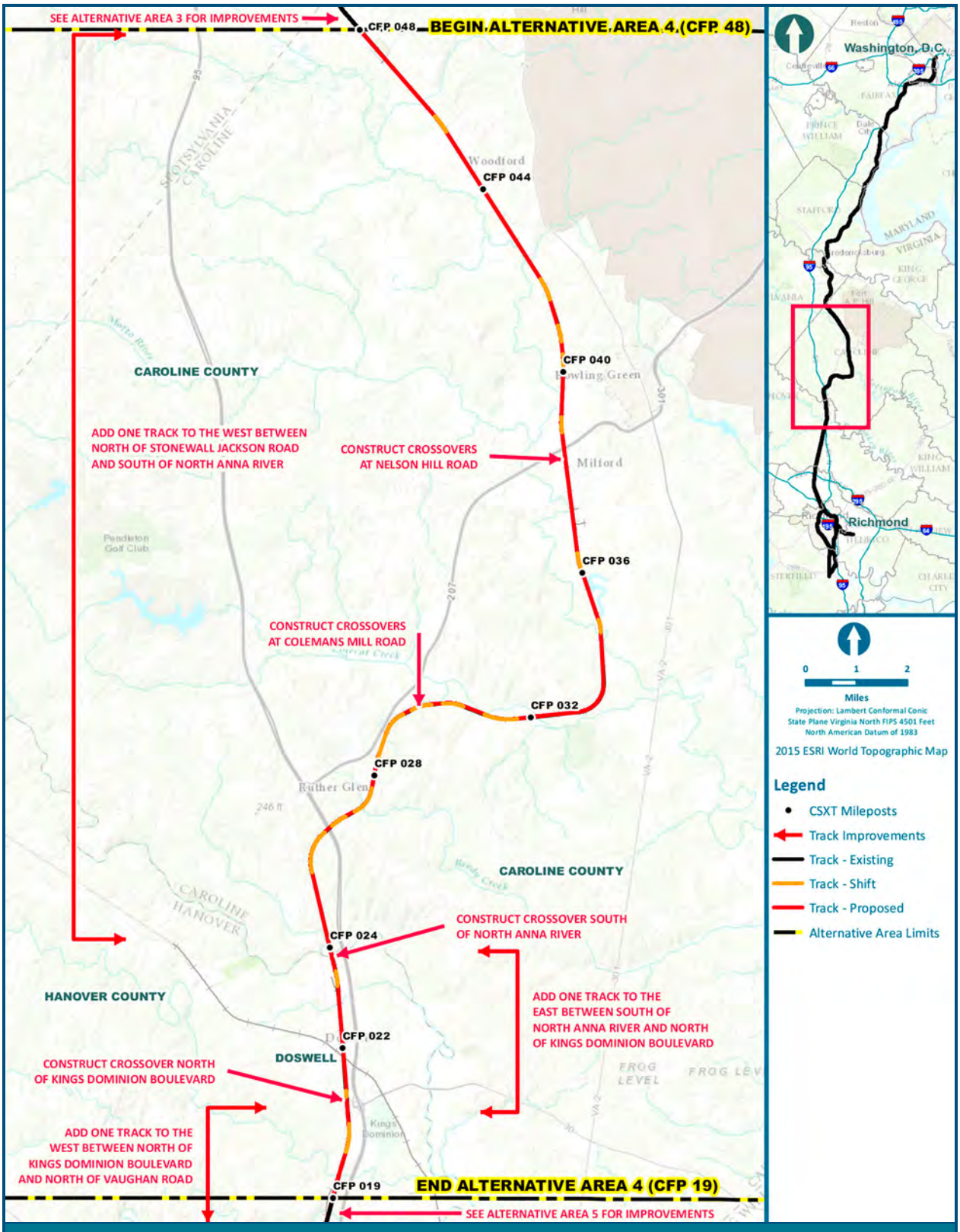


Figure 2.5-10: Build Alternative 4A – Add One Track / Improve Existing Track

2.5.2.5 Area 5: Ashland (Doswell to I-295) Build Alternatives

The Ashland area (CFP 19 to CFP 9) extends from the South Anna River through the Town of Ashland to I-295. The corridor through the Town of Ashland consists of an approximately 9,500-foot-long segment of two main tracks in the median of Center Street/Railroad Avenue that passes through the downtown commercial area, as well as the campus of Randolph-Macon College and residential areas north and south of the commercial district. The vehicular lanes of Center Street/Railroad Avenue are operated one-way on either side of the rail line, with southbound traffic to the west of the tracks and northbound traffic to the east. CSXT's right-of-way has sufficient room for an additional main track through most of the Ashland area, except through downtown Ashland where the right-of-way is limited to the existing tracks. DRPT evaluated several options to provide the required rail capacity in this area, including a bypass option. These options are listed in Table 2.5-11 and shown in Figures 2.5-11 through 2.5-20; the figures include both maps of the Build Alternative rail alignments as well as the station build improvements.

Station options considered include improving the existing downtown Ashland station (with 850-foot platforms or 350-foot platforms) or constructing a new station just south of Ashcake Road (with 850-foot platforms). For the purposes of assessing the effects of the Ashland Area Build Alternatives that retain the existing downtown Ashland station, DRPT assumed that 850-foot platforms would be constructed, which is the worst-case (*i.e.*, greatest impact) platform option and follows the DC2RVA BOD. If shorter 350-foot platforms were constructed instead, the impacts to the surrounding station area described in Chapter 4 would be reduced, with a minor impact on the efficiency of trains stopping at the station.

Detailed graphics illustrating the specific improvements are in Appendix G.

Table 2.5-11: Area 5: Ashland Build Alternatives

Build Alternative	Proposed Improvements
5A: Maintain Two Tracks Through Town ***Rail Alignment: Figure 2.5-11*** ***Station: Figure 2.5-12 A & B*** This alternative would maintain the existing two tracks (i.e., no construction of new track) through Ashland, which would be used by freight and passenger trains similar to current conditions. A new station would be constructed in town. One new track would be constructed north and south of town, and there are some shifts of existing tracks to improve speed throughout the area. Rail improvements are generally within existing right-of-way.	Track ▪ Add one track to the west side north of Kings Dominion Boulevard (CFP 20.81) to Vaughan Road (CFP 15.62). ▪ Add one track to the east side between Ashcake Road (CFP 13.85) and Gwathmey Church Road (CFP 12.95). ▪ Add one track to the west side between Gwathmey Church Road (CFP 12.95) and Cedar Lane (CFP 11.15). ▪ Modify the at-grade crossings at Gwathmey Church Road (CFP 12.95), Elmont Road (CFP 11.55) and Cedar Lane (CFP 11.15) to accommodate the additional third track. Stations ▪ Ashland Amtrak Station (CFP 14.71) - Construct a new station building (approximately 2,300 square feet) and surface parking for approximately 45 spaces at the intersection of Henry Clay Road and Center Street. - Construct two new platforms to service the Amtrak trains; these platforms would be 850 feet in length, and eight inches above top of rail. (An option for this alternative is to construct 350-foot-long platforms.) - A pedestrian access bridge would connect the station to the two platforms, including an elevator to provide ADA access. *Note: these improvements would not apply if 350-foot-long platforms were constructed.*

▶ *Continued.*

Table 2.5-11: Area 5: Ashland Build Alternatives

Build Alternative	Proposed Improvements
	Structures ▪ Add crash walls to accommodate the third track at Old Ridge Road (CFP 18.95) overpass. ▪ Construct a new single-track rail bridge on the west side of the existing structure over Elletts Crossing Road (Route 641) (CFP 17.70). ▪ Plan for construction of a new rail bridge (includes construction of one track on bridge plus space for a second track) on the west side of the existing structure over the South Anna River (CFP 18.70). ▪ Realign and provide grade separation at Vaughan Road (CFP 15.62). ▪ Realign and provide grade separation at Ashcake Road (CFP 13.85) with new connector road from Ashcake Road to Center Street.
5A–Ashcake: Maintain Two Tracks Through Town (Relocate Station to Ashcake) ***Rail Alignment: Figure 2.5-13*** ***Station: Figure 2.5-20*** This alternative would maintain the existing two tracks (i.e., no construction of new track) through Ashland, which would be used by freight and passenger trains similar to current conditions. A new station would be constructed just south of Ashcake Road and the existing station location in town would be closed. One new track would be constructed north and south of town, with some track shifts to improve speed, which would generally be within existing right-of-way.	Track ▪ Add one track to the west side north of Kings Dominion Boulevard (CFP 20.81) to Vaughan Road (CFP 15.62). ▪ Add one track to the east side between Ashcake Road (CFP 13.85) and Gwathmey Church Road (CFP 12.95). ▪ Add one track to the west side between Gwathmey Church Road (CFP 12.95) and Cedar Lane (CFP 11.15). ▪ Modify the at-grade crossings at Gwathmey Church Road (CFP 12.95) and Elmont Road (CFP 11.55) and Cedar Lane (CFP 11.15) to accommodate the additional third track. Stations ▪ Ashland Amtrak Station (CFP 14.71) – existing station platforms removed and service relocated to a new station near Ashcake Road. ▪ Ashcake Road Amtrak Station - Construct a new station building (approximately 2,300 square feet) and surface parking for approximately 45 spaces would be constructed just south of Ashcake Road - A pedestrian access bridge would connect the station to the two platforms, including an elevator to provide ADA access - Two new platforms, 850 feet in length and 8 inches above top of rail, would be constructed to service the Amtrak trains. Structures ▪ Add crash walls to accommodate the third track at Old Ridge Road (CFP 18.95) overpass. ▪ Construct a new single-track rail bridge on the west side of the existing structure over Elletts Crossing Road (Route 641) (CFP 17.70). ▪ Plan for construction of a new rail bridge (includes construction of one track on bridge plus space for a second track) on the west side of the existing structure over the South Anna River (CFP 18.70). ▪ Realign and provide grade separation at Vaughan Road (CFP 15.62). ▪ Realign and provide grade separation at Ashcake Road (CFP 13.85) with new connector road from Ashcake Road to Center Street.
5B: Add One Track East of Existing ***Rail Alignment: Figure 2.5-14*** ***Station: Figure 2.5-19 A & B*** Through downtown Ashland, one additional track is added to the east side of the existing two tracks, which would new right-of-way to construct. A new station would be constructed in town.	Track ▪ Add one track to the west side north of Kings Dominion Boulevard (CFP 20.81) to Vaughan Road (CFP 15.62). ▪ Add one track to the east side between Vaughan Road (CFP 15.62) and Gwathmey Church Road (CFP 12.95). ▪ Add one track to the west side between Gwathmey Church Road (CFP 12.95) and Cedar Lane (CFP 11.15). ▪ Modify the at-grade crossing at West Patrick Street (CFP 15.16), England Street (CFP 14.72), Myrtle Street (CFP 14.64), Francis Street (CFP 14.20), Ashcake Road (CFP 13.85), Gwathmey Church Road (CFP 12.95), Elmont Road (CFP 11.55) and Cedar Lane (CFP 11.15) to accommodate the additional third track.

▶ Continued.

Table 2.5-11: Area 5: Ashland Build Alternatives

Build Alternative	Proposed Improvements
One new track would be constructed north and south of town, with some track shifts to improve speed, on the west side of the existing track. These rail improvements would generally be within existing right-of-way.	▪ Modify/reconstruct North Center Street between Smith Street and England Street, and South Center Street between England Street and Ashcake Road to accommodate the additional third track. ▪ Install 36- to 48-inch culverts, as required for drainage, under the rail line along the alignment. ▪ Install stormwater management facilities. ▪ Install signal and communication facilities. Stations ▪ Ashland Amtrak Station (CFP 14.71) - Construct a new station building (approximately 2,300 square feet) and surface parking for approximately 45 spaces at the intersection of Henry Clay Road and Center Street. - Two new platforms would be constructed to service the Amtrak trains; these platforms would be 850 feet in length, and eight inches above top of rail. (An option for this alternative is to construct 350-foot-long platforms.) - A pedestrian access bridge would connect the station to the two platforms, including an elevator to provide ADA access. *Note: these improvements would not apply if 350-foot-long platforms were constructed.* Structures ▪ Add crash walls to accommodate the third track at Old Ridge Road (CFP 18.95) overpass. ▪ Construct a new single-track rail bridge on the west side of the existing structure over Elletts Crossing Road (Route 641) (CFP 17.70). ▪ Plan for construction of a new rail bridge (includes construction of one track on bridge plus space for a second track) on the west side of the existing structure over the South Anna River (CFP 18.70). ▪ Realign and provide grade separation at Ashcake Road (CFP 13.85) with new connector road from Ashcake Road to Center Street.
5B–Ashcake: Add One Track East of Existing (Relocate Station to Ashcake) ***Rail Alignment: Figure 2.5-15*** ***Station: Figure 2.5-20*** Through downtown Ashland, one additional track is added to the east side of the existing two tracks, which would new right-of-way to construct. A new station would be constructed just south of Ashcake Road and the existing station location in town would be closed. One new track would be constructed north and south of town, with some track shifts to improve speed, on the west side of the existing tracks. These rail improvements would generally be within existing right-of-way.	Track ▪ Add one track to the west side north of Kings Dominion Boulevard (CFP 20.81) to Vaughan Road (CFP 15.62). ▪ Add one track to the east side between Vaughan Road (CFP 15.62) and Gwathmey Church Road (CFP 12.95). ▪ Add one track to the west side between Gwathmey Church Road (CFP 12.95) and Cedar Lane (CFP 11.15). ▪ Modify the at-grade crossing at West Patrick Street (CFP 15.16), England Street (CFP 14.72), Myrtle Street (CFP 14.64), Francis Street (CFP 14.20), Ashcake Road (CFP 13.85), Gwathmey Church Road (CFP 12.95), Elmont Road (CFP 11.55) and Cedar Lane (CFP 11.15) to accommodate the additional third track. ▪ Modify/reconstruct North Center Street between Smith Street and England Street, and South Center Street between England Street and Ashcake Road to accommodate the additional third track. ▪ Install 36- to 48-inch culverts, as required, under the rail line along the alignment. ▪ Install stormwater management facilities. ▪ Install signal and communication facilities. Stations ▪ Ashland Amtrak Station (CFP 14.71) – existing station platforms removed and service relocated to a new station near Ashcake Road. ▪ Ashcake Amtrak Station - Construct a new station building (approximately 2,300 square feet) and surface parking for approximately 45 spaces would be constructed just south of Ashcake Road - A pedestrian access bridge would connect the station to the two platforms, including an elevator to provide ADA access - Two new platforms, 850 feet in length and 8-inches above top of rail, would be constructed to service the Amtrak trains.

▶ *Continued.*

Table 2.5-11: Area 5: Ashland Build Alternatives

Build Alternative	Proposed Improvements
	Structures ▪ Add crash walls at Old Ridge Road (CFP 18.95) overpass. ▪ Construct a new single-track rail bridge on the west side of the existing structure over Elletts Crossing Road (Route 641) (CFP 17.70). ▪ Plan for construction of a new rail bridge (includes construction of one track on bridge plus space for a second track) on the west side of the existing structure over the South Anna River (CFP 18.70). ▪ Realign and provide grade separation at Ashcake Road (CFP 13.85) with new connector road from Ashcake Road to Center Street.
5C: Add Two-Track West Bypass ***Rail Alignment: Figure 2.5-16*** ***Station: Figure 2.5-12 A & B*** The existing two-track corridor and a new station in downtown Ashland would continue to serve regional passenger rail. An 8.75-mile, two-track bypass would be constructed on new right-of way west of the town and would serve both freight rail and possibly long distance passenger rail trains, which do not serve the Ashland station. One new track would be added north and south of the bypass in the area, with some track shifts to improve speed, which would generally be within existing right-of-way.	Track ▪ Add one track to the west side north of Kings Dominion Boulevard (CFP 20.81) to south of the South Anna River (CFP 18.52) ▪ Construct a two-track bypass on a greenfield alignment west of Ashland from south of the South Anna River (CFP 18.52 = ABP 8.32) to north of Elmont Road (CFP 11.61 = ABP 0.00) ▪ Add one track to the west side north of Elmont Road (CFP 11.55) to Cedar Lane (CFP 11.15) ▪ Construct a new culvert over Falling Creek ▪ Install culverts, as required for drainage, under the rail line along the alignment ▪ Install stormwater management facilities ▪ Install signal and communication facilities Stations ▪ Ashland Amtrak Station (CFP 14.71) ▪ Construct a new station building (approximately 2,300 square feet) and surface parking for approximately 45 spaces would be constructed at the intersection of Henry Clay Road and Center Street. ▪ Two new platforms would be constructed to service the Amtrak trains; these platforms would be 850 feet in length, and eight inches above top of rail. (An option for this alternative is to construct 350-foot-long platforms.) ▪ A pedestrian access bridge would connect the station to the two platforms, including an elevator to provide ADA access. *Note: these improvements would not apply if 350-foot-long platforms were constructed.* Structures ▪ Add crash walls at Old Ridge Road (CFP 18.95) overpass. ▪ Plan for construction of a new rail bridge (includes construction of one track on bridge plus space for a second track) on the west side of the existing structure over the South Anna River (CFP 18.70). ▪ Grade separate crossings at Washington Highway (ABP 7.0), Blunts Bridge Road (ABP 5.83), West Patrick Henry Road (ABP 4.29), Yowell Road (ABP 3.25), Elmont Road (ABP 1.11) (including realignment of the road) and Ashcake Road (ABP 2.59). ▪ Close the crossing at Independence Road, Farmers Inn Lane, and Quailwood Lane. Alternative driveway access to be provided for Quailwood Lane.
5C–Ashcake: Add Two-Track West Bypass (Relocate Station to Ashcake) ***Rail Alignment: Figure 2.5-17*** ***Station: Figure 2.5-20*** The existing two-track corridor in downtown Ashland and a new station just south of Ashcake Road would continue to serve regional passenger rail, and the existing station location would be closed.	Track ▪ Add one track to the west side north of Kings Dominion Boulevard (CFP 20.81) to south of the South Anna River (CFP 18.52) ▪ Construct a two-track bypass on a greenfield alignment west of Ashland from south of the South Anna River (CFP 18.52 = ABP 8.32) to north of Elmont Road (CFP 11.61 = ABP 0.00) ▪ Add one track to the west side north of Elmont Road (CFP 11.55) to Cedar Lane (CFP 11.15) ▪ Construct a new culvert over Falling Creek ▪ Install culverts, as required for drainage, under the rail line along the alignment ▪ Install stormwater management facilities ▪ Install signal and communication facilities Stations ▪ Ashland Amtrak Station (CFP 14.71) – existing station platforms removed and service relocated to a new station near Ashcake Road.

▶ *Continued.*

Table 2.5-11: Area 5: Ashland Build Alternatives

Build Alternative	Proposed Improvements
An 8.75-mile, two-track bypass would be constructed on new right-of-way west of the town and would serve both freight rail and possibly long distance passenger rail trains, which do not serve the Ashland station. One new track would be added north and south of the bypass in the area, with some track shifts to improve speed, which would generally be within existing right-of-way.	▪ Ashcake Amtrak Station - Construct a new station building (approximately 2,300 square feet) and surface parking for approximately 45 spaces would be constructed just south of Ashcake Road - A pedestrian access bridge would connect the station to the two platforms, including an elevator to provide ADA access - Two new platforms, 850 feet in length and 8-inches above top of rail, would be constructed to service the Amtrak trains.
	Structures ▪ Add crash walls at Old Ridge Road (CFP 18.95) overpass. ▪ Plan for construction of a new rail bridge (includes construction of one track on bridge plus space for a second track) on the west side of the existing structure over the South Anna River (CFP 18.70). ▪ Grade separate crossings at Washington Highway (ABP 7.0), Blunts Bridge Road (ABP 5.83), West Patrick Henry Road (ABP 4.29), Yowell Road (ABP 3.25), Elmont Road (ABP 1.11) (including realignment of the road) and Ashcake Road (ABP 2.59). ▪ Close the crossing at Independence Road, Farmers Inn Lane, and Quailwood Lane. Alternative driveway access to be provided for Quailwood Lane.
5D–Ashcake: Three Tracks Centered Through Town (Add One Track, Relocate Station to Ashcake) ***Rail Alignment: Figure 2.5-18*** ***Station: Figure 2.5-20*** One additional track is added to the existing two-track corridor, with the centering of all tracks on the existing alignment. This rail alignment would preclude use of the existing station location, which would be closed and the platforms would be removed. A new station would be constructed just south of Ashcake Road. Rail improvements generally require new right-of-way, especially within the town of Ashland.	Track ▪ Add one track to the west side north of Kings Dominion Boulevard (CFP 20.81) to Vaughan Road (CFP 15.62) ▪ Shift existing tracks east up to 9 feet from Vaughan Road (CFP 15.62) to Gwathmey Church Road (CFP 12.95). ▪ Add one track to the west side between Vaughan Road (CFP 15.62) to Gwathmey Church Road (CFP 12.95). ▪ Modify the at-grade crossing at West Patrick Street (CFP 15.16), England Street (CFP 14.72), Myrtle Street (CFP 14.64), Francis Street (CFP 14.20), Gwathmey Church Road (CFP 12.95), Elmont Road (CFP 11.55) and Cedar Lane (CFP 11.15) to accommodate the additional third track. ▪ Install 36- to 48-inch culverts, as required, under the rail line along the alignment. ▪ Install stormwater management facilities. ▪ Install signal and communication facilities. Stations ▪ Ashland Amtrak Station (CFP 14.71) –existing station platforms removed and service relocated to a new station near Ashcake Road. ▪ Ashcake Amtrak Station - Construct a new station building (approximately 2,300 square feet) and surface parking for approximately 45 spaces just south of Ashcake Road. - A pedestrian access bridge would connect the station to the two platforms, including an elevator to provide ADA access. - Two new platforms, 850 feet in length and 8-inches above top of rail, would be constructed to service the Amtrak trains. Structures ▪ Add crash walls at Old Ridge Road (CFP 18.95) overpass. ▪ Construct a new single-track rail bridge on the west side of the existing structure over Elletts Crossing Road (Route 641) (CFP 17.70). ▪ Plan for construction of a new rail bridge (includes construction of one track on bridge plus space for a second track) on the west side of the existing structure over the South Anna River (CFP 18.70). ▪ Grade separate crossings at Ashcake Road (CFP 13.85) and Vaughan Road (CFP 15.62).

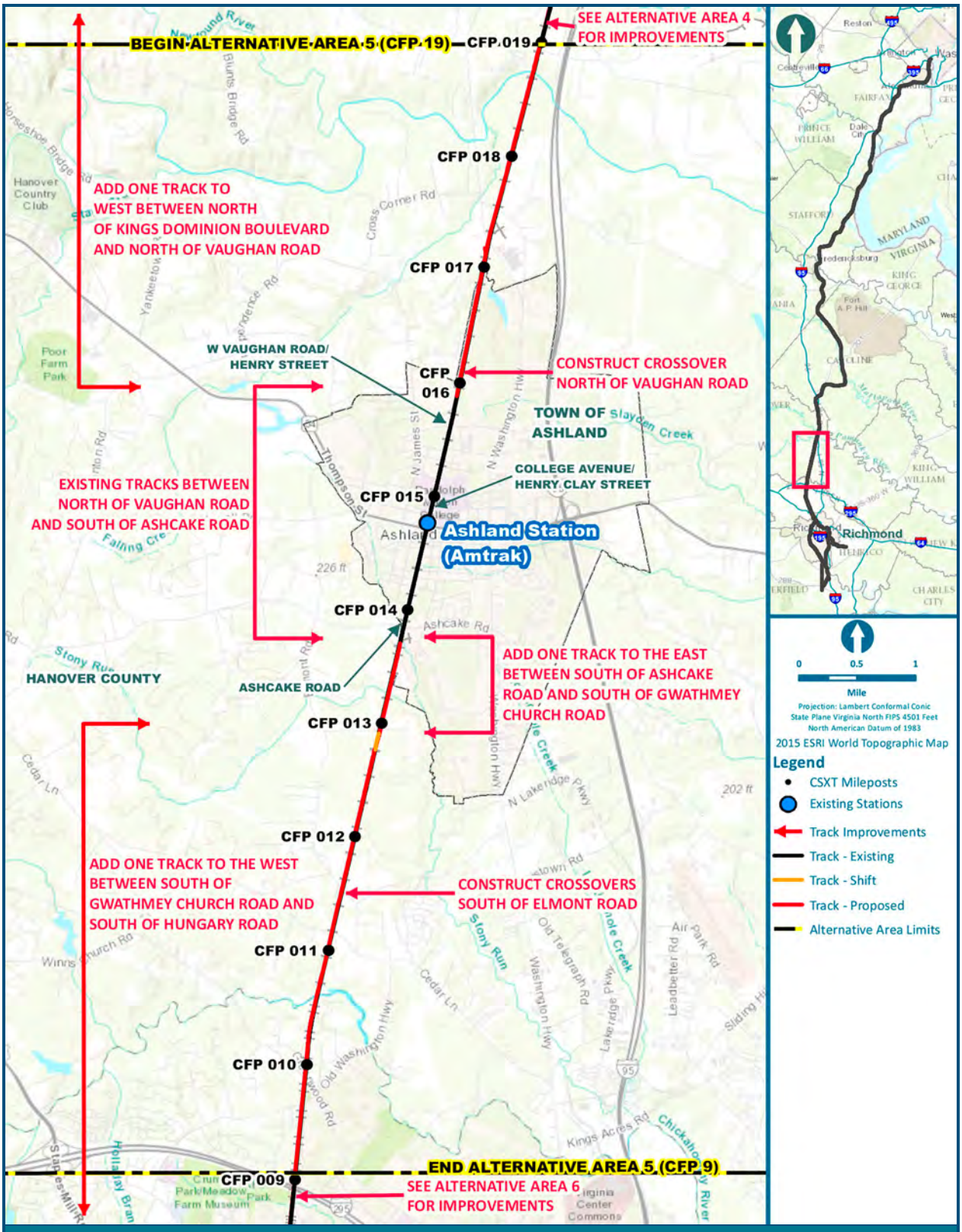


Figure 2.5-11: Build Alternative 5A – Maintain Two Tracks Through Town

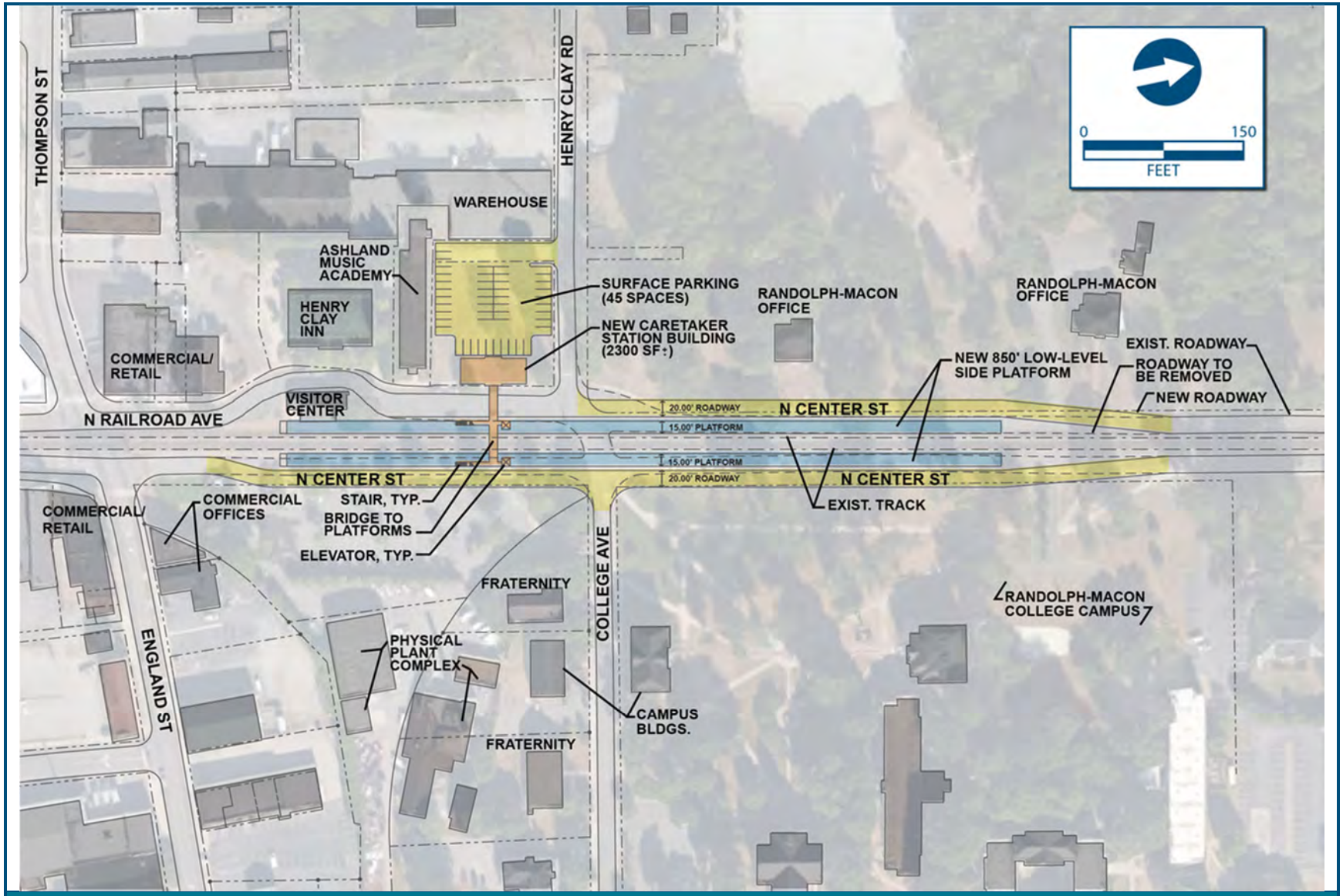


Figure 2.5-12A: Ashland Station Improvements for Build Alternatives 5A and 5C (Two-Track/850-Foot Platforms)

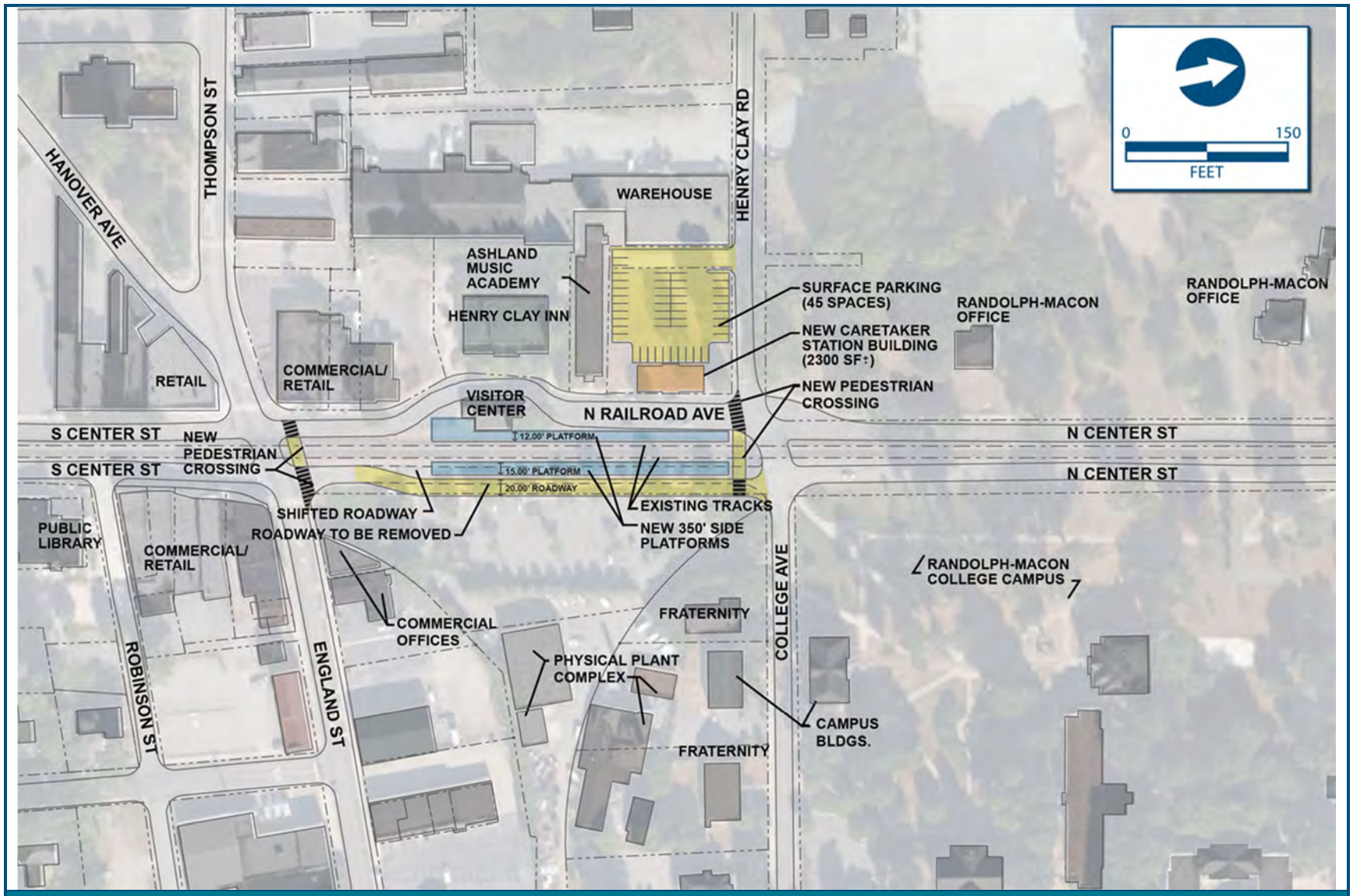


Figure 2.5-12B: Ashland Station Improvements for Build Alternatives 5A and 5C (Two-Track/350-Foot Platforms)

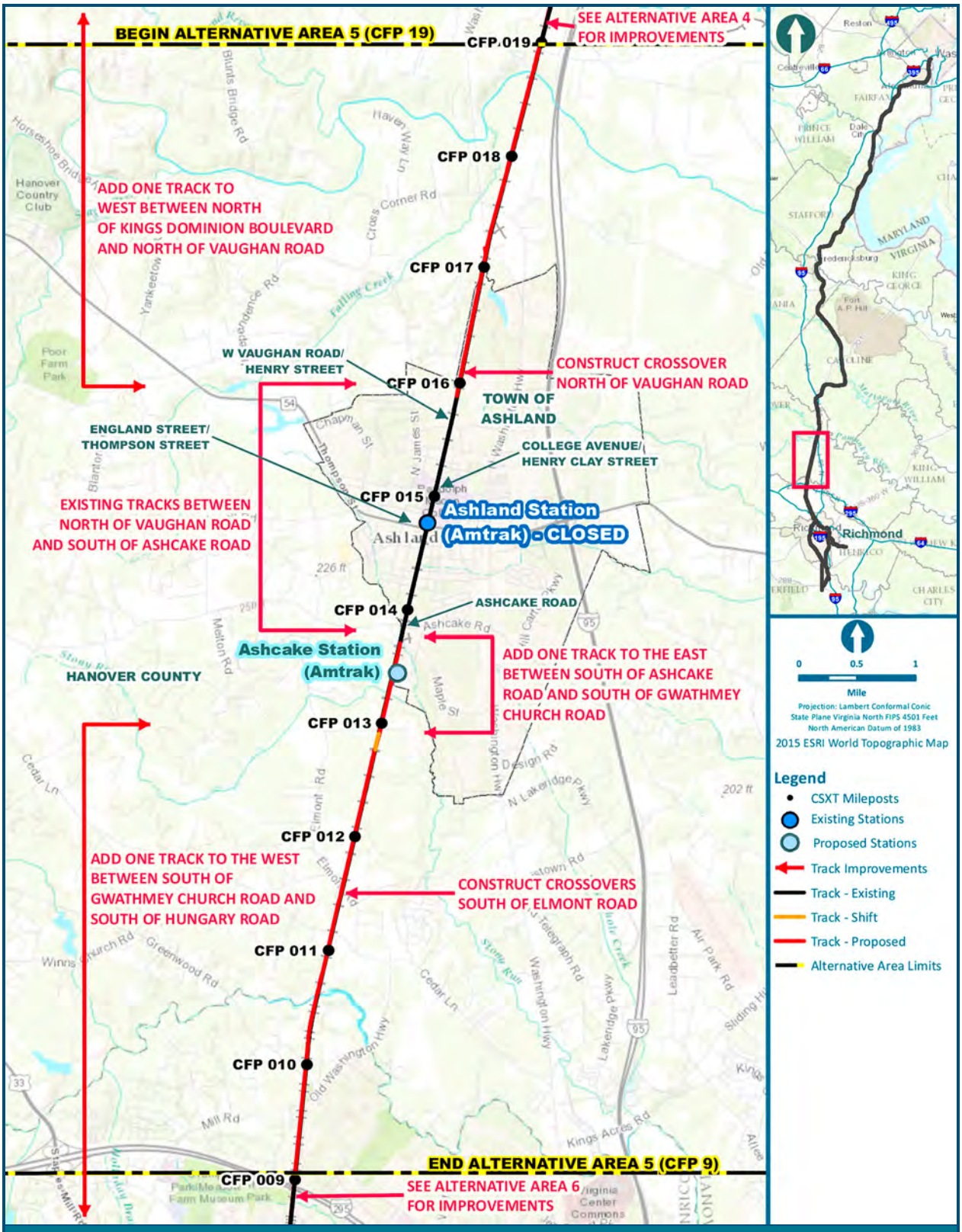


Figure 2.5-13: Build Alternative 5A–Ashcake – Maintain Two Tracks Through Town (Relocate Station to Ashcake)

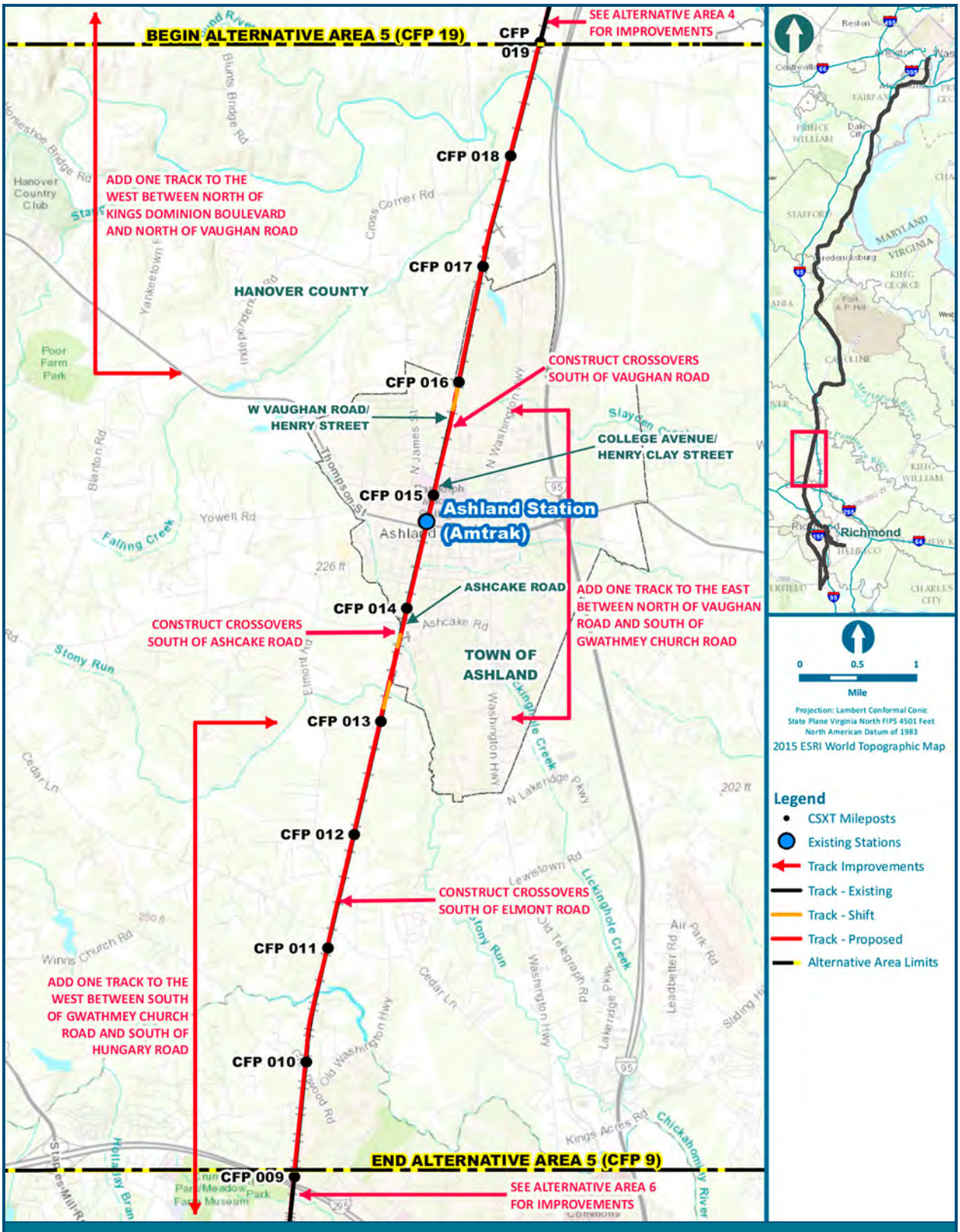


Figure 2.5-14: Build Alternative 5B – Add One Track Through Town East of Existing

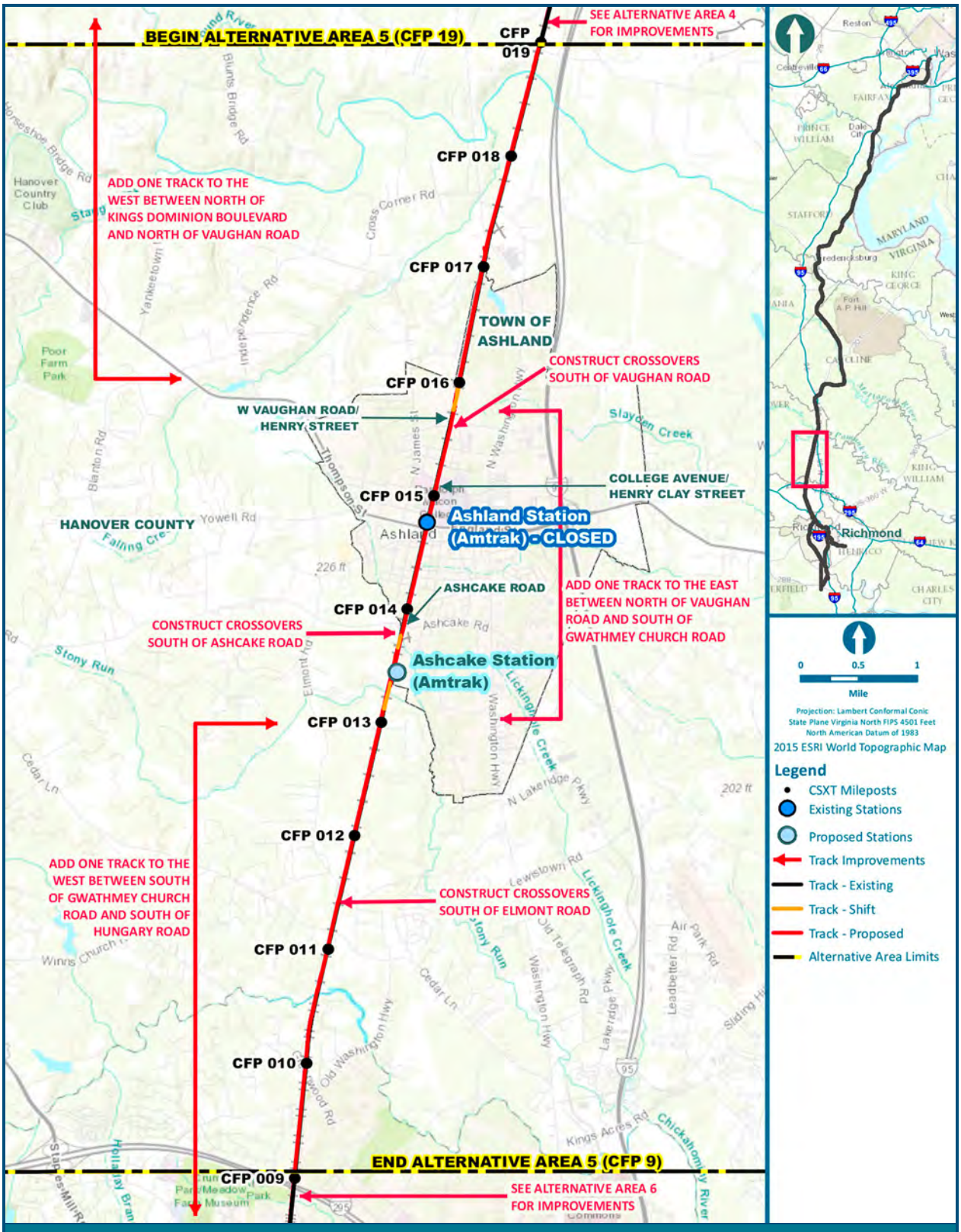


Figure 2.5-15: Build Alternative 5B–Ashcake – Add One Track Through Town East of Existing (Relocate Station to Ashcake)

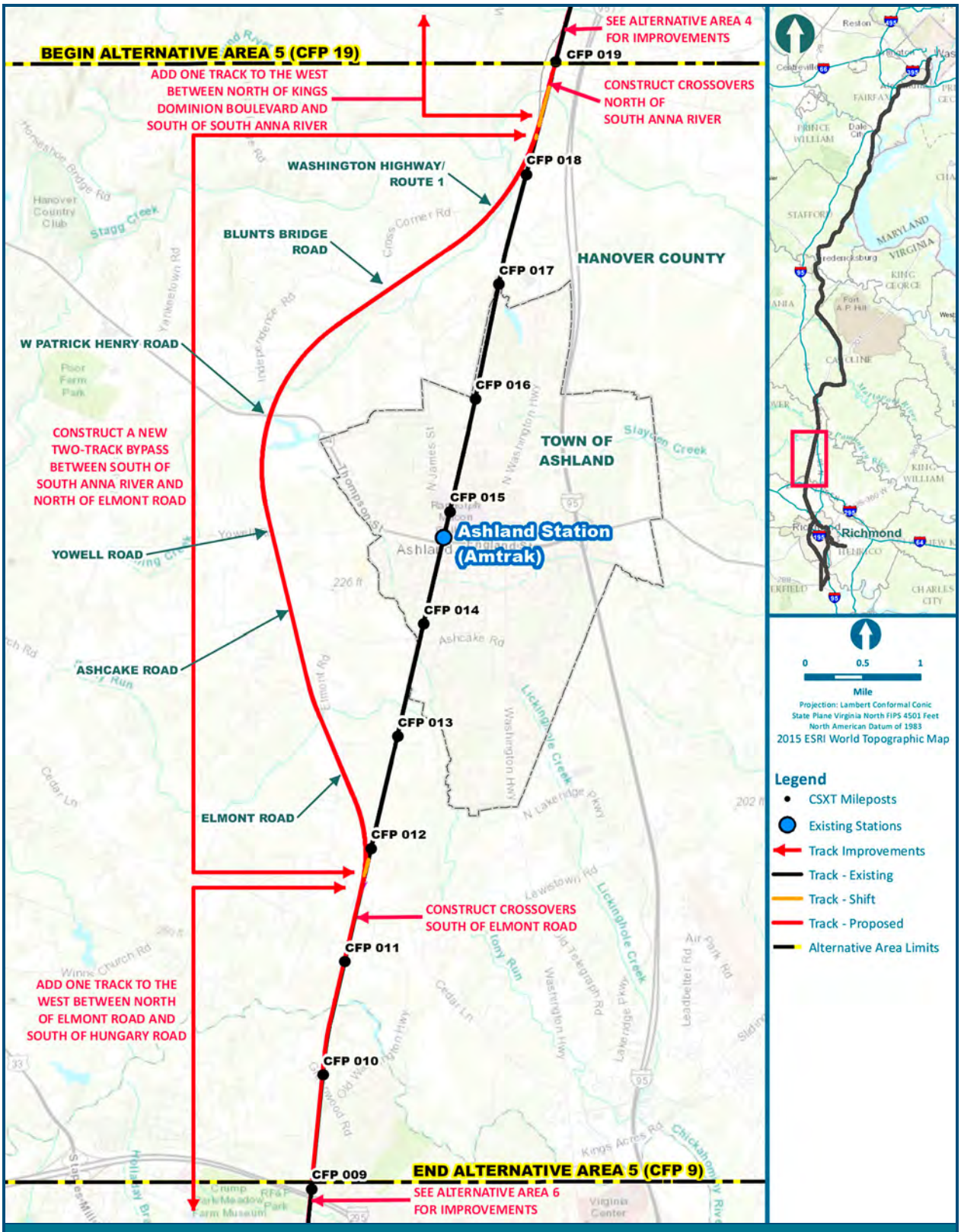


Figure 2.5-16: Build Alternative 5C – Add Two-Track West Bypass

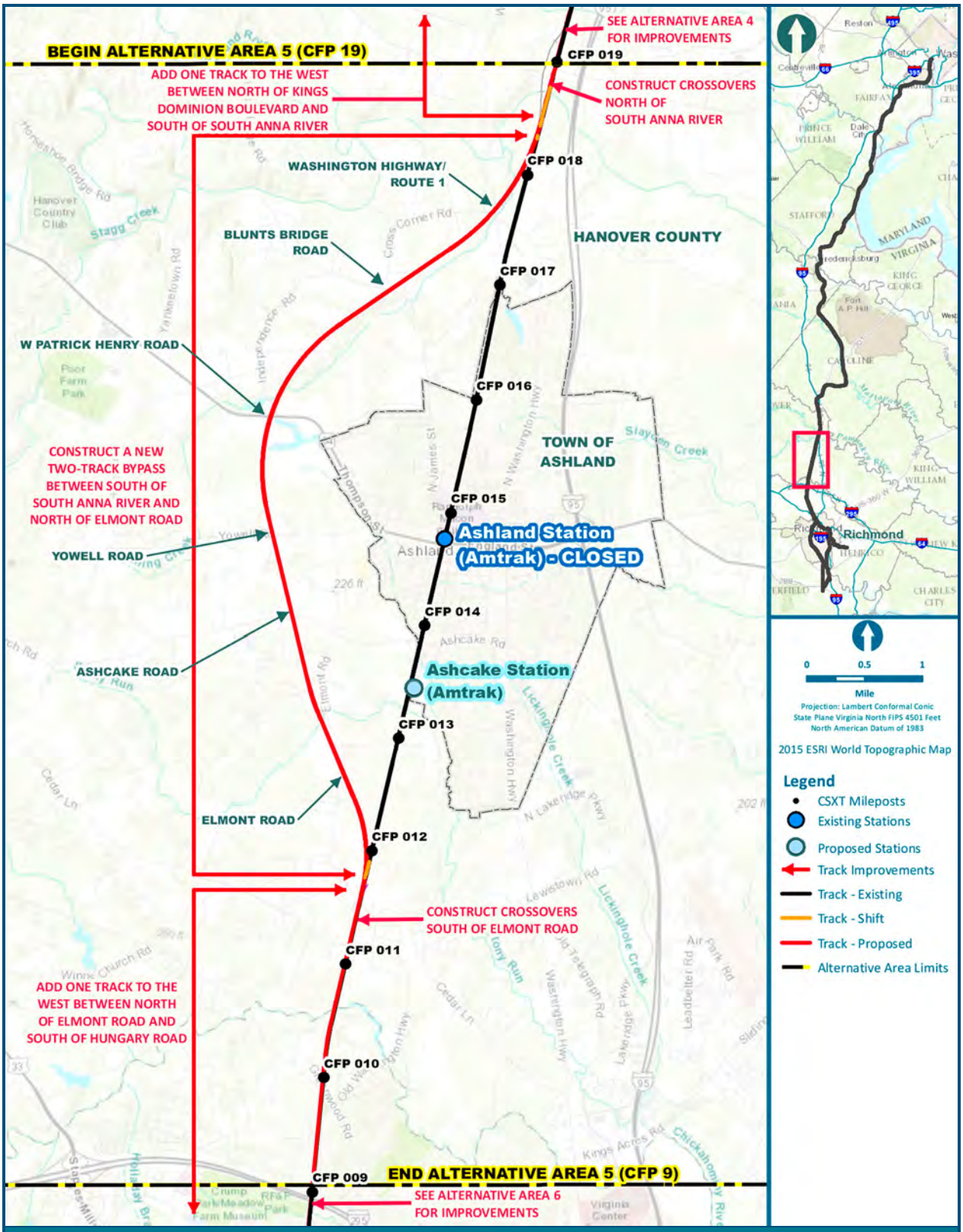


Figure 2.5-17: Build Alternative 5C–Ashcake – Add Two-Track West Bypass (Relocate Station to Ashcake)

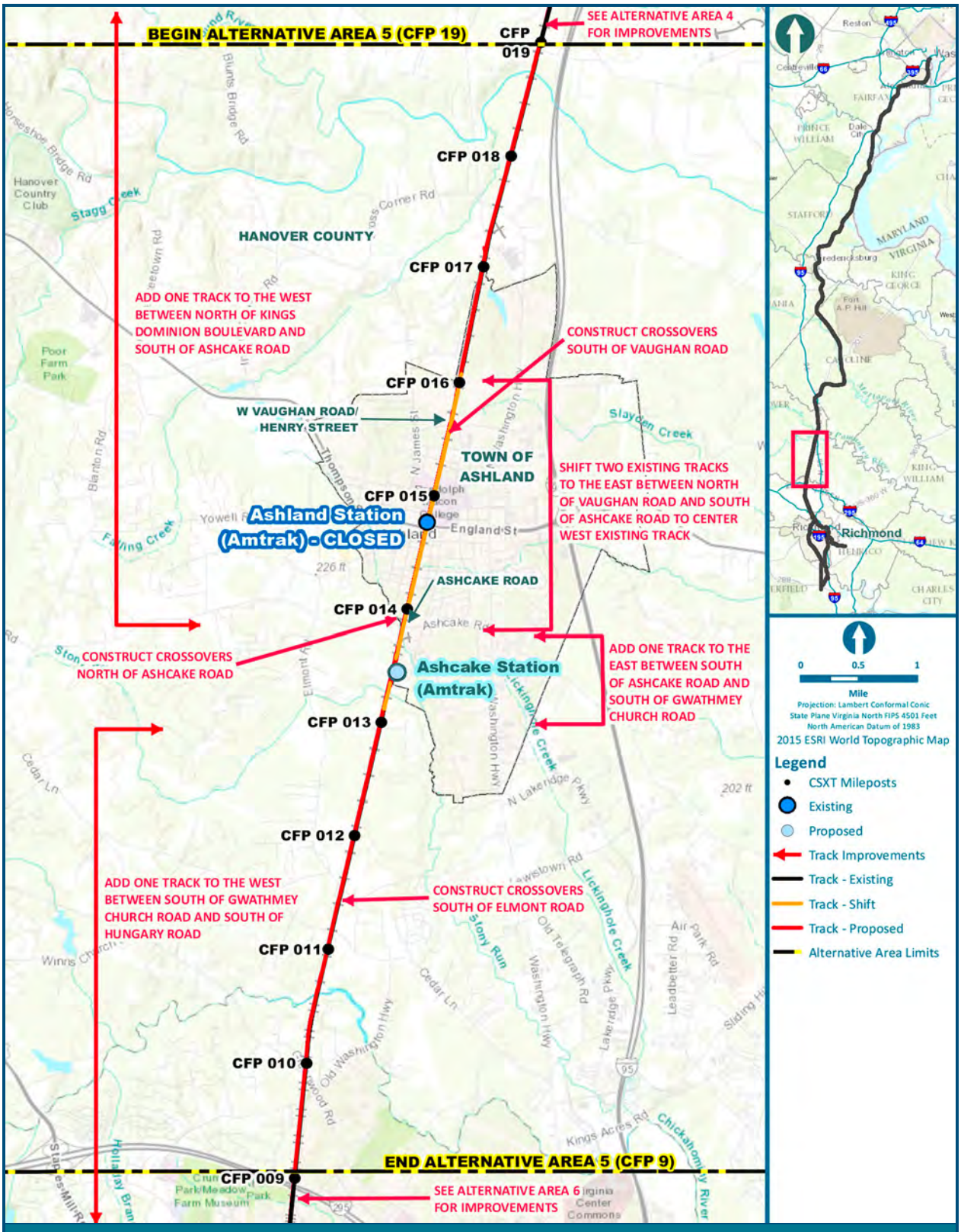


Figure 2.5-18: Build Alternative 5D – Three Tracks Centered Through Town (Add Single Track, Relocate Station to Ashcake)

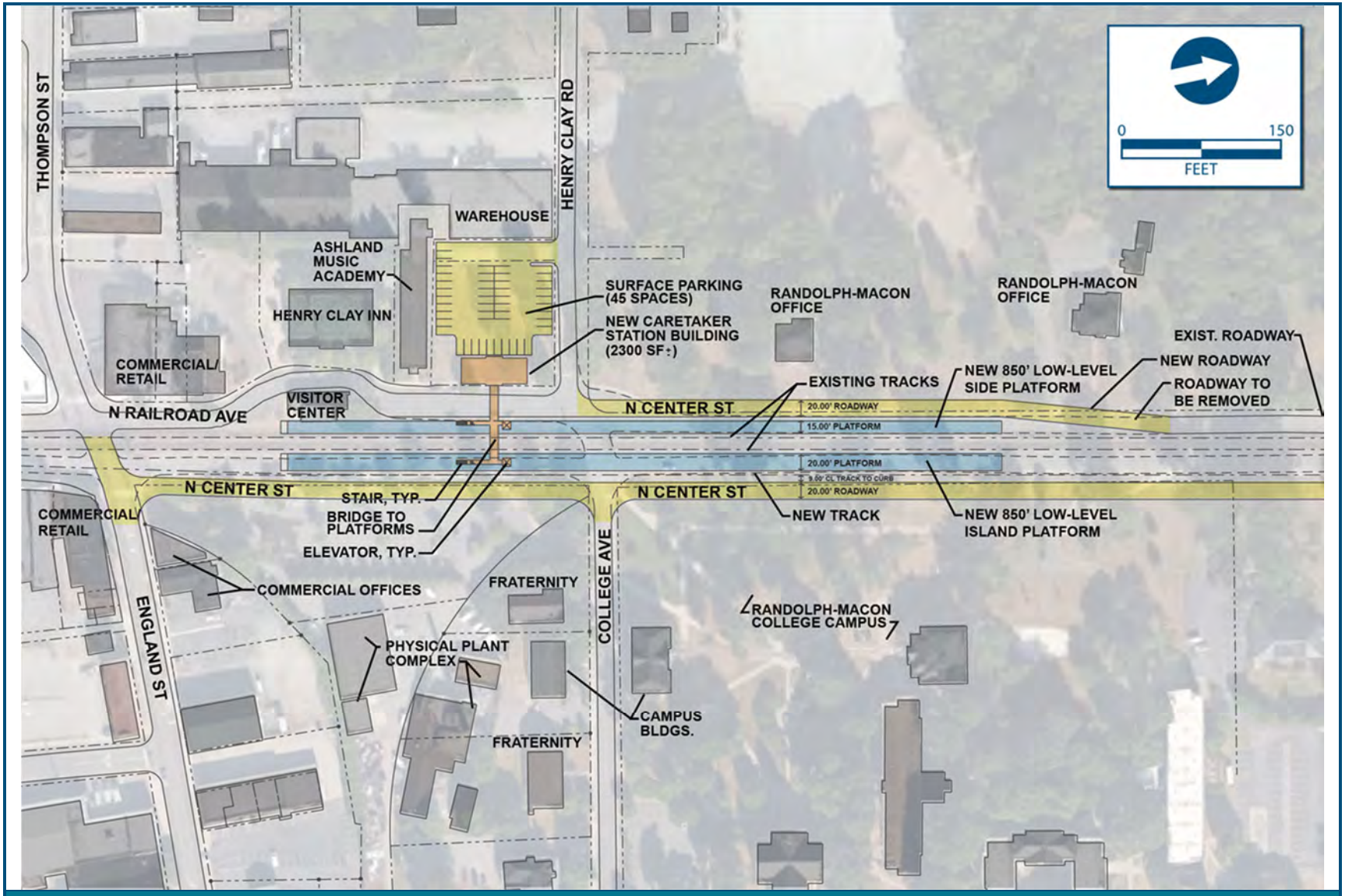


Figure 2.5-19A: Ashland Station Improvements for Build Alternative 5B (Three-Track/850-Foot Platforms)

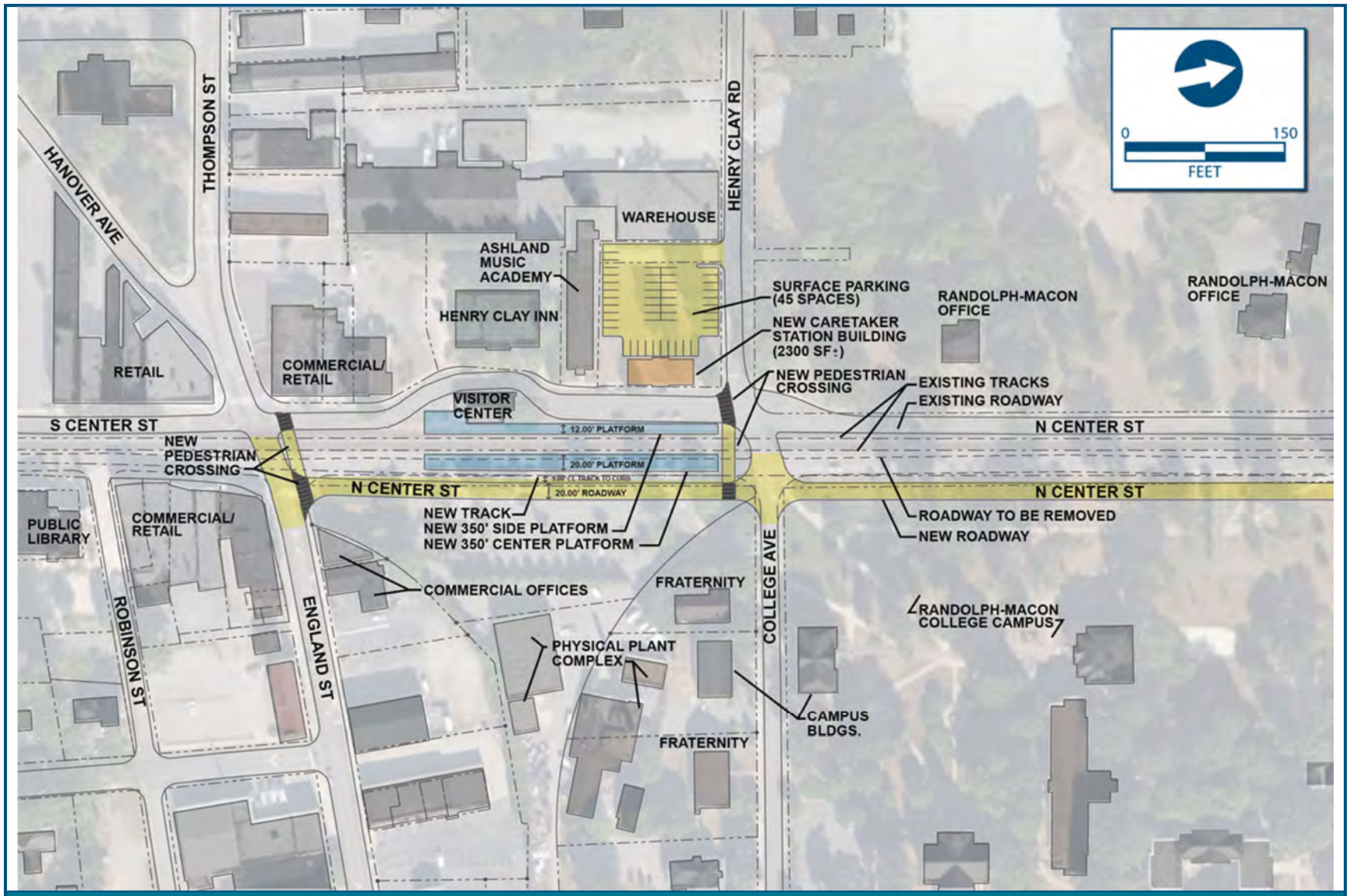


Figure 2.5-19B: Ashland Station Improvements for Build Alternative 5B (Three-Track/350-Foot Platforms)

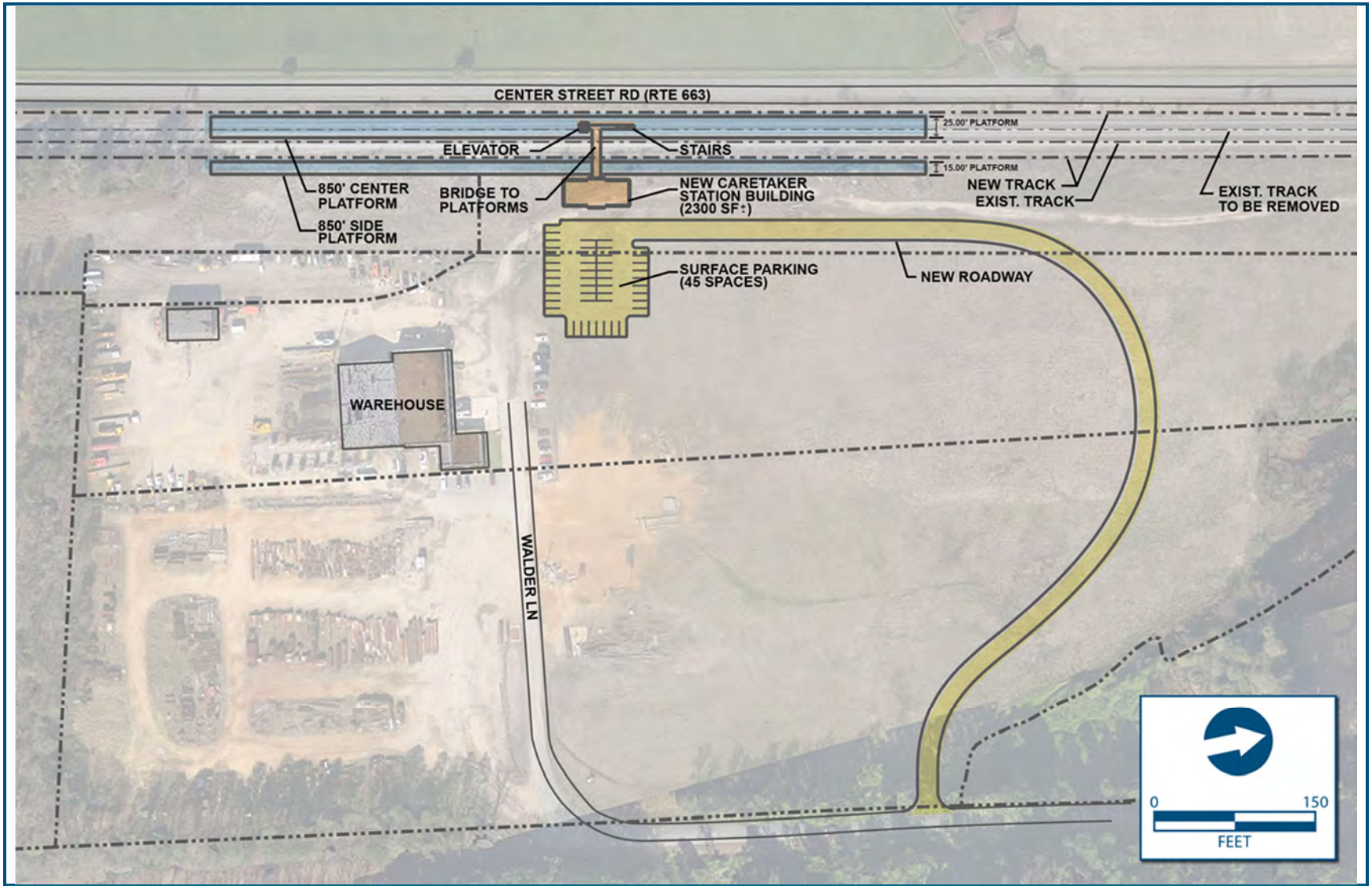


Figure 2.5-20: Ashcake Station Improvements for Build Alternatives 5A–Ashcake, 5B–Ashcake, 5C–Ashcake, and 5D–Ashcake

2.5.2.6 Area 6: Richmond (I-295 to Centralia) Build Alternatives

The Richmond area (CFP 9 to A11) encompasses the area from I-295 through Richmond to Centralia. In Richmond, the A-Line and S-Line railroads diverge at the south end of Acca Yard forming two routes through the city. The westward of the two routes is the A-Line, which arcs around Richmond as the double-track North End Subdivision, CSXT's principal freight route between Richmond and points south toward North Carolina. The eastward of the two routes is the S-Line, which passes through the center of Richmond as the Bellwood Subdivision, used primarily by local freights to serve industries and Amtrak service to Newport News. The A-Line and the S-Line reconnect at Centralia, approximately 14 miles south of the south Acca Yard wye.

DRPT developed alternatives for the Richmond area based on passenger train routes and potential station locations, with the majority of potential improvements largely within existing railroad right-of-way. Alternatives vary on whether they use the A-Line or S-Line, based primarily on the ability to service both passenger train and freight service routes and potential station locations. DRPT identified eight Build Alternatives, to include four single station alternatives that would consolidate service to one station, and three potential two-station alternatives that offer combinations of services and rail lines using the existing Main Street Station and Staples Mill Road Station.

Each Build Alternative is described further below in Table 2.5-12 and shown in Figure 2.5-21 through Figure 2.5-38, which include maps of the Build Alternative rail alignments as well as station build improvements.

Table 2.5-12 includes descriptions of which passenger train types serve which stations for each Build Alternative. For the single station alternatives, all alternatives provide Interstate Corridor (SEHSR and Carolinian), Northeast Regional (SEHSR and Virginia), and Amtrak Long Distance service to one station. Service to the two-station alternatives vary by Build Alternative; however, all alternatives do provide Northeast Regional (SEHSR) and Interstate Corridor (SEHSR) service to at least one station; which station, as well as Long Distance (Amtrak), Interstate Corridor (Carolinian), and Northeast Regional (Virginia) service, varies by Build Alternative. The Auto Train (Amtrak) does not stop in Richmond.

For reference, passenger trains serve Richmond in existing and No Build conditions as follows:

- Northeast Regional (Virginia) trains currently terminating at Richmond terminate at the Staples Mill Road Station; however, under No Build conditions, those trains are extended to Norfolk.
- Northeast Regional (Virginia) trains terminating at Newport News stop at Staples Mill Road Station, are routed on the S-Line to the east side of Main Street Station where they stop, and then continue on the Peninsula Subdivision.

There are no changes to CSXT freight service routes on the A-Line or S-Line as a result of proposed changes to passenger train routes through Richmond as part of the DC2RVA Project.

Detailed graphics illustrating the specific improvements are in Appendix H.

Table 2.5-12: Area 6: Richmond Build Alternatives

Build Alternative	Proposed Improvements
6A: Staples Mill Road Station Only ***Rail Alignment: Figure 2.5-21*** ***Station: Figure 2.5-24*** This alternative includes infrastructure and station improvements associated with service consolidated to Staples Mill Road Station. Main Street Station would be closed to passenger rail service. 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. Freight and passenger rail service operating together on the A-Line, CSXT's principal freight corridor, would increase rail congestion/delay. *Passenger Service*: Interstate Corridor (SEHSR and Carolinian), Northeast Regional (SEHSR and Virginia) service to Norfolk, and Long Distance (Amtrak) passenger trains moving north-south through Richmond would be routed through Staples Mill Road Station to Centralia using the A-Line. One Northeast Regional (SEHSR) round trip would terminate at Staples Mill Road Station. Northeast Regional (SEHSR and Virginia) service to Newport News would continue from Staples Mill Road Station past Main Street Station (closed) on the S-Line, then on the Peninsula Subdivision.	Track ▪ Add a third main line track on the A-Line from Meadows (A 1.0) (south of the James River) to Centralia (A 10.7). The added track is on the east side of the existing track north of the Clopton Lead (A 5.5) and transitions to the west side south of Clopton to the junction with the S-Line at Centralia (A 10.7). ▪ Shift tracks on the A-Line east to improve speed between MP 1.2 and 1.4. ▪ Add a third main track from Greendale (CFP 4.8) to Staples Mill Road Station (CFP 4.6). ▪ Improve the existing two main tracks from Acca Yard (CFP 1.7) to AM Junction (CA 85.5). ▪ Add a second main track on the existing elevated rail structure on the east side of Main Street Station (SRN 0.0) from AM Junction (CA 85.5) to Rivanna Junction (CA 84.5). ▪ Install 36- to 48-inch culverts, as required for drainage, under the rail line along the alignment. ▪ Install stormwater management facilities. ▪ Install signal and communication facilities. Stations ▪ Staples Mill Road Station (CFP 4.6) - Modify existing platforms to one low-level island boarding platform and one level island platform. - Construct a pedestrian bridge with an elevator and stairs to access the platforms. - Replace the existing station building with a two-story building. - Construct surface parking for approximately 340 spaces and parking garage for approximately 300 spaces to replace the existing surface parking lot. ▪ Close Main Street Station to intercity passenger rail service. Structures ▪ Replace deficient road overpasses with new structures providing sufficient vertical and horizontal clearance for the new track including: - Midlothian Turnpike (A 1.55) - State Route 288 (A 10.35)
6B–A-Line: Boulevard Station Only, A-Line ***Rail Alignment: Figure 2.5-22*** ***Station: Figure 2.5-25*** This alternative includes infrastructure and station improvements associated with service consolidated to a new station at Boulevard, which would include an elevated loop track. Staples Mill Road Station and Main Street Station would be closed to passenger rail service. 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. Freight and passenger rail service operating together on the A-Line, CSXT's principal freight corridor, would increase rail congestion/delay.	Track ▪ Add a third main line track from Greendale (CFP 4.8) to former Staples Mill Road Station (CFP 4.6) and add a fifth main line track from Staples Mill Road Station (CFP 4.6) to north Acca Yard (CFP 3.4). ▪ Add a two-track bypass on the east side of Acca Yard (CFP 1.7). ▪ Add a third main track from Acca Yard (CFP 1.7) to the proposed Boulevard Station. ▪ Add a second main track on the existing elevated rail structure on the east side of Main Street Station (SRN 0.0) from AM Junction (CA 85.5) to Rivanna Junction (CA 84.5). ▪ Add a third main line track on the A-Line from Meadows (A 1.0) (south of the James River) to Centralia (A10.7). The added track is on the east side of the existing track north of the Clopton Lead (A 5.5) and transitions to the west side south of Clopton to the junction with the S-Line at Centralia (A 10.7).

▶ Continued.

Table 2.5-12: Area 6: Richmond Build Alternatives

Build Alternative	Proposed Improvements
Passenger Service: Interstate Corridor (SEHSR and Carolinian), Northeast Regional (SEHSR and Virginia) service to Norfolk, and Long Distance (Amtrak) passenger trains moving north-south through Richmond would be routed through a new Boulevard Station and then to Centralia using the A-Line. One Northeast Regional (SEHSR) round trip would terminate at the new Boulevard Station. Northeast Regional (SEHSR and Virginia) passenger service to Newport News would continue from the new Boulevard Station past Main Street Station (closed) on the S-Line, then on the Peninsula Subdivision.	▪ Shift tracks on the A-Line east to improve speed between MP 1.2 and 1.4. ▪ Install 36- to 48-inch culverts, as required for drainage, under the rail line along the alignment. ▪ Install stormwater management facilities. ▪ Install signal and communication facilities. Stations ▪ Boulevard Station - Construct a new two-story station building adjacent to the main line tracks. - Construct one low-level island boarding platform and one level island platform; both 1,200 feet in length. - Construct a pedestrian bridge with an elevator and stairs to access the platforms. - Construct surface parking for approximately 30 spaces and parking garage for approximately 600 spaces adjacent to the new station building. ▪ Close Main Street Station and Staples Mill Road Station to intercity passenger rail service. Structures ▪ Replace deficient road overpasses with new structures providing sufficient vertical and horizontal clearance for the new track including: - Dumbarton Road (CFP 3.71) - North Boulevard (SRN 3.90) - Midlothian Turnpike (A 1.55) - State Route 288 (A 10.35)
6B–S-Line: Boulevard Station Only, S-Line ***Rail Alignment: Figure 2.5-23*** ***Station: Figure 2.5-25*** This alternative includes infrastructure and station improvements associated with service consolidated to a new station at Boulevard Road. Staples Mill Road Station and Main Street Station would be closed to passenger rail service. 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. 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 (i.e., the A-Line), would reduce rail congestion/delay. *Passenger Service*: All Interstate Corridor (SEHSR and Carolinian), Northeast Regional (SEHSR and Virginia) to Norfolk, and Long Distance (Amtrak) passenger trains moving north-south through Richmond would be routed through a new Boulevard Station and then to Centralia using the S-Line. One Northeast Regional (SEHSR) round trip would terminate at the new Boulevard Station.	Track ▪ Add a third main line track from Greendale (CFP 4.8) to former Staples Mill Road Station (CFP 4.6) and add a fifth main line track from Staples Mill Road Station (CFP 4.6) to north Acca Yard (CFP 3.4). ▪ Add a two-track bypass on the east side of Acca Yard (CFP 1.7). ▪ Add a third main track from Acca Yard (CFP 1.7) to AM Junction (CA 85.5). ▪ Add a new wye track near Hospital Street (SRN 1.23) to turn passenger trains. ▪ Add a new passenger layover/servicing facility near Brown Street Yard (SRN 0.4) with three tracks. ▪ Add a second main track on the existing elevated rail structure on both the east and west side of Main Street Station (SRN 0.0) from AM Junction (CA 85.5) to Rivanna Junction (CA 84.5) with the west track extending from AM Junction (CA 85.5) to the Triple Rail Crossing. ▪ Add a second main track on the S-Line from the Triple Rail Crossing to Centralia (S 10.9) where only a single track currently exists. ▪ Install 36- to 48-inch culverts, as required for drainage, under the rail line along the alignment. ▪ Install stormwater management facilities. ▪ Install signal and communication facilities.

▶ Continued.

Table 2.5-12: Area 6: Richmond Build Alternatives

Build Alternative	Proposed Improvements
Northeast Regional (SEHSR and Virginia) passenger service to Newport News would continue from the new Boulevard Station past Main Street Station (closed) on the S-Line, then on the Peninsula Subdivision.	Stations ▪ Boulevard Station - Construct a new two-story station building adjacent to the main line tracks. - Construct one low-level island boarding platform and one level island platform; both 1,200 feet in length. - Construct a pedestrian bridge with an elevator and stairs to access the platforms. - Construct surface parking for approximately 30 spaces and parking garage for approximately 600 spaces adjacent to the new station building. ▪ Close Main Street Station and Staples Mill Road Station to intercity passenger rail service. Structures ▪ Replace deficient road overpasses with new structures providing sufficient vertical and horizontal clearance for the new track including: - Dumbarton Road (CFP 3.71) - North Boulevard (SRN 3.90) - Elliham Avenue (S 7.83) ▪ Plan for construction of a new rail bridge on the S-Line across the James River from the Triple Rail Crossing (includes construction of one track on bridge plus space for a second track).
6C: Broad Street Station Only ***Rail Alignment: Figure 2.5-26*** ***Station: Figure 2.5-28*** This alternative includes infrastructure and station improvements associated with service consolidated to a new Broad Street Station, which includes an at-grade loop track. Staples Mill Road Station and Main Street Station would be closed to passenger rail service. 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. Freight and passenger rail service operating together on the A-Line, CSXT's principal freight corridor, would increase rail congestion/delay. *Passenger Service*: Interstate Corridor (SEHSR and Carolinian), Northeast Regional (SEHSR and Virginia) to Norfolk, and Long Distance (Amtrak) passenger trains moving north-south through Richmond would be routed through a new Broad Street station on a loop track and then to Centralia using the A-Line. One Northeast Regional (SEHSR) round trip would terminate at Broad Street. Northeast Regional (SEHSR and Virginia) passenger service to Newport News would continue from the new Broad Street Station loop track past Main Street Station (closed) on the S-Line, then on the Peninsula Subdivision.	Track ▪ Add a third main line track from Greendale (CFP 4.8) to Staples Mill Road Station (CFP 4.6). ▪ Add a loop track, similar to the historic loop track that once served the Broad Street station. The loop track would enclose the area currently used for the Washington Redskins Football Team summer training camp, and require demolition of several existing buildings. ▪ Add a second main track on the existing elevated rail structure on the east side of Main Street Station (SRN 0.0) from AM Junction (CA 85.5) to Rivanna Junction (CA 84.5). ▪ Add a third main line track on the A-Line from Meadows (A 1.0) (south of the James River) to Centralia (A 10.7). The added track is on the east side of the existing track north of the Clopton Lead (A 5.5) and transitions to the west side south of Clopton to the junction with the S-Line at Centralia (A 10.7). ▪ Shift tracks on the A-Line east to improve speed between MP 1.2 and 1.4. ▪ Install 36- to 48-inch culverts, as required for drainage, under the rail line along the alignment. ▪ Install stormwater management facilities. ▪ Install signal and communication facilities. Stations ▪ Broad Street Station - Construct a new two-story station building adjacent to the old Broad Street Station building (now the Virginia Science Museum). - Construct two level island platforms 1,000 feet in length. - Construct a pedestrian bridge with an elevator and stairs to access the platforms.

▶ Continued.

Table 2.5-12: Area 6: Richmond Build Alternatives

Build Alternative	Proposed Improvements
	- Construct surface parking for approximately 300 spaces and parking garage for approximately 300 spaces adjacent to the new station building. ▪ Close Main Street Station and Staples Mill Road Station to intercity passenger rail service. Structures ▪ Replace deficient road overpasses with new structures providing sufficient vertical and horizontal clearance for the new track including: - Midlothian Turnpike (A 1.55) - State Route 288 (A 10.37)
6D: Main Street Station Only ***Rail Alignment: Figure 2.5-27*** ***Station: Figure 2.5-29*** This alternative includes infrastructure and station improvements associated with service consolidated to Main Street Station. Staples Mill Road Station would be closed. 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. 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 (i.e., the A-Line), would reduce rail congestion/delay. *Passenger Service*: All Interstate Corridor (SEHSR and Carolinian), Northeast Regional (SEHSR and Virginia) to Norfolk, and Long Distance (Amtrak) passenger trains moving north-south through Richmond would be routed to the west side of Main Street Station and then to Centralia using the S-Line. One Northeast Regional (SEHSR) round trip would terminate at Main Street Station. Northeast Regional (SEHSR and Virginia) passenger service to Newport News would be routed to the east side of Main Street Station and then on the Peninsula Subdivision.	Track ▪ Add a third main line track from Greendale (CFP 4.8) to former Staples Mill Road Station (CFP 4.6) and add a fifth main line track from Staples Mill Road Station (CFP 4.6) to north Acca Yard (CFP 3.4). ▪ Add a two-track bypass on the east side of Acca Yard (CFP 1.7). ▪ Add a third main track from Acca Yard (CFP 1.7) to AM Junction (CA 85.5). ▪ Add a new wye track near Hospital Street (SRN 1.23) to turn passenger trains. ▪ Add a new passenger layover/servicing facility near Brown Street Yard (SRN 0.4) with three tracks. ▪ Add a second main track on the existing elevated rail structure on both the east and west side of Main Street Station (SRN 0.0) from AM Junction (CA 85.5) to Rivanna Junction (CA 84.5) with the west track extending from AM Junction (CA 85.5) to the Triple Rail Crossing. ▪ Add a second main track on the S-Line from the James River to Centralia (S 10.9) where only a single track currently exists. ▪ Add a new 12,000-foot staging track extending south from the South Yard (S 1.7). ▪ Install 36- to 48-inch culverts, as required for drainage, under the rail line along the alignment. ▪ Install stormwater management facilities. ▪ Install signal and communication facilities. Stations ▪ Main Street Station (SRN 0.0) ▪ Construct new station facilities (approximately 6,800 square feet) within the existing station building and renovated train shed. ▪ Construct two low-level boarding platforms (850 feet in length) east of the existing station and two low-level boarding platforms (1,200 feet in length) west of the existing station. ▪ Construct surface parking and two parking garages for approximately 600 spaces east of the existing station building. ▪ Close Staples Mill Road Station to intercity passenger rail service. Structures ▪ Replace deficient road overpasses with new structures providing sufficient vertical and horizontal clearance for the new track including: - Dumbarton Road (CFP 3.71) - Elliham Avenue (CFP 7.83) ▪ Plan for construction of a new rail bridge on the S-Line across the James River from the Triple Rail Crossing (includes construction of one track on bridge plus space for a second track).

▶ Continued.

Table 2.5-12: Area 6: Richmond Build Alternatives

Build Alternative	Proposed Improvements
6E: Split Service, Staples Mill Road/Main Street Stations ***Rail Alignment: Figure 2.5-30*** ***Stations: Figure 2.5-31 and Figure 2.4-32*** This alternative includes infrastructure improvements associated with station and service improvements at both Main Street Station and Staples Mill Road Station-Split Service; both stations would remain operational. 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. Freight and passenger rail service operating together on the A-Line, CSXT's principal freight corridor, would increase rail congestion/delay. *Passenger Service*: As described further below, all passenger trains that stop in Richmond serve Staples Mill Road Station; trains to and from Newport News additionally serve Main Street Station. Interstate Corridor (SEHSR and Carolinian), Northeast Regional (SEHSR and Virginia) to Norfolk, and Long Distance (Amtrak) passenger trains moving north-south through Richmond would be routed through Staples Mill Road Station to Centralia using the A-Line, bypassing Main Street Station. One Northeast Regional (SEHSR) round trip would terminate at Main Street Station. Northeast Regional (SEHSR and Virginia) passenger service to Newport News would continue from Staples Mill Road station to the east side of Main Street Station on the S-Line, then continue on the Peninsula Subdivision.	Track ▪ Add a third main track from Greendale (CFP 4.8) to Acca Yard (CFP 1.7). ▪ Improve the two main line tracks from Acca Yard (CFP 1.7) to AM Junction (CA 85.5). ▪ Add a new wye near Hospital Street (SRN 1.23) to turn passenger trains. ▪ Add a new passenger layover/servicing facility near Brown Street Yard (SRN 0.4) with three tracks. ▪ Add a second main track on the existing elevated rail structure on the east side of Main Street Station (SRN 0.0) from AM Junction (CA 85.5) to Rivanna Junction (CA 84.5). ▪ Add a third main line track on the A-Line from Meadows (A 1.0) (south of the James River) to Centralia (A 10.7). The added track is on the east side of the existing track north of the Clopton Lead (A 5.5) and transitions to the west side south of Clopton to the junction with the S-Line at Centralia (A 10.7). ▪ Shift tracks on the A-Line east to improve speed between MP 1.2 and 1.4. ▪ Install 36- to 48-inch culverts, as required for drainage, under the rail line along the alignment. ▪ Install stormwater management facilities. ▪ Install signal and communication facilities. Stations ▪ Staples Mill Road Station (CFP 4.6) - Construct new platforms, to include one low-level island boarding platform east of all new tracks and one level island platform between the new tracks. - Construct a pedestrian bridge with an elevator and stairs to access the platforms. - Replace the existing station building with an approximately 10,400 square foot two-story building. - Construct surface parking for approximately 300 spaces and parking garage for approximately 300 spaces to replace the existing surface parking lot. ▪ Main Street Station (SRN 0.0) - Construct station facilities within the approximately 6,800 square foot existing station building and renovated train shed. - Construct two low-level island boarding platform (850 feet in length) east of the existing station. - Construct surface parking for approximately 80 spaces east of the existing station building. Structures ▪ Replace deficient road overpasses with new structures providing sufficient vertical and horizontal clearance for the new track including: - Midlothian Turnpike (A 1.55) - State Route 288 (A 10.35)

▶ Continued.

Table 2.5-12: Area 6: Richmond Build Alternatives

Build Alternative	Proposed Improvements
6F: Full Service, Staples Mill Road/Main Street Stations ***Rail Alignment: Figure 2.5-33*** ***Stations: Figure 2.5-34 and Figure 2.4-35*** This alternative includes infrastructure improvements associated with station and service improvements at Main Street Station and Staples Mill Road Station-Full Service; both stations would remain operational. 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. 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 (i.e., the A-Line), would reduce rail congestion/delay. *Passenger Service*: As described further below, all passenger trains that stop in Richmond serve both stations. Interstate Corridor (SEHSR and Carolinian), Northeast Regional (SEHSR and Virginia) to Norfolk, and Long Distance (Amtrak) passenger trains moving north-south through Richmond would be routed through Staples Mill Road Station to the west side of Main Street Station and then to Centralia using the S-Line. One Northeast Regional (SEHSR) round trip would terminate at Main Street Station. Northeast Regional (SEHSR and Virginia) passenger service to Newport News would continue from the east side of Main Street Station on the Peninsula Subdivision.	Track ▪ Add a third main line track from Greendale (CFP 4.8) to Staples Mill Road Station (CFP 4.6) and add a fifth main line track from Staples Mill Road Station (CFP 4.6) to north Acca Yard (CFP 3.4). ▪ Add a two-track bypass on the east side of Acca Yard (CFP 1.7). ▪ Add a third main track from Acca Yard (CFP 1.7) to AM Junction (CA 85.5). ▪ Add a new wye track near Hospital Street (SRN 1.23) to turn passenger trains. ▪ Add a new passenger layover/servicing facility near Brown Street Yard (SRN 0.4) with three tracks. ▪ Add a second main track on the existing elevated rail structure on both the east and west side of Main Street Station (SRN 0.0), with the east track extending from AM Junction (CA 85.5) to Rivanna Junction (CA 84.5) and the west track extending from AM Junction (CA 85.5) to the Triple Rail Crossing. ▪ Add a second main track on the S-Line from the James River to Centralia (S 10.9) where only a single track currently exists. ▪ Add a new 12,000-foot staging track from the South Yard. ▪ Install 36- to 48-inch culverts, as required, under the rail line. ▪ Install stormwater management facilities. ▪ Install signal and communication facilities. Stations ▪ Staples Mill Road Station (CFP 4.6) - Remove existing platforms and construct one low-level island boarding platform and one level island platform; both 1,200 feet in length on east side of main tracks - Construct a pedestrian bridge with an elevator and stairs to access the platforms. - Replace the existing station building with an approximately 10,400 square foot two-story building. - Construct surface parking for approximately 400 spaces to replace the existing surface parking lot. ▪ Main Street Station (SRN 0.0) - Construct station facilities within the approximately 6,800 square foot existing station building and renovated train shed. - Construct two low-level boarding platforms (850 feet in length) east of the existing station and two low level platforms (850 feet in length) west of the existing station. Long distance passenger trains would be served by the new 850-foot platforms as there is no baggage service nor are crew changes required at the Main Street Station under this Build Alternative. - Construct parking garage for approximately 300 spaces east of the existing station building. Structures ▪ Replace deficient road overpasses with new structures providing sufficient vertical and horizontal clearance for the new track including: - Dumbarton Road (CFP 3.71) - Elliham Avenue (S 7.83) ▪ Plan for construction of a new rail bridge on the S-Line across the James River (includes construction of one track on bridge plus space for a second track).

▶ Continued.

Table 2.5-12: Area 6: Richmond Build Alternatives

Build Alternative	Proposed Improvements
6G: Shared Service, Staples Mill Road/Main Street Stations ***Rail Alignment: Figure 2.5-36*** ***Stations: Figure 2.5-37 and Figure 2.4-38*** This alternative includes infrastructure improvements associated with station and service improvements at Main Street Station and Staples Mill Road Station-Shared Service; both stations would remain operational. 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; while the A-Line is used for service as part of this alternative, it does not require proposed new track. Freight and passenger rail service operating together on the A-Line, CSXT's principal freight corridor, would increase rail congestion/delay. *Passenger Service*: As described further below, all new proposed SEHSR service (Interstate Corridor and Northeast Regional) serve both stations, while other Amtrak passenger trains that stop in Richmond serve either one or both stations. Interstate Corridor (SEHSR) and Northeast Regional (SEHSR and Virginia) to Norfolk passenger trains moving north-south through Richmond would be routed from Staples Mill Road Station to the west side of Main Street Station and then to Centralia using the S-Line. Interstate Corridor (Carolinian) and Long Distance (Amtrak) passenger trains moving north-south through Richmond would be routed through Staples Mill Road Station to Centralia using the A-Line, bypassing Main Street Station. One Northeast Regional (SEHSR) round trip would terminate at Main Street Station. Northeast Regional (SEHSR and Virginia) service to Newport News would be routed from Staples Mill Road Station to the east side of Main Street Station on the S-Line, then continue on the Peninsula Subdivision.	Track ▪ Add a third main line track from Greendale (CFP 4.8) to former Staples Mill Road Station (CFP 4.6) and add a fifth main line track from Staples Mill Road Station (CFP 4.6) to north Acca Yard (CFP 3.4). ▪ Add a two-track bypass on the east side of Acca Yard (CFP 1.7). ▪ Add a third main track from Acca Yard (CFP 1.7) to AM Junction (CA 85.5). ▪ Add a new wye track near Hospital Street (SRN 1.23) to turn passenger trains. ▪ Add new passenger layover/servicing facility near Brown Street Yard (SRN 0.4) with three tracks. ▪ Add a second main track on the existing elevated rail structure on both the east and west side of Main Street Station (SRN 0.0) from AM Junction (CA 85.5) to Rivanna Junction (CA 84.5) with the west track extended to the Triple Rail Crossing. ▪ Add a second main track on the S-Line from the James River to Centralia (S 10.9) where only a single track currently exists. ▪ Add a new 12,000-foot staging track extending south from the South Yard. ▪ Install 36- to 48-inch culverts, as required for drainage, under the rail line along the alignment. ▪ Install stormwater management facilities. ▪ Install signal and communication facilities. Stations ▪ Staples Mill Road Station (CFP 4.6) - Remove existing platforms and construct four level island platforms all 1,200 feet in length (two platforms on the east side of the tracks and two platforms on the west side of the tracks). - Construct a pedestrian bridge with an elevator and stairs to access the platforms. - Replace the existing station building with an approximately 10,400 square feet two-story building. - Construct surface parking for approximately 475 spaces to replace the existing surface parking lot. ▪ Main Street Station (SRN 0.0) - Construct station facilities within the approximately 6,800 square foot existing station building and renovated train shed. - Construct two low-level boarding platforms (850 feet in length) east of the existing station and two low-level platforms (850 feet in length) west of the existing station. Long distance passenger trains would be served by the new 850-foot platforms as there is no baggage service nor are crew changes required at the Main Street Station under this Build Alternative. - Construct parking garage for approximately 200 spaces east of the existing station building. Structures ▪ Replace deficient road overpasses with new structures providing sufficient vertical and horizontal clearance for the new track including: - Dumbarton Road (CFP 3.71) - Elliham Avenue (S 7.83) ▪ Add a new rail bridge on the S-Line across the James River (with one track on the bridge)

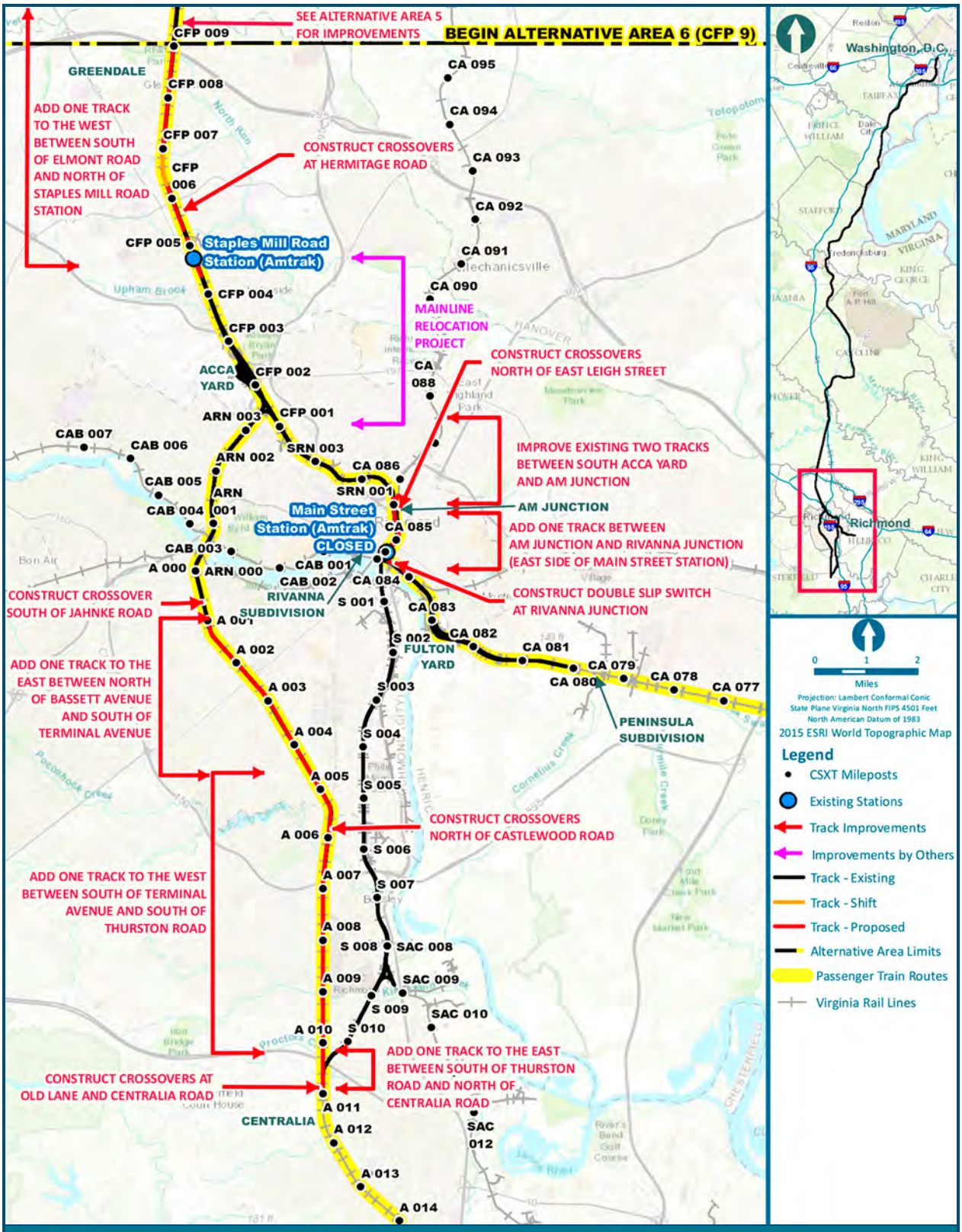


Figure 2.5-21: Build Alternative 6A – Staples Mill Road Station Only

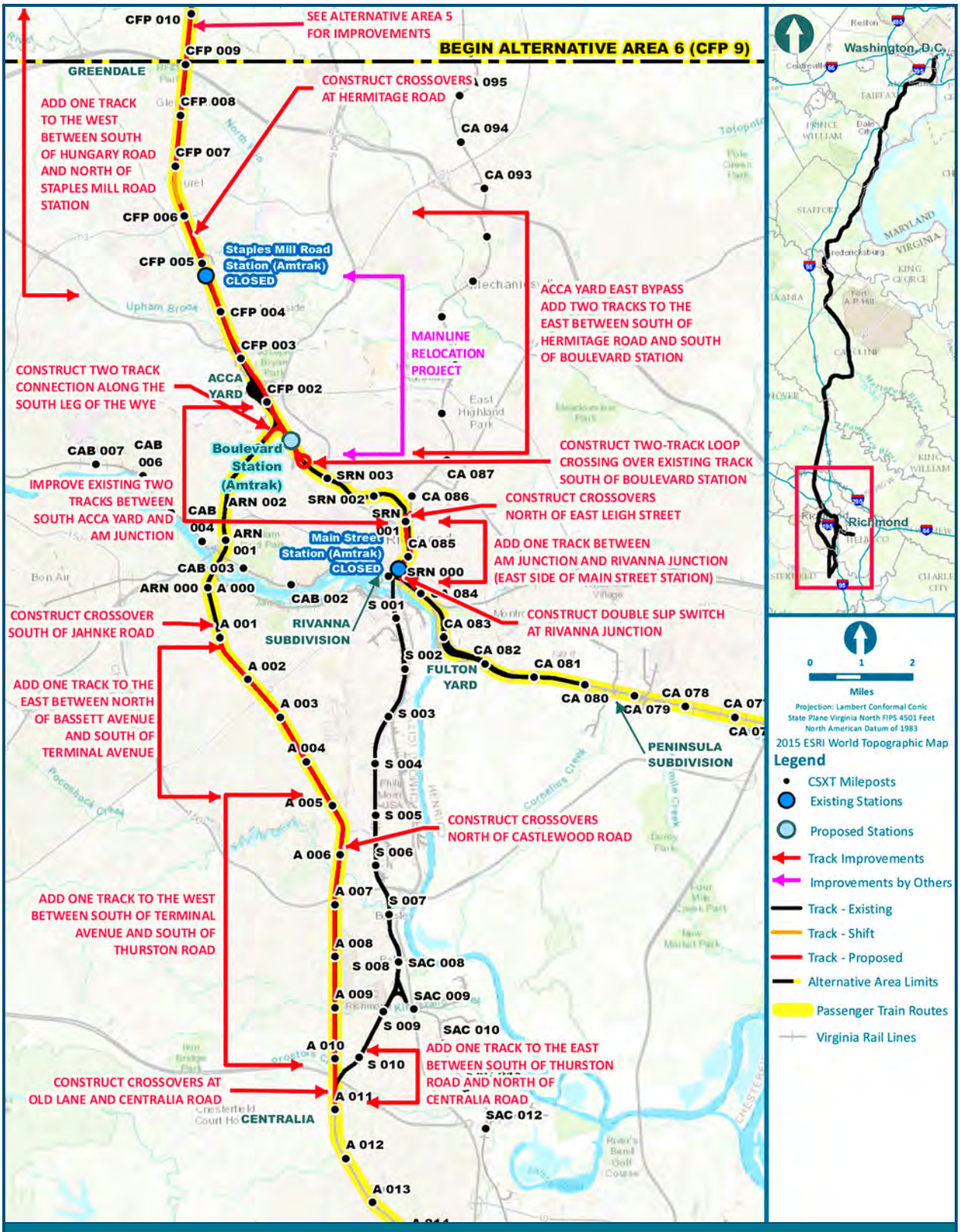


Figure 2.5-22: Build Alternative 6B–A-Line – Boulevard Station Only, A-Line

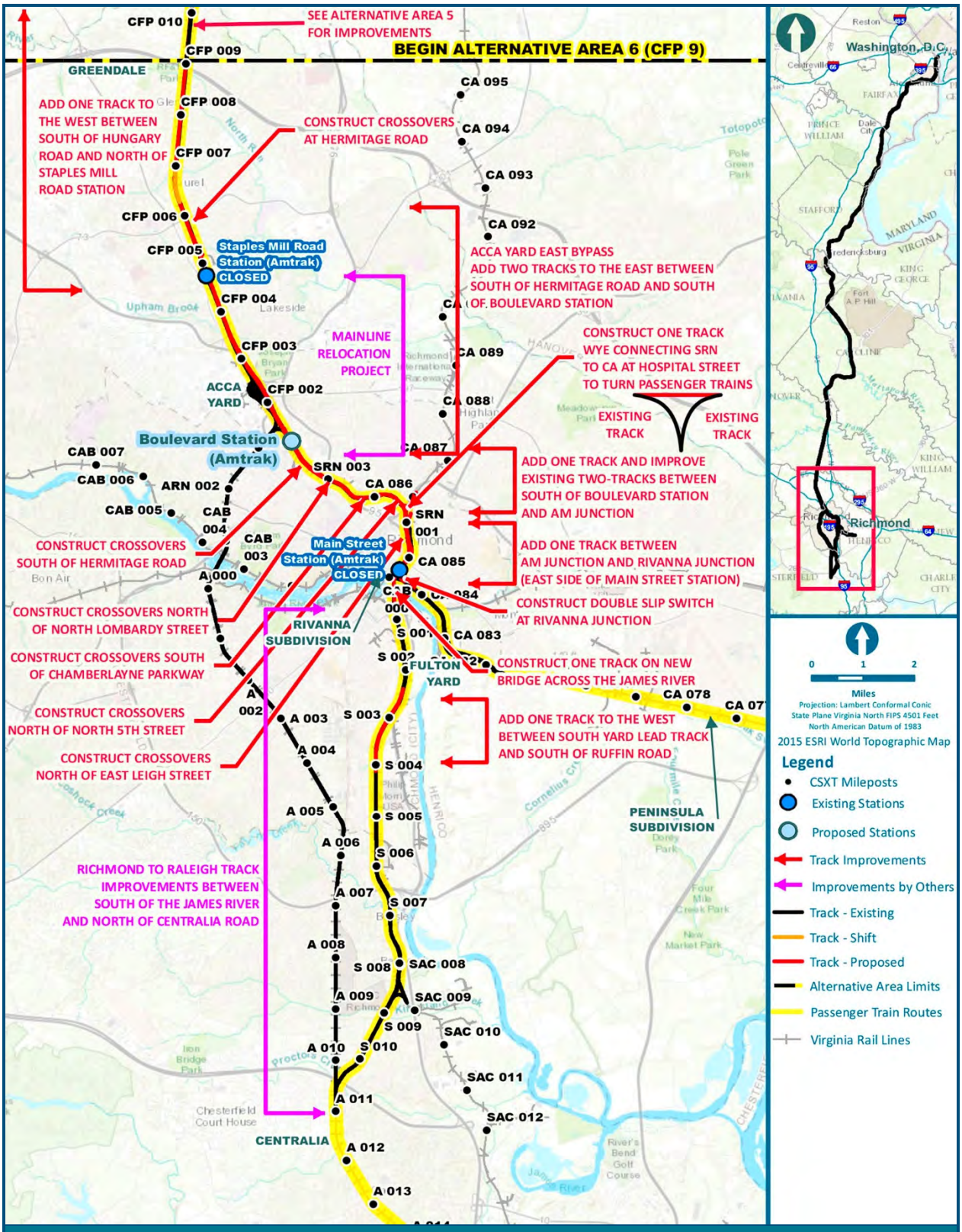


Figure 2.5-23: Build Alternative 6B–S-Line – Boulevard Station Only, S-Line

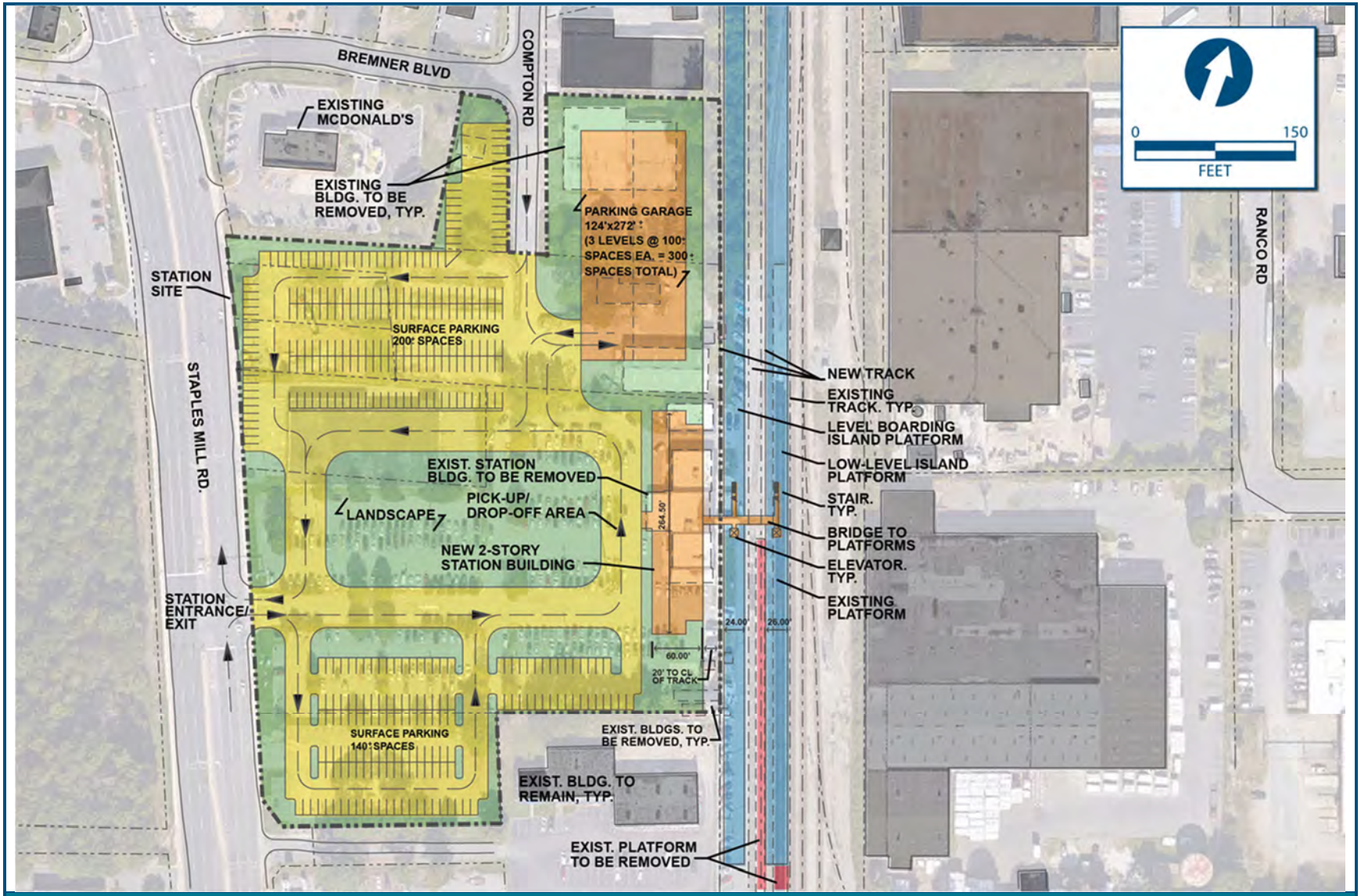


Figure 2.5-24: Staples Mill Road Station Improvements for Build Alternative 6A

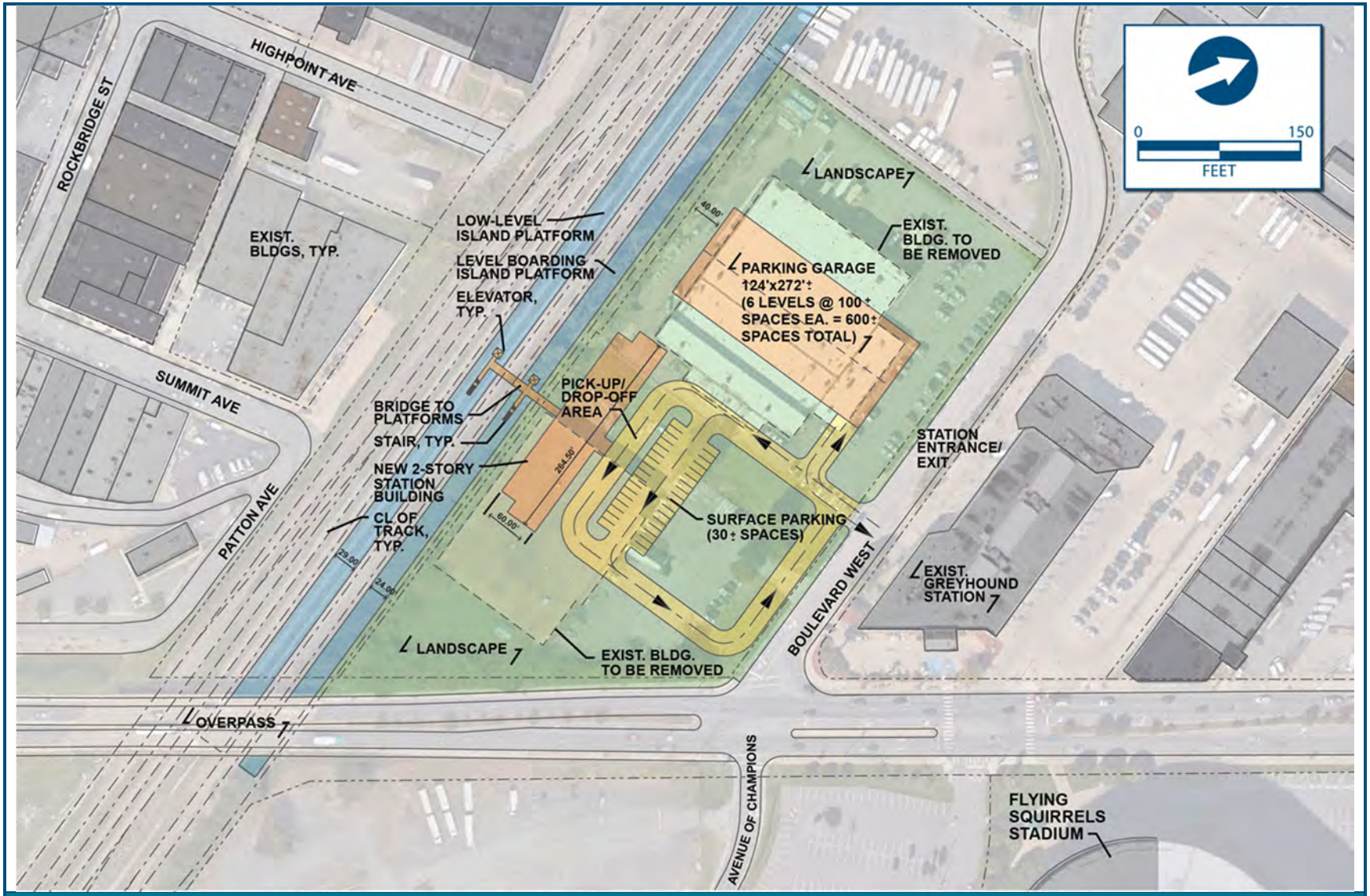


Figure 2.5-25: Boulevard Station Improvements for Build Alternatives 6B–A-Line and 6B–S-Line

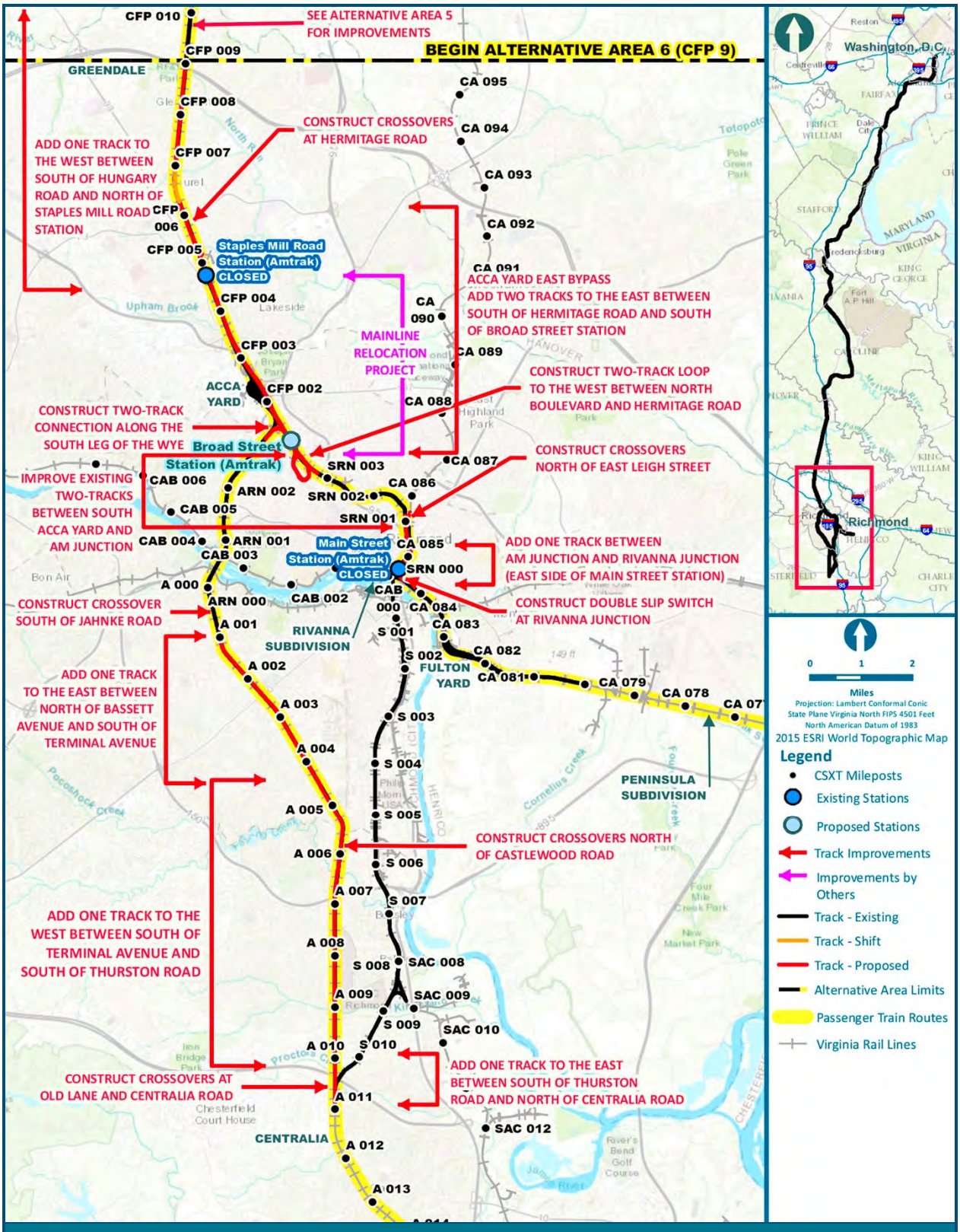


Figure 2.5-26: Build Alternative 6C – Broad Street Station Only

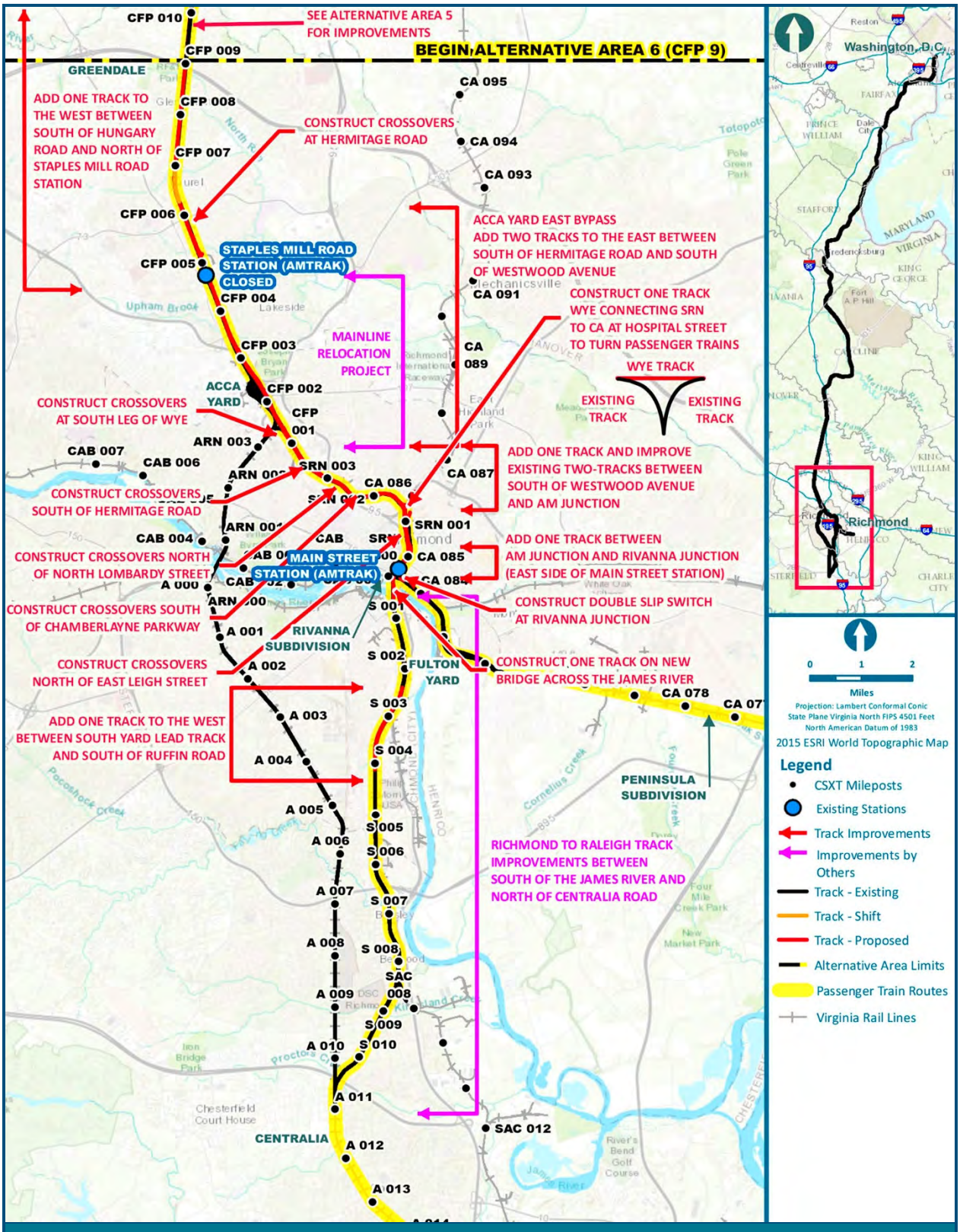


Figure 2.5-27: Build Alternative 6D – Main Street Station Only

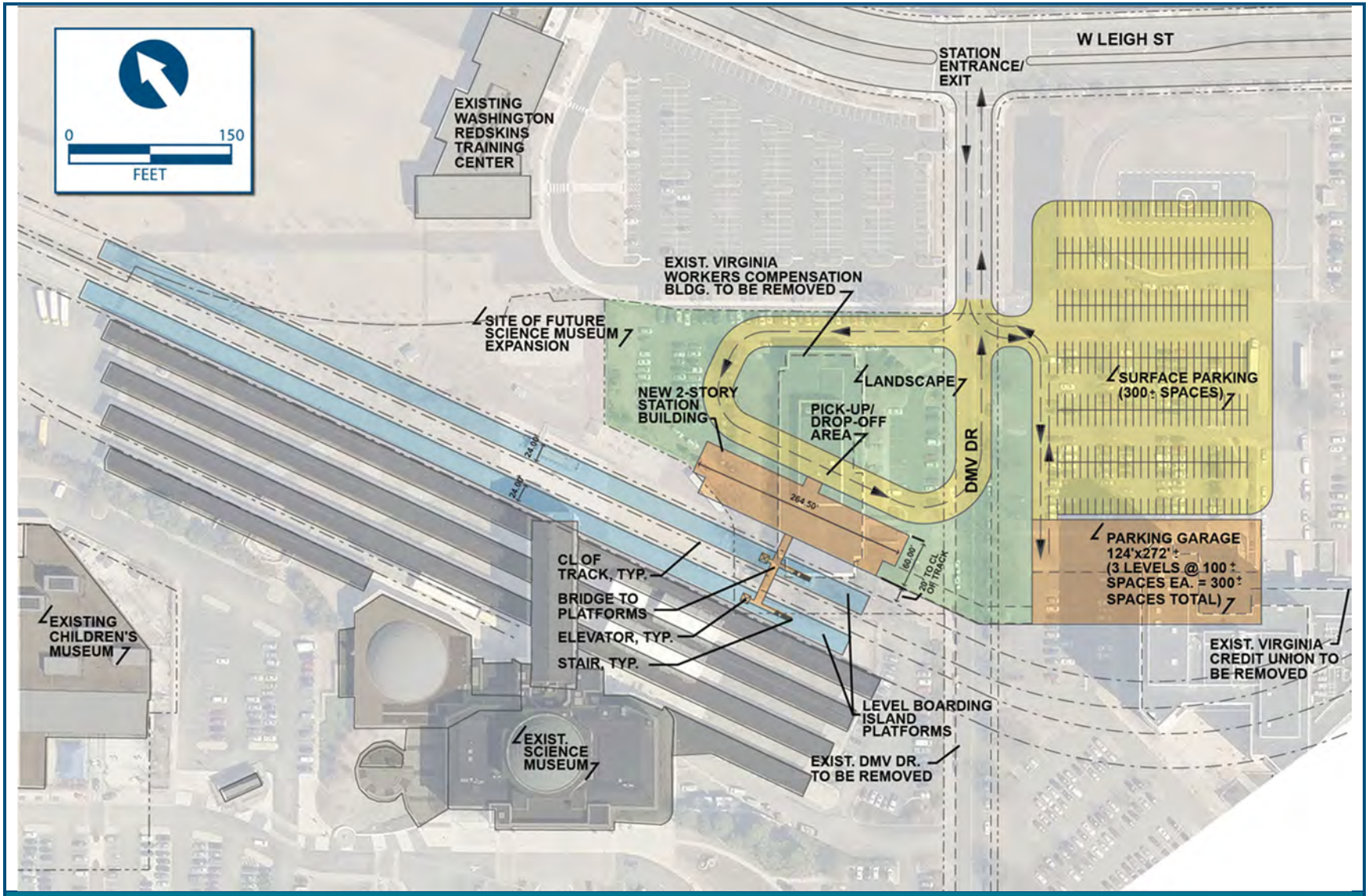


Figure 2.5-28: Broad Street Station Improvements for Build Alternative 6C

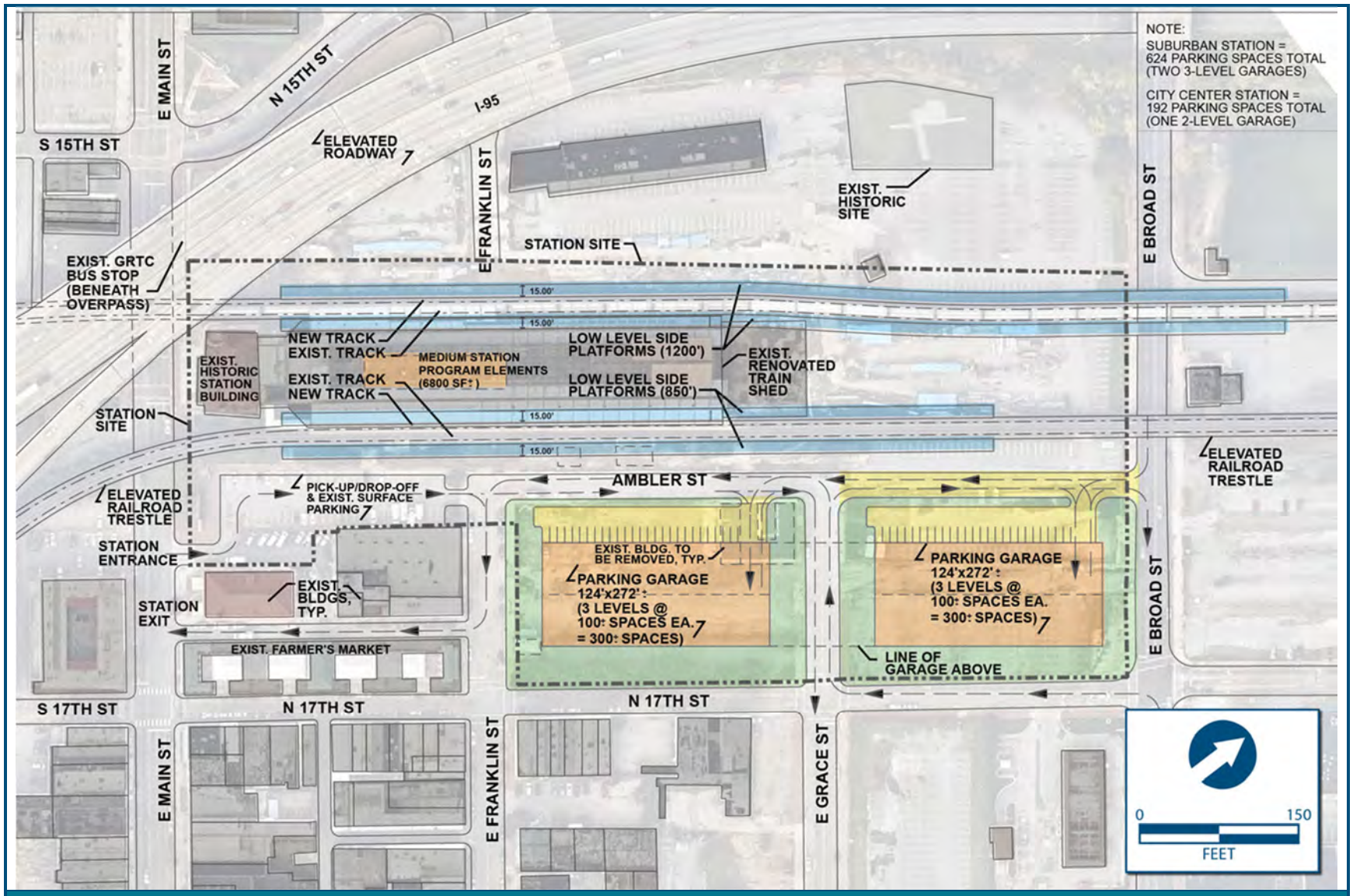


Figure 2.5-29: Main Street Station Improvements for Build Alternative 6D

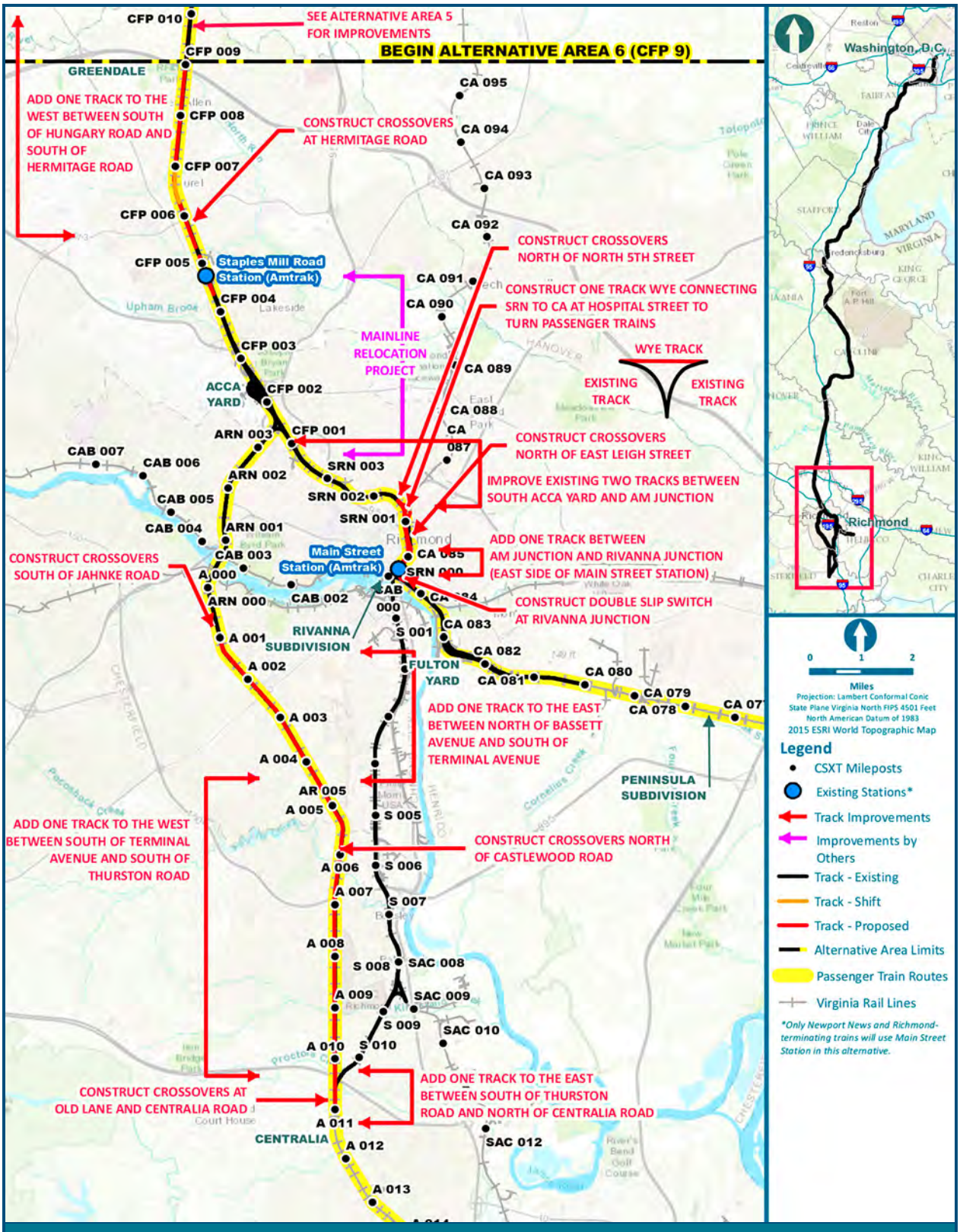


Figure 2.5-30: Build Alternative 6E – Split Service, Staples Mill Road / Main Street Stations

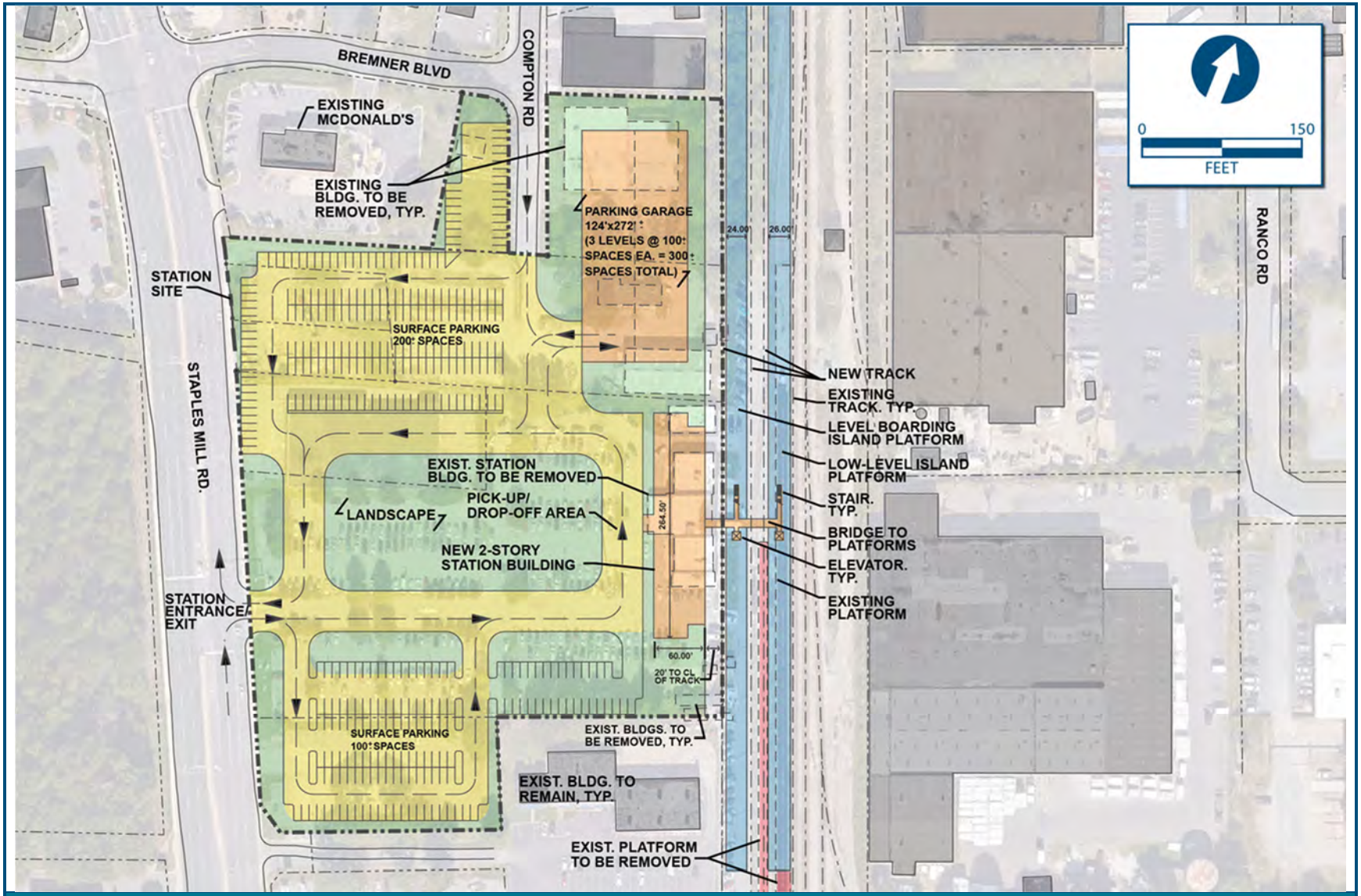


Figure 2.5-31: Staples Mill Road Station Improvements for Build Alternative 6E

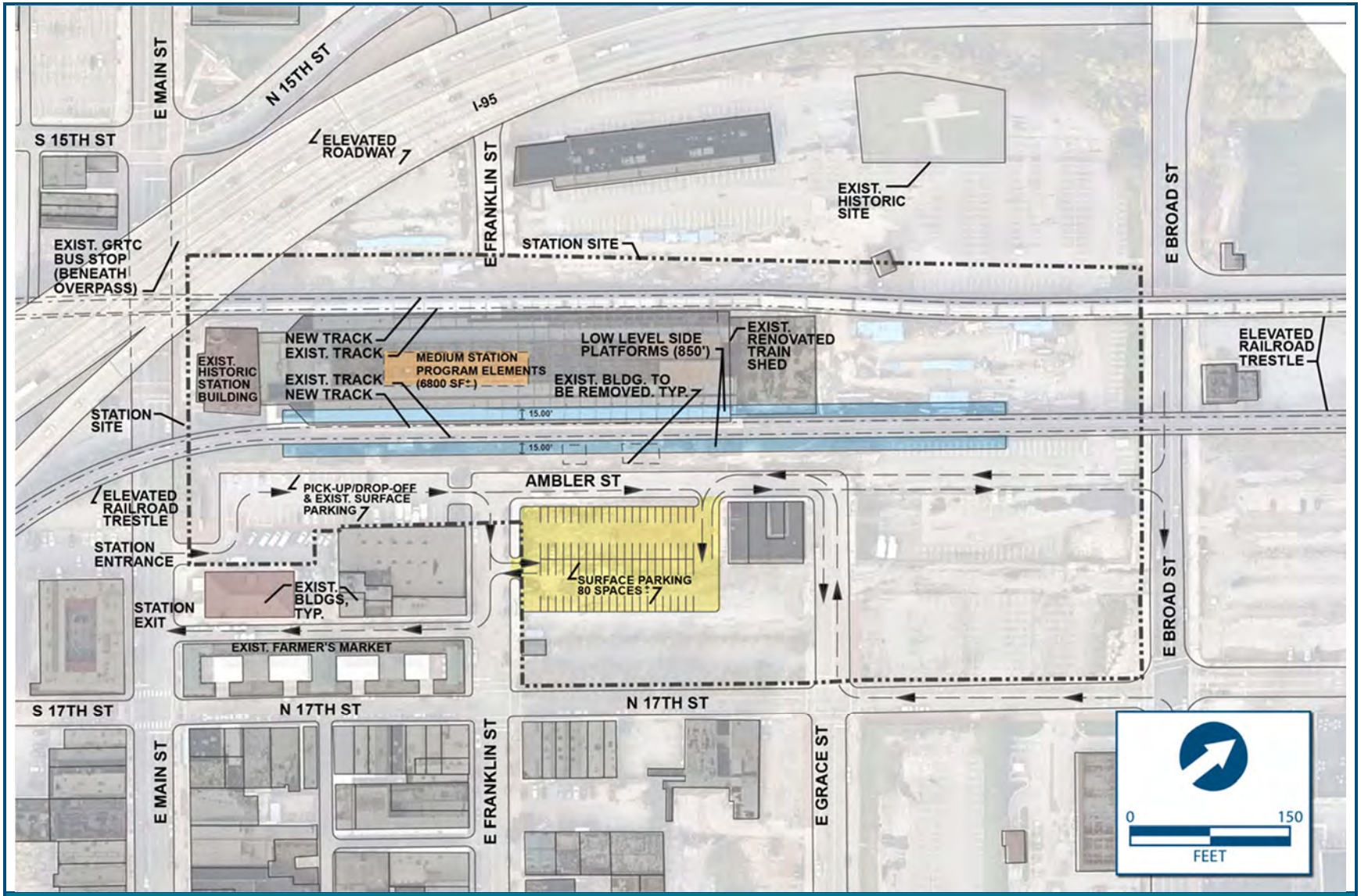


Figure 2.5-32: Main Street Station Improvements for Build Alternative 6E

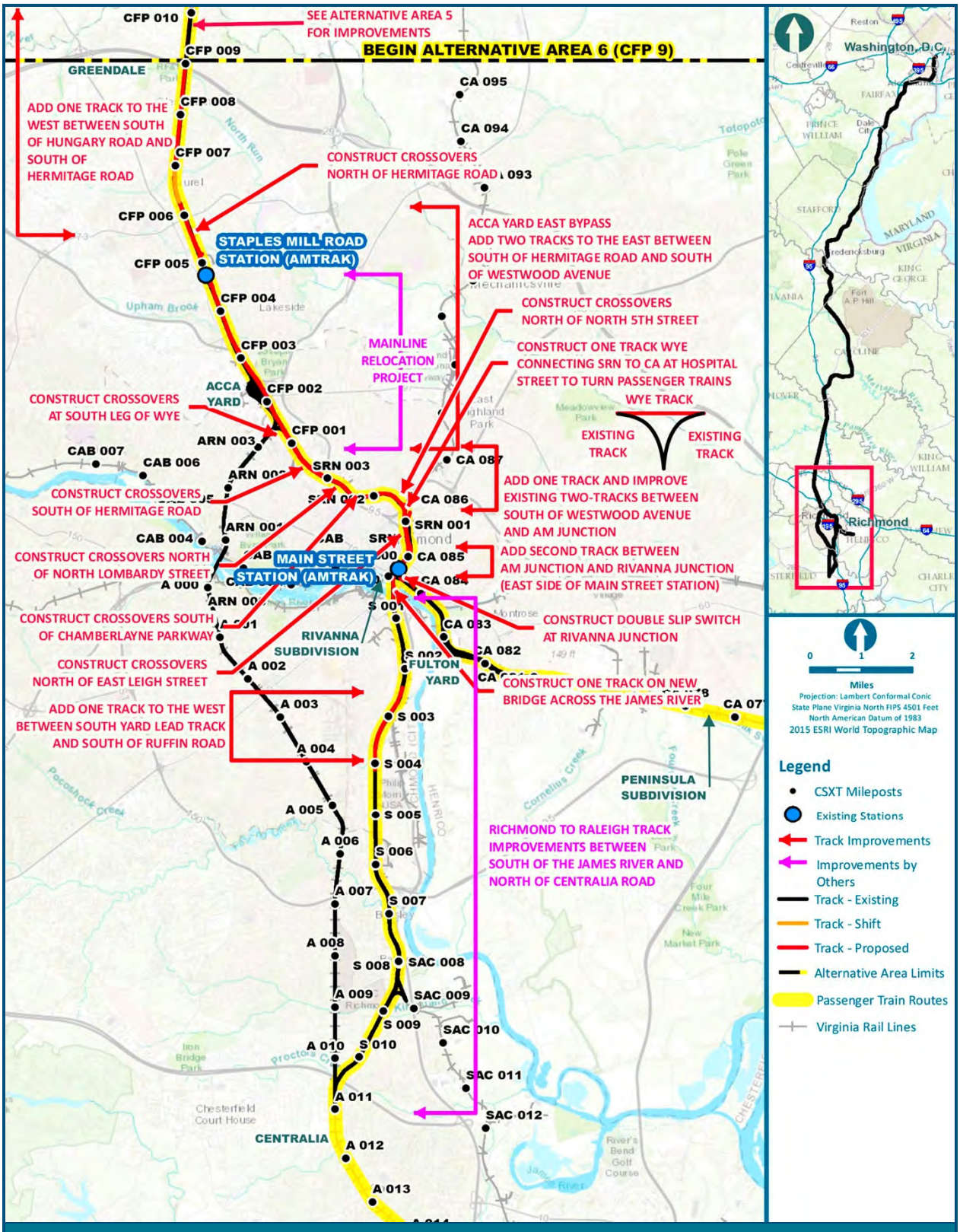


Figure 2.5-33: Build Alternative 6F – Full Service, Staples Mill Road / Main Street Stations

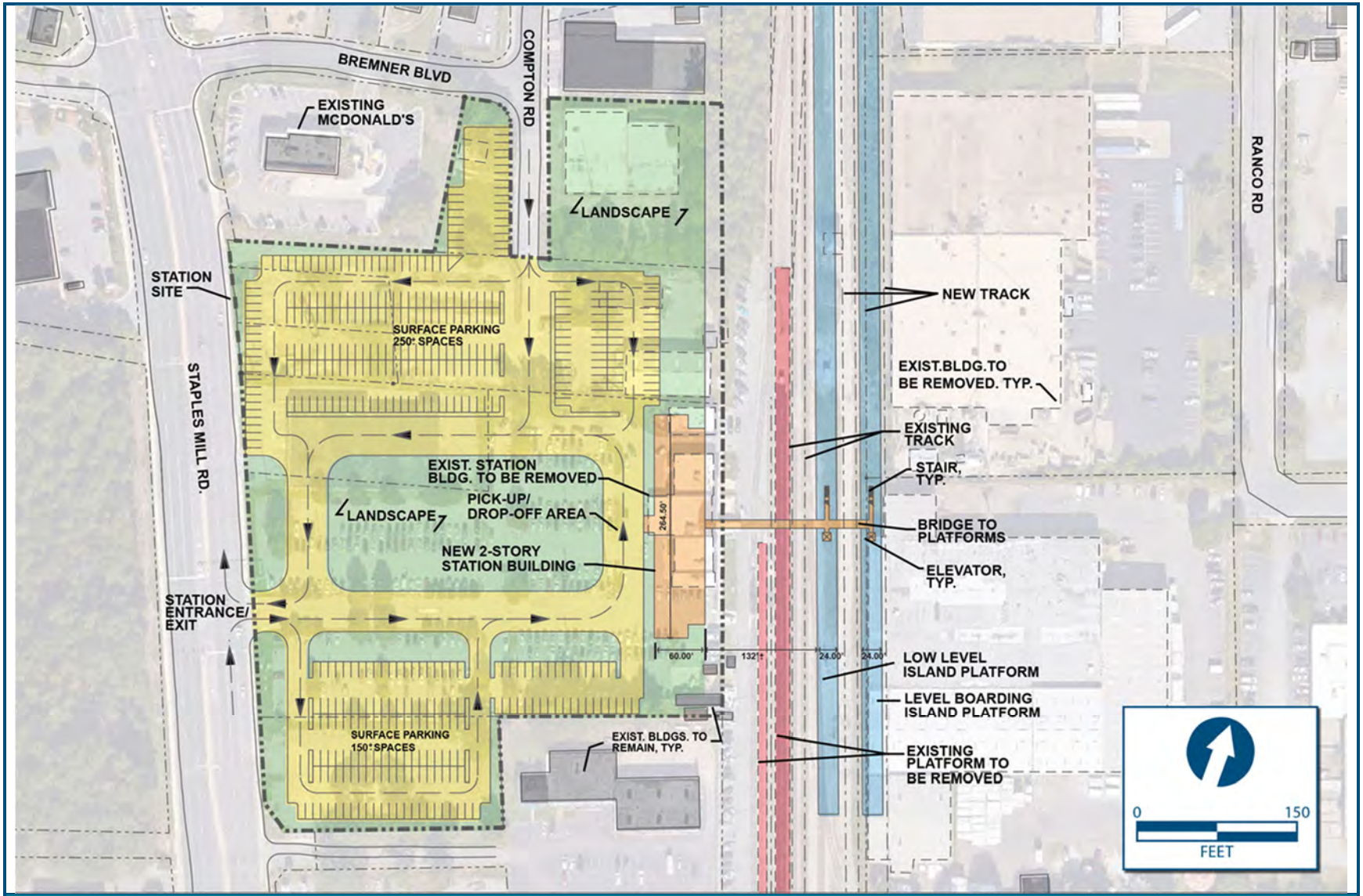


Figure 2.5-34: Staples Mill Road Station Improvements for Build Alternative 6F

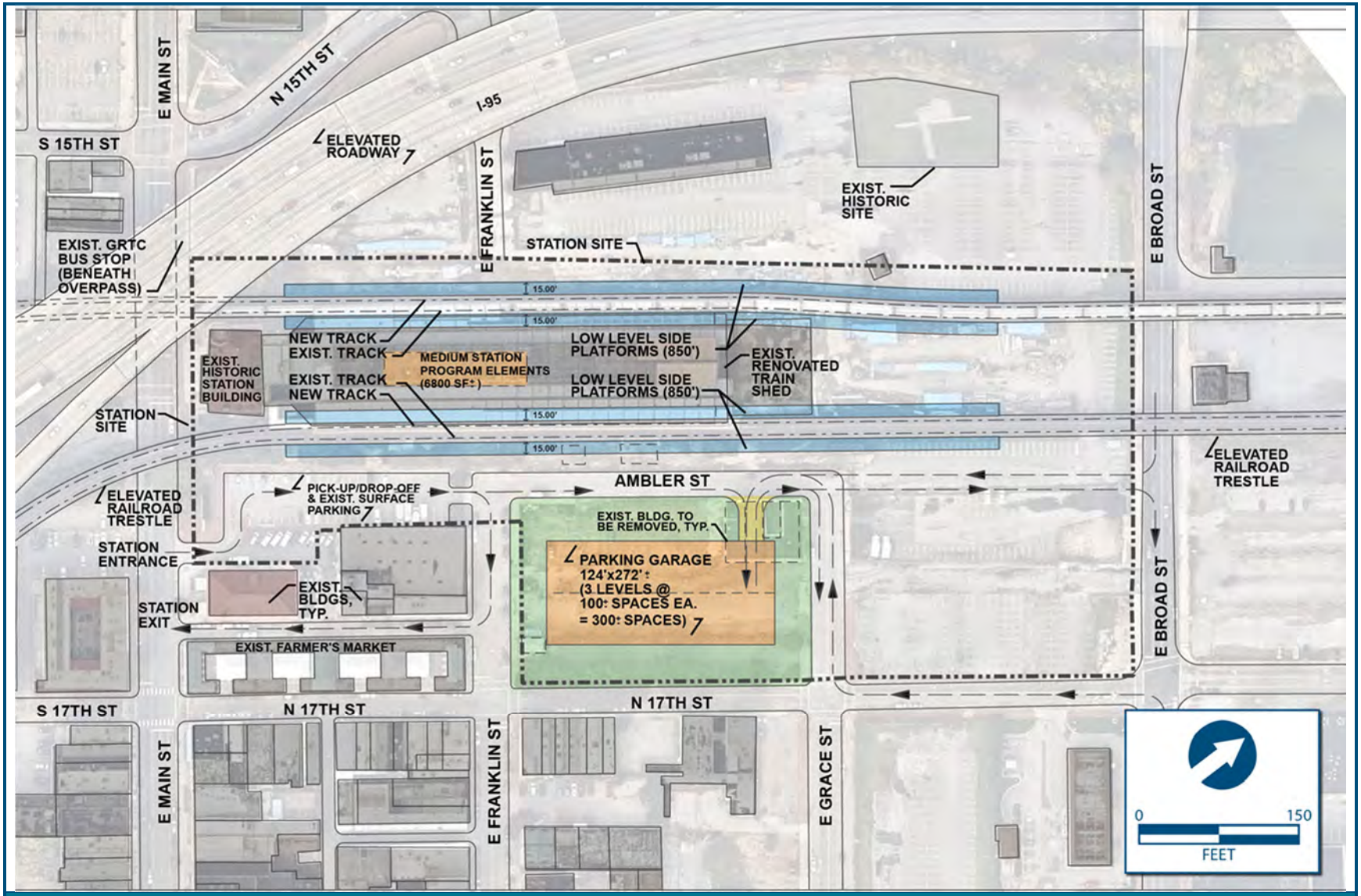


Figure 2.5-35: Main Street Station Improvements for Build Alternative 6F

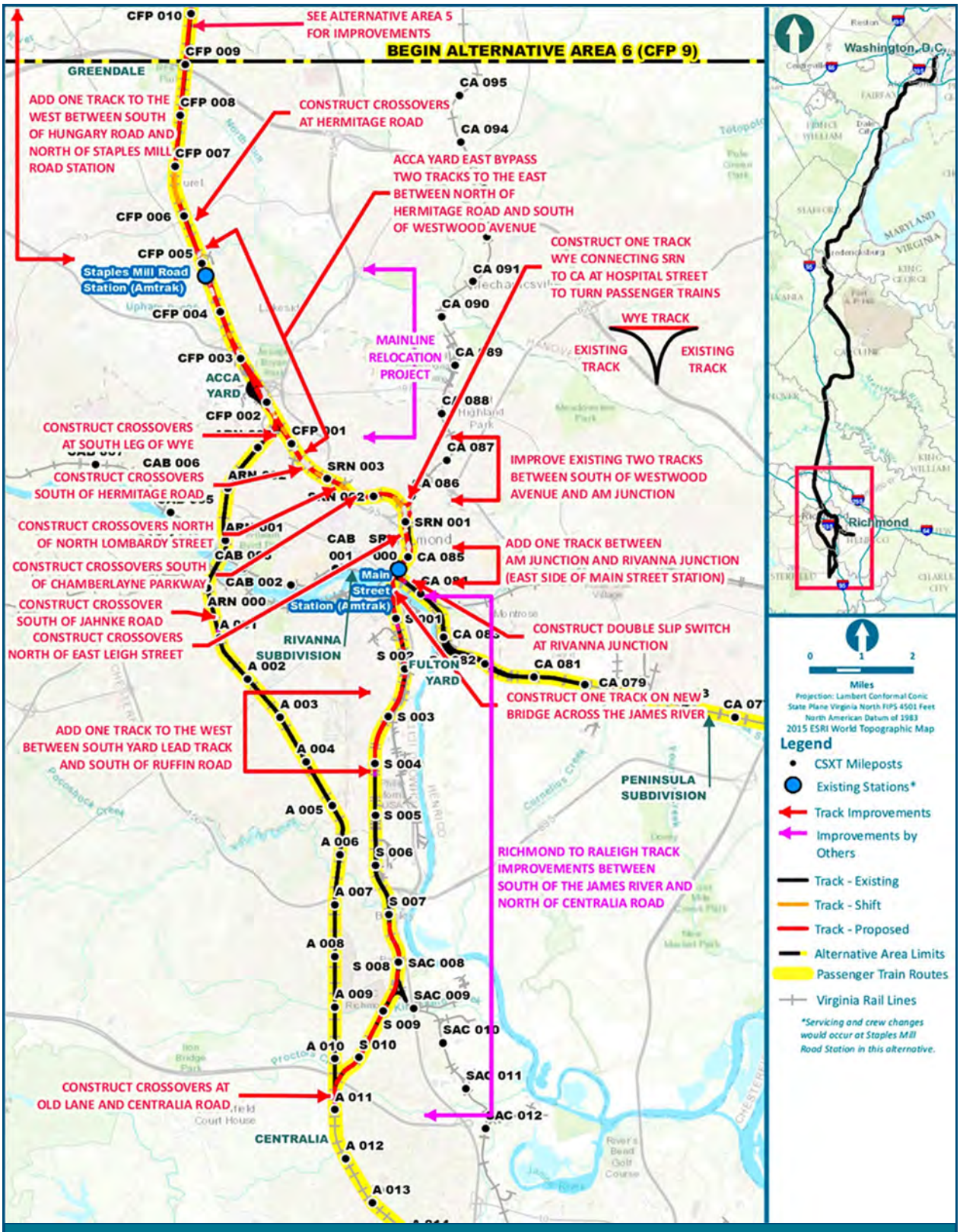


Figure 2.5-36: Build Alternative 6G – Shared Service, Staples Mill Road / Main Street Stations

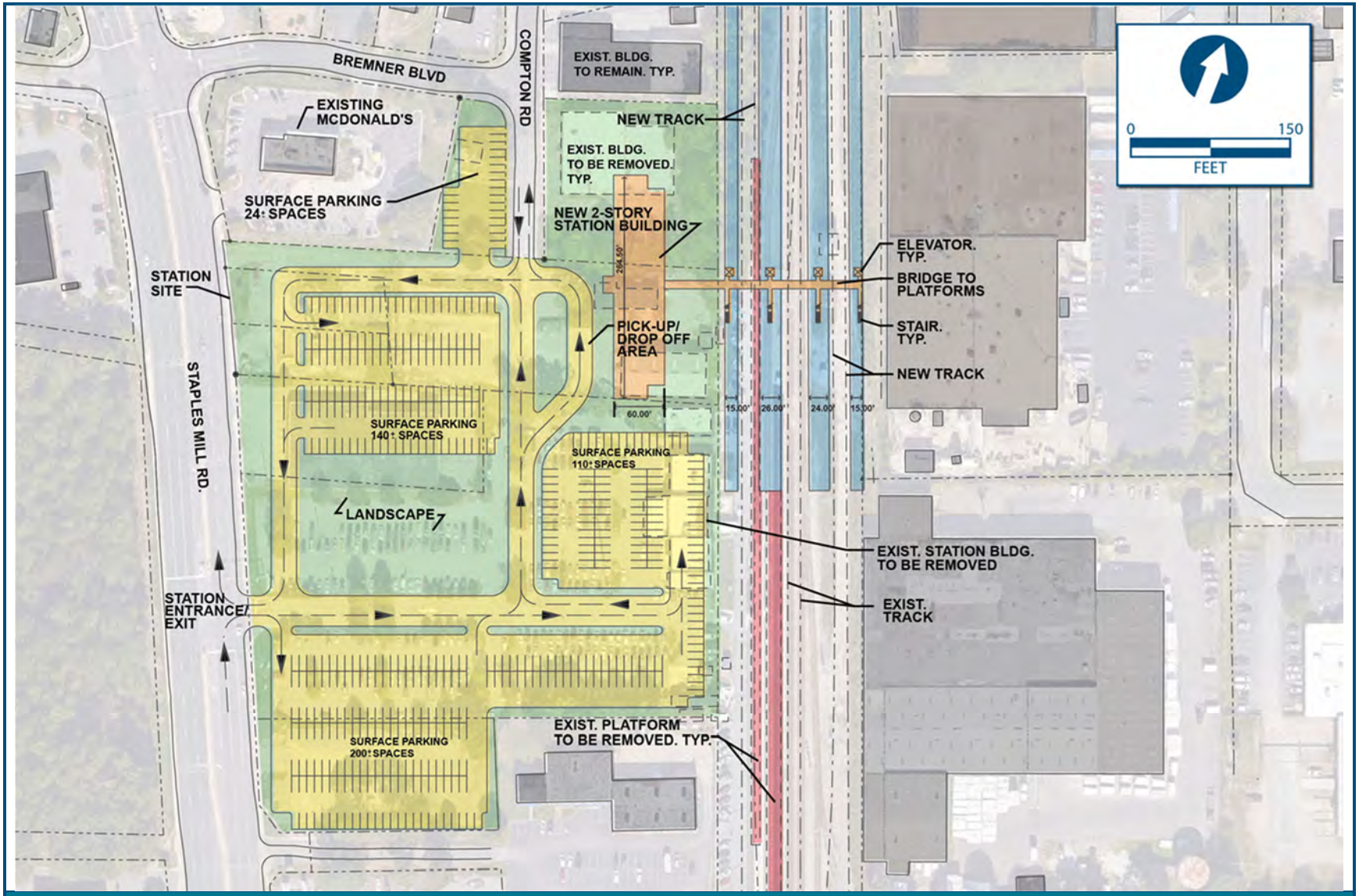


Figure 2.5-37: Staples Mill Road Station Improvements for Build Alternative 6G

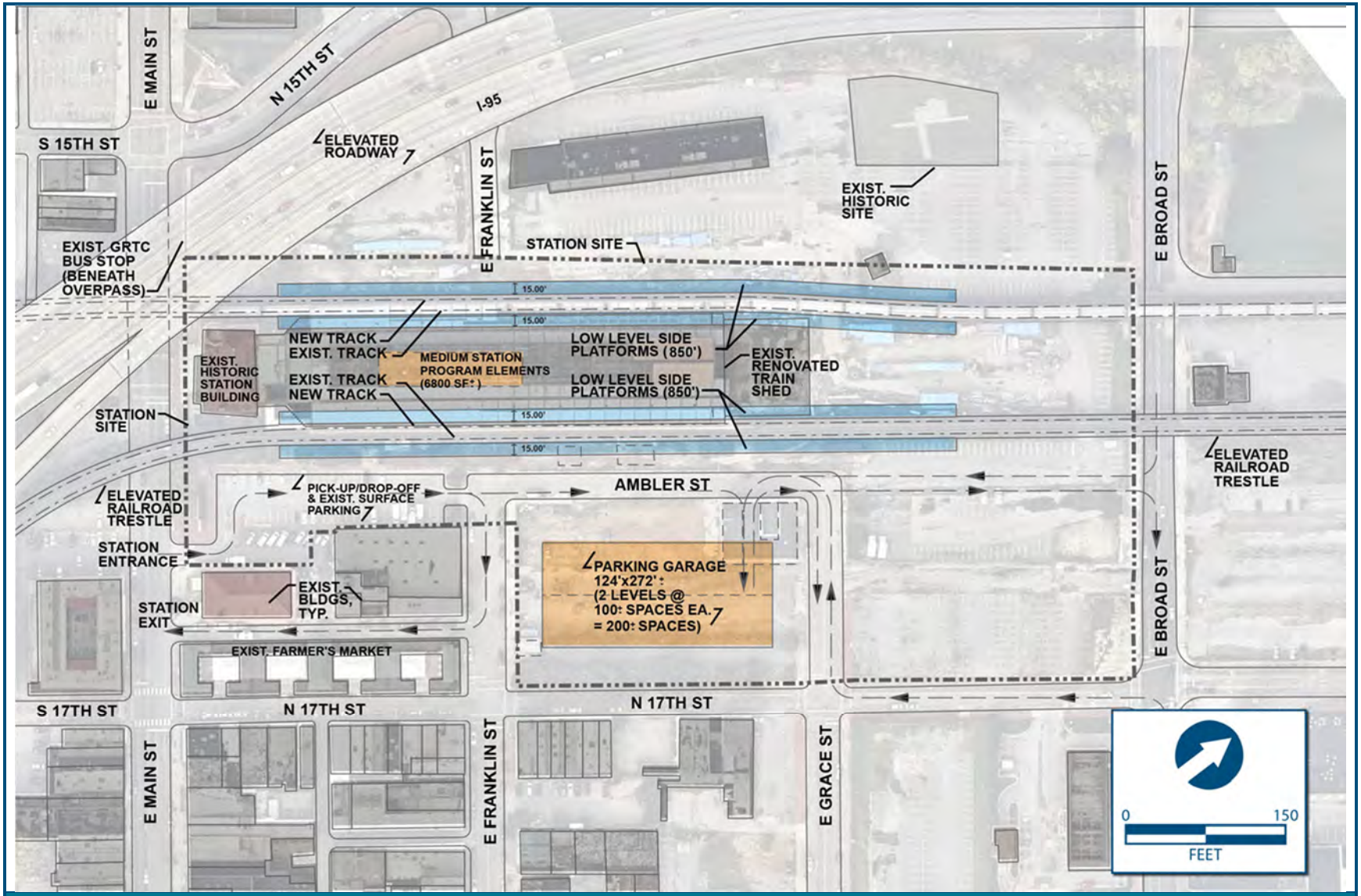


Figure 2.5-38: Main Street Station Improvements for Build Alternative 6G

2.6 OPERATIONS ANALYSIS AND RIDERSHIP ESTIMATES

2.6.1 Operations Analysis

DRPT has conducted preliminary operations simulation modeling to estimate rail performance in the corridor and inform DRPT's evaluation of alternatives. Operations simulation modeling is an iterative process that is ongoing, and additional operations simulation analyses will be conducted through the Final EIS and SDP phases of the Project. Appendix I provides additional details of this operations analysis, which is summarized in this section.

DRPT's preliminary operations simulation modeling focused on evaluating whether suggested infrastructure is sufficient to meet the DC2RVA Project's Purpose and Need, and specifically to meet intercity passenger train and freight service performance goals established by the *Passenger Rail Investment and Improvement Act of 2008* (PRIIA), also known as Public Law 110-432, and published as the *Metrics and Standards for Intercity Passenger Rail Service Under Section 207 of the Passenger Rail Investment and Improvement Act of 2008*, in the Federal Register on May 12, 2010. PRIIA's performance goals for intercity passenger trains are for all passenger trains to be on-time at each station and at corridor endpoints at least 90% of the time. On-time, as defined by PRIIA, means arriving at a station at the scheduled time or within a set "late tolerance" period following the scheduled time. The length of the late tolerance period varies by the type of intercity passenger service and the total distance between the train's scheduled endpoints. PRIIA's performance goal for freight service is for intercity passenger rail service to not materially delay the movement of freight. The performance of freight trains is compared for different alternatives by estimating future freight train delay and comparing against existing freight train performance. Freight train delay is measured as minutes of delay per train, per 100 train-miles. This metric compares the simulated time a freight train took to cover its route inclusive of interactions with other trains, passenger and freight, compared to the time the freight train would have taken to cover its route had it encountered no delays en route.

The operations simulation analyses evaluate a schedule of planned train movements (encompassing all intercity passenger, commuter, and freight trains moving through the corridor) in combination with a set of existing or proposed infrastructure. The results of the analyses estimate whether the combined schedule of operations and infrastructure performs sufficiently to meet the PRIIA goals. The operations simulation analyses include the proposed intercity passenger trains described in Section 2.2.1, as well as CSXT freight trains and VRE commuter trains. DRPT assumed the new DC2RVA service (18 additional intercity passenger trains per day) would be in place in 2025, and that no additional changes in intercity passenger trains would occur between 2025 and the horizon year of 2045. VRE commuter train frequencies were assumed to increase from 34 weekday trains in 2015 to a projected 38 weekday trains for the years 2025 through 2045. To forecast freight train growth from existing (2015) levels, CSXT provided freight volumes for the future years 2025 and 2045 using the U.S. DOT Freight Analysis Framework projected growth rates for rail. CSXT freight growth is independent of the DC2RVA Project and will occur by itself regardless of whether or not the DC2RVA Project is implemented. CSXT actual freight growth will be driven by market forces and may be greater or less than the projected growth rates.

Intercity passenger train and freight train performance estimates from the different Build Alternatives simulated in 2025 are compared against performance estimates for a 2025 No Build Alternative consisting of the No Build infrastructure and service levels described in Sections 2.2 and 2.5.1.

DRPT has completed three preliminary phases of operations simulation modeling that assess the performance of trains operating in the DC2RVA corridor between Washington, D.C. and Centralia, VA. These three phases have assumed ideal operating conditions – that all tracks are fully operational, with no outages for maintenance, repairs, or other restrictions on operations. These preliminary operations simulations also apply an intercity passenger train schedule developed by DRPT to reduce travel time through the corridor to the maximum extent practical by assuming intercity passenger trains will operate at the maximum practical speed allowed by track design and geometry between station stops. The operations simulations incorporate VRE's operating schedule, and projected movements of CSXT freight trains. The three preliminary phases of operations simulation modeling completed to date are:

1. Preliminary Ashland and Fredericksburg Simulations Modeling - performed to estimate whether two main tracks through Ashland and/or Fredericksburg would be sufficient in the Build Alternative. *See Section 2.6.1.1.*
2. Additional Ashland Simulation Modeling - performed to estimate the operational impacts of 11 potential infrastructure and service options in the Ashland/Hanover area that, if proven operationally feasible, would not require the addition of a third main track through the Town of Ashland, VA. *See Section 2.6.1.2.*
3. Richmond Area Simulation Modeling - performed to compare passenger train and freight train operating performance among the Richmond-area alternatives carried forward into the Draft EIS. *See Section 2.6.1.3.*

2.6.1.1 Preliminary Ashland and Fredericksburg Simulation Modeling

This first phase of the preliminary operations modeling was performed to estimate whether two main tracks through Ashland and/or Fredericksburg would be sufficient to consider in a Build Alternative. Based on previous studies, such as the 2002 SEHSR Tier 1 document, DRPT assumed three main tracks in the corridor from Arlington to Richmond, and then evaluated the effects on train performance of having only two main tracks through Fredericksburg and/or Ashland. The operations simulation for year 2025 estimated that having only two main tracks in Fredericksburg and/or Ashland could potentially meet the PRIIA on-time performance goal for the corridor. However, operations simulation for year 2045 estimated that having only two main tracks in Fredericksburg and/or Ashland failed to dispatch (i.e., the operations simulation concluded that the infrastructure had insufficient capacity for the number of trains projected to operate in the corridor in the year 2045). DRPT's preliminary conclusion, based on the schedule, infrastructure, and operating parameters evaluated in this initial phase of operations simulation, was that three main tracks through Fredericksburg, or a two-track bypass around Fredericksburg in lieu of a third main track through the city and town, would be required by year 2045 to accommodate the projected future levels of passenger, freight, and commuter service. DRPT also concluded that additional operations simulation modeling should be undertaken in the Ashland Area to test a broader range of infrastructure and service options that might not require the addition of a third main track through the Town of Ashland.

2.6.1.2 Additional Ashland Simulation Modeling

DRPT's second phase of preliminary operations simulation modeling was performed to estimate the operational impacts of additional potential infrastructure and service options in the Ashland/Hanover area that, if proven operationally feasible, would not require the addition of a

third main track through the Town of Ashland. DRPT evaluated the effects of a tunnel beneath the Town in lieu of a third track at grade, effects of operating trains at a maximum speed of 70 mph instead of 90 mph, and modifying or eliminating station service, including relocation of the station to south of Ashcake Road. DRPT also evaluated the effects of routing some northbound freight trains onto the Buckingham Branch Railroad between Richmond and Doswell. (Not all northbound freight trains are feasible to be rerouted onto the Buckingham Branch owing to operational requirements and clearance restrictions.) The train performance estimates derived from this second phase of DRPT's preliminary operations simulation suggested that in order to accommodate the additional 18 intercity passenger trains per day , accommodate CSXT's projected freight growth, and meet PRIIA's passenger and freight train on-time performance goals through 2045, either a third main track through Ashland or a two-track bypass around Ashland would provide the highest likelihood that trains would meet their performance goals under the service level and schedule projected. DRPT's preliminary conclusion, based on the schedule, infrastructure, and operating parameters evaluated in this second phase of operations simulation was that, while a third main track through Ashland or a two-track bypass around Ashland would accommodate the Project's service and performance goals through 2045, other alternatives should be considered, perhaps in concert with service and schedule modifications, that could also achieve the Project's service and performance goals.

2.6.1.3 Richmond Area Simulation Modeling

Preliminary operations simulation modeling was also performed by DRPT to compare passenger train and freight train operating performance among the Richmond-area alternatives carried forward into the Draft EIS. Like the earlier preliminary operations simulation modeling, DRPT applied a preliminary intercity passenger train schedule based on maximum practical reductions to travel time, assumed an additional 18 intercity passenger trains plus CSXT's projected growth for 2025 and 2045, and assumed ideal operating conditions. The seven Richmond-area Alternatives modeled are listed below:

- 6A. Staples Mill Road Station (all trains via A-Line and West Acca bypass)
- 6B. Broad Street Station (all trains via A-Line and East Acca bypass)
- 6C. Boulevard Station (all trains via A-Line and East Acca bypass). A Boulevard Station S-Line option (all trains via S-Line and East Acca bypass) was not modeled, but is assumed by DRPT to have similar operating parameters as Alternative 6D Main Street Station.
- 6D. Main Street Station (all trains via S-Line and East Acca bypass)
- 6E. Main Street / Staples Mill – Split Service (only Newport News trains make both stops; all other via trains via A-Line with a Staples Mill only stop; West Acca bypass)
- 6F. Main Street / Staples Mill – Full Service (all trains make both stops, operate via S-Line and East Acca bypass)
- 6G. Main Street / Staples Mill – Shared Service (all Regional and Interstate Corridor trains make both stops, operate via S-Line and East Acca bypass; long distance trains operate via A-Line and stop at Staples Mill Only)

DRPT's third phase of preliminary operations simulation modeling estimated that alternatives relying on the A-Line to carry both passenger and freight trains through 2045 (Alternatives 6A, 6B, 6C, 6E and 6G) failed to meet the PRIIA performance goals. Factors that contributed to the inability

of the A-Line options to accommodate the projected passenger and freight train service levels at the performance thresholds required under PRIIA include the lack of a third main track from Acca Yard south within the existing median of I-195 and across the James River and the operating complexities associated with freight trains entering and exiting the Acca Yard terminal area. The third phase also estimated that the two Richmond-area alternatives (6C Boulevard Station S-Line and 6F Main Street/Staples Mill Road – Full Service) that keep most freight trains and the Amtrak Auto Train on the A-Line while using the S-Line through Richmond for the regular intercity passenger trains could potentially meet the PRIIA performance goals through 2045.

2.6.2 Ridership

DRPT prepared ridership forecasts using a travel demand forecasting model derived from a survey of rail and other travel in the Washington, D.C. to Richmond corridor. Appendix J provides additional details of the ridership forecasting process, which is summarized in this section.

DRPT combined information from this survey with ridership forecasting procedures developed for connecting corridors north and south of the DC2RVA Project corridor to estimate ridership within the areas of DC2RVA, the SEHSR corridor, and the Northeast Corridor. Key elements of the forecasting process include:

- The size and geographic distribution of the overall demand for long-distance travel in the corridor.
- Estimating total travel for 2015 and 2045 by assuming that growth from 2008 is proportional to zone-level projections of population and employment growth obtained from corridor Metropolitan Planning Organizations.
- The size and geographic distribution of rail travel demand was obtained from 2015 Amtrak station-level actual ridership.
- Characteristics of existing rail travelers and their sensitivity to potential service improvements (e.g., faster running times, more service, easier access and egress, and greater on-time performance).
- The structure of the demand forecasting models was adapted by DRPT from those developed for the NEC FUTURE project. Parameters were adjusted to match traveler sensitivity to service attributes obtained from the corridor surveys.
- Modeling parameters were refined so that the model replicates existing observed Amtrak station-level ridership and revenue when the model is tested with the current rail schedules.
- Future year ridership for each alternative is forecasted by combining the calibrated model, projections of future overall travel, and rail schedules representing each DC2RVA alternative.

Using this methodology, DRPT projects population growth and employment in the corridor together with planned service enhancements included in the No Build Alternative will increase corridor ridership from approximately 1.4 million annual trips in 2015 to 2.2 million annual trips in 2045, an increase of approximately 57 percent. DRPT projects that the various Build Alternatives will result in between 2.9 million and 3.0 million annual rail trips traveling to, from, and within the corridor. This represents a growth of approximately 40 percent over the ridership

expected with the No Build service plan and an increase of approximately 110 percent over existing ridership.

The principal drivers of this increase are:

- A reduction in train travel times between Washington, D.C. and Richmond.
- An increase in frequency from 9 round trips (in the No Build Alternative) to 18 round trips per day (in the Build Alternative) between Washington, D.C. and Richmond.
- Increased service to Norfolk, which will grow from one daily round trip per day with the current schedule and three daily round trips per day in the No Build Alternative, up to six round trips per day with the Build Alternatives.
- Improved reliability of the passenger rail service from an on-time perspective from 66 percent today to 90 percent in the Build Alternatives.

Table 2.6-1 summarizes the ridership associated with each of the 2045 build service conditions. As this table indicates, ridership is highest for the Staples Mill Road Only Build Alternative due to a slightly faster trip time for trains passing through Richmond from the south. The different Staples Mill Road and Main Street station combination alternatives follow closely behind due to accessibility to the market for Downtown Richmond.

Table 2.6-1: Annual Rail Trips to/from/within DC2RVA Corridor (Millions) by Year and Alternative

Year	Build Alternative	Annual Rail Trips
2015	Existing Schedule (66% OTP)	1.388
2045	Existing Schedule (66% OTP)	2.018
2045	No Build Alternative[1] (66% OTP)	2.180
2045	6A: Staples Mill Road Station Only (90% OTP)	3.295
2045	6B: Boulevard Station Only, A-Line[2] (90% OTP)	3.203
2045	6C: Broad Street Station Only (90% OTP)	3.160
2045	6D: Main Street Station Only (90% OTP)	3.213
2045	6E: Split Service, Staples Mill Road/Main Street Stations (90% OTP)	3.218
2045	6F: Full Service, Staples Mill Road/Main Street Stations (90% OTP)	3.258
2045	6G: Shared Service, Staples Mill Road/Main Street Stations (90% OTP)	3.261

Notes:

1) No Build Alternative includes ridership associated with the extension of two Northeast Regional (VA) round trips from Richmond to Norfolk and the addition of one new Northeast Regional (VA) round trip between Washington, D.C. and Lynchburg.

2) A single 6B ridership is reported because 6B–A-Line ridership and 6B–S-Line ridership are anticipated to be similar.

Although the ridership varies among the alternatives, the standard deviation among all station alternatives was approximately 1%, which is within the margin of error for the analysis performed.

The ridership model used by DRPT also provides a high-level estimate of the revenue generated by the new service for each of the Richmond alternatives. DRPT has included the revenue estimates in Appendix J for another point of reference; Section 4.5 of Appendix J includes tables that show estimates for 2025 and Section 5.0 of Appendix J shows revenue estimates for 2045.

DRPT developed revenue forecasts based on current average station-to-station passenger fares. The resulting estimates of revenue represent the entire trip from the originating to the destination station.

Portions of some trips extend outside of the DC2RVA corridor, such as trips to North Carolina, New York, or Boston. DRPT made no attempt to show any allocation of the estimated revenue to the specific parties, such as Amtrak, the Commonwealth of Virginia, or other NEC states, or to specific geographic areas.

It should be noted that these revenue forecasts are not comparable to the operating costs provided in Section 2.7, which account only for costs accrued inside the DC2RVA corridor. DRPT did not include revenue estimates as a factor in its consideration of recommended preferred alternatives described in Chapter 7.

2.6.3 Travel Time and Reliability

To aid in preliminary ridership forecasting, DRPT developed conceptual timetables incorporating the train frequency and train speed for each of the Richmond Build Alternatives described in Section 2.5.2.6. Table 2.6-2 summarizes the estimated travel times, inclusive of station stops, between Washington and Richmond based on the conceptual timetables developed for each Richmond Build Alternative.

Table 2.6-2: DC2RVA Corridor Travel Times (hours:minutes) by Richmond Station Option, Washington Union Station to Richmond, VA

Service Type	Interstate Corridor		Northeast Regional		Long Distance	
Direction	South	North	South	North	South	North
No Build (to Staples Mill Road)	2:06	2:16	2:16	2:20	2:02	2:22
No Build (to Main Street Station)	*No Service*	*No Service*	2:40	2:50	*No Service*	*No Service*
6A: Staples Mill Road Station Only	1:50	1:50	1:58	1:57	1:49	2:10
6B–A-Line: Boulevard Station Only, A-Line	1:56	1:58	2:04	2:05	1:55	2:14
6B–S-Line: Boulevard Station Only, S-Line	1:56	1:58	2:04	2:05	1:55	2:14
6C: Broad Station Street Only	2:01	2:02	2:09	2:09	2:00	1:58
6D: Main Street Station Only	2:06	2:06	2:14	2:13	2:05	2:23
6E: Split Service, Staples Mill Road/Main Street Stations (travel time to Staples Mill)	1:50	1:50	1:58	1:57	1:49	2:10
6E: Split Service, Staples Mill Road/Main Street Stations (travel time to Main Street)	2:15	2:13	2:21	2:18	2:20	2:37
6F: Full Service, Staples Mill Road/Main Street Stations (travel time to Staples Mill)	1:50	1:50	1:58	1:57	1:49	2:10
6F: Full Service, Staples Mill Road/Main Street Stations (travel time to Main Street)	*No Service*	*No Service*	2:29	2:25	*No Service*	*No Service*
6G: Shared Service, Staples Mill Road/Main Street Stations (travel time to Staples Mill Road)	1:50	1:50	1:58	1:57	1:49	2:10
6G: Shared Service, Staples Mill Road/Main Street Stations (travel time to Main Street)	2:15	2:13	2:21	2:18	*No Service*	*No Service*

Currently, intercity passenger trains traveling between Washington, D.C. and Richmond reach the end of their trip segment on the DC2RVA corridor on time approximately 66% of the time – meaning that 34% of the trains are late. Given that the definition of "on-time" includes a potential delay interval – i.e., a train may be several minutes past its scheduled arrival into a station and still be classified as "on-time" – this makes it difficult for many train travelers to rely on the train schedules, and forces passengers to allot additional time to their trips to compensate for the potential delays. The DC2RVA Project, by increasing capacity and interoperability of the main

tracks, would improve the reliability of intercity passenger trains within the corridor. For example, a recent (June 9, 2017) train trip on Northeast Regional Train #95 from Washington Union Station to Richmond's Staples Mill Road Station, illustrates how the limited track capacity on this busy shared-use corridor can cause delays. Train #95, traveling south from Boston on the Northeast Corridor, arrived in Washington Union Station late. After an engine change, crew change, and passenger loading and unloading, train #95 departed Washington Union Station approximately 20 minutes behind schedule. Because it was late leaving Union Station, and owing to heavy passenger and freight train volume on the corridor south of Washington, D.C., Train #95 was positioned behind a slower freight train. Passenger and freight traffic moving in the opposite direction used the adjacent second main track to pass Train #95, leaving no opportunity for Train #95 to cross to the adjacent track and overtake the slower freight train until well south of Fredericksburg, more than an hour after departing Washington. As a result, Train #95 was 61 minutes late arriving into Staples Mill Road Station – an additional 41 minutes of delay caused by congestion on the corridor.

The DC2RVA Project would not be able to improve the on-time performance of trains arriving into Union Station from the Northeast Corridor – however, the added track capacity and additional crossovers of the DC2RVA Project would provide additional opportunities for higher-speed passenger trains to pass slower-speed freight trains and commuter trains making frequent station stops. The additional infrastructure planned by the DC2RVA Project would allow intercity passenger trains to closely adhere to their scheduled travel time between Washington, D.C. and Richmond without incurring delays in that segment of their total trip. The DC2RVA Project shares PRIIA's performance goals for intercity passenger trains for all passenger trains to be on-time at each station and corridor endpoints at least 90% of the time.

2.7 CAPITAL AND OPERATING COSTS

This section presents a summary of the estimated capital cost to design and construct and the estimated annual cost to operate and maintain the various DC2RVA alternatives under consideration. This section discusses the estimated costs for building, operating, and maintaining the DC2RVA Project.

2.7.1 Capital Costs

Capital costs represent the total cost associated with the design, management, land acquisition, and construction of the DC2RVA Project. All material quantities are estimated based on a conceptual (10 percent) level of design for the DC2RVA Project and are based on 2025 unit costs. Table 2.7-1 shows the capital cost estimates for each Build Alternative for the DC2RVA Project. Detailed estimates are provided in Appendix K.

Table 2.7-1: Capital Costs Per Build Alternative

Alternative Area	Build Alternative	Capital Cost (2025 $ - millions)
Area 1: Arlington (Long Bridge Approach)	1A: Add Two Tracks on the East	$35.6
	1B: Add Two Tracks on the West	$46.6
	1C: Add One Track East and One Track West	$42.3
Area 2: Northern Virginia (Long Bridge to Dahlgren Spur)	2A: Add One Track/Improve Existing Track	$1,652.6
Area 3: Fredericksburg (Dahlgren Spur to Crossroads)	3A: Maintain Two Tracks Through Town	$240.2
	3B: Add One Track East of Existing	$506.9

Table 2.7-1: Capital Costs Per Build Alternative

Alternative Area	Build Alternative	Capital Cost (2025 $ - millions)
	3C: Add Two-Track Bypass East	$977.5
Area 4: Central Virginia (Crossroads to Doswell)	4A: Add One Track/Improve Existing Track	$643.2
Area 5: Ashland (Doswell to I-295)	5A: Maintain Two Tracks Through Town (850-Foot Platforms)	$349.5
	5A–Ashcake: Maintain Two Tracks Through Town (Relocate Station to Ashcake)	$350.3
	5B: Add One Track Through Town East of Existing (850-Foot Platforms)	$388.3
	5B–Ashcake: Add One Track Through Town East of Existing (Relocate Station to Ashcake)	$388.8
	5C: Add Two-Track West Bypass (850-Foot Platforms)	$599.2
	5C–Ashcake: Add Two-Track West Bypass (Relocate Station to Ashcake)	$600.0
	5D–Ashcake: Three Tracks Centered Through Town (Add One Track, Relocate Station to Ashcake)	$398.8
Area 6: Richmond (I-295 to Centralia)	6A: Staples Mill Road Station Only	$1,087.7
	6B–A-Line: Boulevard Station Only, A-Line	$1,524.1
	6B–S-Line: Boulevard Station Only, S-Line	$1,451.2
	6C: Broad Street Station Only	$1,488.7
	6D: Main Street Station Only	$1.323.5
	6E: Split Service, Staples Mill Road/Main Street Stations	$1.266.5
	6F: Full Service, Staples Mill Road/Main Street Stations	$1,482.9
	6G: Shared Service, Staples Mill Road/Main Street Stations	$1,599.1

The 2025 capital costs represent the infrastructure required for a potential Build Alternative. Operational modeling, ridership, and revenue are factors that impact the level of infrastructure required. Build Alternative 6A (Staples Mill Road Station Only), which does not include a third mainline track across the James River on the CSXT A-Line and stays within the median of Powhite Parkway, has the lowest overall estimated capital costs. However, train performance estimates calculated using computer-based operations simulation modeling indicate that this alternative does not meet the Project's passenger train on-time performance requirements or freight train delay requirements, because of the lack of additional track capacity to accommodate the increases in passenger train service. Adding a third main line track and new bridge across the James River on the CSXT A-Line and the third track in the median of the Powhite Parkway would increase the capital cost of Build Alternative 6A to $1,887.0 million, and may require additional environmental impacts. Other Build Alternatives that also primarily use the A-Line for freight and passenger service (6B–A-Line, 6C, 6E, and 6G) would have similar increases in capital costs. Build Alternative 6G (Shared Service, Staples Mill Road/Main Street Stations) has the highest overall estimated capital costs because it uses both the CSXT A-Line and S-Line corridors in Richmond, requiring the maximum amount of additional improvements.

2.7.2 Operating and Maintenance Costs

The estimate of long-term operations and maintenance (O&M) costs include both train operations and infrastructure maintenance. Operations consists of labor costs, electrical power, and other factors required to keep the DC2RVA Project in service, whereas maintenance includes routine

servicing of vehicles, maintenance of the tracks, signals, communications, and other systems needed to keep the system safe and reliable. This section presents a summary of the estimated annual cost to operate and maintain the DC2RVA passenger rail service. These costs are calculated based on the passenger rail service for the full DC2RVA corridor and are presented relative to the suite of alternatives that result in changes in passenger rail service: the No Build Alternative and the Richmond Area Build Alternatives.

Table 2.7-2 shows the resultant total costs by alternative. Costs are shown in 2015 constant dollars.

Table 2.7-2: Estimated O&M Costs for Each Alternative

Year	Build Alternative	Total O&M Cost (2015 $)
2015	Existing	$46,837,206
2045	No Build Alternative	$54,767,392
2045	6A: Staples Mill Road Station Only	$97,499,879
2045	6B: Boulevard Station Only (A- and S-Line alternatives)	$99,449,483
2045	6C: Broad Street Station Only	$99,253,709
2045	6D: Main Street Station Only	$99,910,050
2045	6E: Split Service, Staples Mill Road/Main Street Stations	$97,795,859
2045	6F: Full Service, Staples Mill Road/Main Street Stations	$100,331,049
2045	6G: Shared Service, Staples Mill Road/Main Street Stations	$99,646,766

Notes:

Although the O&M cost varies among the alternatives, the standard deviation among all 2045 Richmond Build Alternatives was approximately 1%, which is within the margin of error for the analysis performed.

The 2045 build service conditions represent approximately a doubling of intercity passenger service and ridership. Because service and ridership are the key drivers of cost, the O&M costs for the Build Alternatives are also approximately double the costs of today's service (2015). Build Alternative 6A (Staples Mill Road Stations Only) has the lowest overall estimated O&M costs because it has the lowest estimated number of annual revenue miles (tied with Build Alternative 6E: Split Service, Staples Mill Road/Main Street Stations), the lowest estimated number of annual revenue hours, and a high number of overall station boardings/alightings. Build Alternative 6F (Full Service, Staples Mill Road/Main Street Stations) has the highest overall estimated O&M costs. That alternative has the highest estimated station boardings/alightings and the second-highest revenue hours compared with the other Build Alternatives.

2.8 CONSTRUCTION PLAN

The approach to constructing infrastructure improvements for the DC2RVA Project, described below, would be common to all of the Build Alternatives. Construction would not begin until a final design is approved, additional permanent and temporary right-of-way is acquired, and all necessary permits and approvals are in place.

Within the DC2RVA corridor, the construction of the additional track, infrastructure additions and modification to control points, new station infrastructure with additional platforms, and track shifts requires a phased construction approach. During construction, at least one main track would remain in operation while under construction. Station improvements for platform additions and pedestrian access would be constructed early to support the new track when placed in operation. Additional early construction activities include major bridges having an extended lead time, earthwork, and retaining walls. Figure 2.8-1 provides a general construction approach for the DC2RVA Project.

Figure 2.8-1: General Construction Approach

Four major construction activities would comprise the majority of the construction efforts: rail, bridge, road, and station construction. Appendix L provides a general description of each of the major construction activities, which are summarized below.

Rail Construction. The proposed track structure is ballasted track to be constructed on a prepared track bed. As the earthwork is completed, a sub-ballast layer would be constructed with aggregates hauled from the local quarries and from contractor's stockpiles. The sub-ballast would be graded, rolled, and compacted to establish a solid base. Following placement of the sub-ballast, an 8-inch layer of ballast would be placed as the final layer. This new surface is called a track bed. Once the track bed is in place, railroad ties (wood or concrete) would be placed and the continuous welded rail (CWR) fastened and anchored in place. As placement of the ties and CWR can disturb the ballast, tamping and lining track would be done to finish the installation.

In addition to new main track construction, construction would also involve shifting the existing track alignment. The track shifts would utilize existing rail and track bed if possible. In areas where existing rail and track bed are not feasible to use, additional grading and installation of new track bed would occur, followed by tamping and lining the track to finish.

The addition of the new main line track and speed improvements would require upgrades and reconfiguration of the existing control points, and the addition of new control points on the DC2RVA corridor.

Bridge Construction. Bridge construction along the corridor would include rail and road structures. New structures would generally reflect the horizontal and vertical profiles of existing structures. The structure type (concrete, steel, or timber types) proposed varies according to function, and design requirements at each respected location. Foundations also vary from spread footings to deep foundations (*e.g.*, pipe piles, pre-stressed concrete piles, or drilled shafts). Pile driving would be required for the deep foundations. Local ordinances may limit work activities to avoid night time work. During construction, existing roads would be temporarily closed or temporary detours would be used.

Road Construction. Due to the alignment of the corridor, roads are proposed to be lowered, elevated, realigned, or reconstructed. The roadways would be designed and constructed to VDOT standards. After the earthwork operations and utilities relocations are constructed, the roadway subgrade, base and final pavement sections would be constructed. Since roadway closures and detours during the construction process are anticipated, close coordination between the contractor and the relevant local agencies will be essential to scheduling temporary road closures and obtaining approval of detour routes.

Station Construction. The existing railway passenger stations on the DC2RVA corridor require facilities infrastructure improvements. The site preparation for station construction may include clearing and grubbing; building demolition and relocation; grading for the platform and third track; utility service installation and relocations; and drainage installations. Other infrastructure improvements proposed at the Richmond area stations include intermodal connectivity for local transit, passenger pickup and drop offs, and parking as either parking decks or paved parking areas.

The additional main line track would require construction of new platforms at the stations. The platform work consists of a poured concrete structure with, utilities, elevators, and pedestrian overpasses for ingress and egress to the station. The overhead pedestrian structures include stairways and elevators to be constructed on the platforms and station for access.