IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF COLUMBIA

THE COMMITTEE OF 100 ON THE FEDERAL CITY	)
Plaintiff	)
v.	)
ANTHONY FOXX, Secretary of Transportation, et al.	)
Defendants	)

PLAINTIFF'S MOTION FOR A PRELIMINARY INJUNCTION

EXHIBIT 11

Chapter 3

Alternatives

Chapter 3
Alternatives

3.1 Overview

This chapter describes the reasonable alternatives considered for the Project, including the 'no action' alternative, as required by the National Environmental Policy Act (NEPA), and the 'build' alternatives that involve the reconstruction of Virginia Avenue Tunnel at its current location. One of the Build Alternatives was selected as the Preferred Alternative. Prior to the development of the alternatives, 12 different design concepts were developed, which were shared with the agencies and the public. Following a detailed screening process, some of the concepts were eliminated from further consideration. Others were carried forward and developed into the four candidate alternatives, all of which underwent rigorous evaluation as documented in this Final EIS.

West Tunnel Portal at 2nd Street SE

East Tunnel Portal at 11th Street SE

In the initial phases of project development, 12 concepts were developed and analyzed to determine whether they meet eight criteria based on the Project's Purpose and Need. After applying these criteria, four of those 12 concepts were retained in the EIS for detailed analysis as formal NEPA alternatives, including a "no build" scenario. The three Build Alternatives underwent additional engineering design modifications largely to ensure that the demolition of existing tunnel structures and the construction of new facilities minimize risks to the structural integrity of I-695, which is aligned immediately to the north of the tunnel. In addition and regardless of the Build Alternative, the Project will extend the east portal by approximately 330 feet to a location northeast of the 12th Street and M Street T-intersection.

The four alternatives retained for detailed analysis in the EIS are as follows:

- Alternative 1 - No Build (originally *Concept* 1): The No Build alternative is automatically carried forward into the NEPA process. The tunnel would not be rebuilt under this alternative. However, the railroad would continue to operate trains through the tunnel and at some point, emergency or unplanned major repairs or rehabilitation could be

required to this critical, aging infrastructure that might prove equally disruptive to the community than the Build Alternatives.

- Alternative 2 -Rebuilt Tunnel / Temporary Runaround Track (originally *Concept 2*): This alternative involves rebuilding the existing Virginia Avenue Tunnel. It would be rebuilt with two railroad tracks and enough vertical clearance to accommodate double-stack intermodal container freight trains. It would be rebuilt in generally the same location, except aligned approximately seven feet to the south of the existing tunnel center line. It would be rebuilt using protected open trench construction methods. During construction, freight trains would be temporarily routed through a protected open trench outside the existing tunnel (runaround track). The runaround track would be aligned to the south and generally parallel to the existing tunnel, and would be located below street level. Due to new columns associated with the rebuilt 11th Street Bridge, the runaround track would slightly separate from the tunnel alignment on the east end starting just west of Virginia Avenue Park. Safety measures such as securing fencing would be used to prevent pedestrians and cyclists from accessing the runaround track.
- Alternative 3 - Two New Tunnels (originally *Concept 5*): Alternative 3 was identified as the Preferred Alternative. Hereinafter, this alternative will be referred to as the Preferred Alternative. The Preferred Alternative involves replacing the existing Virginia Avenue Tunnel with two new permanent tunnels constructed sequentially. Each new tunnel will have a single railroad track with enough vertical clearance to allow double-stack intermodal container freight trains. A new parallel, south side tunnel will be built first as trains continue operating in the existing Virginia Avenue Tunnel. After the south side tunnel is completed, train operations will switch over to the new tunnel and the existing Virginia Avenue Tunnel will be demolished and rebuilt. With the exception of operating in a protected open trench for approximately 230 feet immediately east of the 2nd Street portal (within the Virginia Avenue SE segment between 2nd and 3rd Streets SE), trains will operate in enclosed tunnels throughout construction under the Preferred Alternative. Throughout most of the length of the rebuilt tunnel, the two tunnels will be separated by a center wall. This center wall will be the new centerline of the two tunnels, and it will be aligned approximately 25 feet south of the existing tunnel centerline, between 2nd and 9th Streets SE. Due to new columns associated with the rebuilt 11th Street Bridge, the tunnels will be separated on the east end starting just west of Virginia Avenue Park, resulting in two separate single-track tunnels and openings at the east portal.
- Alternative 4 - New Partitioned Tunnel / Online Rebuild (originally *Concept 6*): Alternative 4 would result in a new tunnel with two permanent tracks. Similar to the Preferred Alternative, the new tunnel would be partitioned and have enough vertical clearance to allow double-stack intermodal container freight trains. It would be aligned approximately 17 feet south of the existing tunnel's centerline. The new tunnel would be built using protected open trench construction methods. The rebuild would occur 'online' meaning that during the period of construction, the protected open trench would accommodate both construction activities and train operations. Maintaining safe and reliable temporary train operations is a more complicated endeavor under Alternative 4 than under the other two Build Alternatives due to the online rebuild approach.

This chapter is organized as follows:

- Rationale for identifying Alternative 3 as the Project's Preferred Alternative;
- Description of the "No Action" or "No Build" alternative, Alternative 1;
- Description of the Build Alternatives
- Construction period descriptions of the Preferred Alternative and the other Build Alternatives, which include:
  - Limits of disturbance needed to construct the Project,
  - Construction phasing,
  - Construction haul routes,
  - Maintenance of traffic plan,
  - Safety and security measures,
  - Cost estimate and duration of construction, and
- Post-construction condition of the new Virginia Avenue SE; and
- Explanation of the process that led to the selection of the three Build Alternatives and the elimination of design concepts from consideration.

3.2 Selection of the Preferred Alternative

Alternative 3 was selected as the Preferred Alternative. The primary reasons for selecting Alternative 3 as the preferred alternative include the ability of this alternative to best meet the project Purpose and Need while minimizing environmental impacts and addressing community concerns. This alternative reduces the construction duration for the Project to the greatest extent possible as well as accommodates the train operations in a closed tunnel thereby addressing community concerns about operation of trains within an open trench near residents. This alternative also enhances the safety of the tunnel and rail road operations by providing a center wall in the new tunnel separating the two sets of tracks, which will provide the benefit of isolating any derailment within the tunnel. The wall will also provide maintenance flexibility if an operational shutdown is required. Although the outer surface of the southern wall under Alternative 3 will be located approximately 25 feet south of the existing tunnel's outer southern wall, the new enclosed structure, track ballast/bed and concrete floor will serve to prevent proximity effects from train-related vibration to nearby buildings.

Alternative 3 was developed in direct response to community concerns about trains temporarily operating in an open trench during construction near neighborhoods. These concerns were repeated and further elaborated upon during the Draft EIS comment period as manifested in a range of air quality, safety, noise, vibration and general quality of life concerns expressed by a number of residents who live near the proposed construction area.

Moreover, although the centerline of the new Virginia Avenue Tunnel under Alternative 3 will be 25 feet south of the existing tunnel centerline or 18 and 8 feet further south than tunnels under Alternative 2 or 4, respectively, the additional design features, such as the new enclosed structure, track ballast/bed and concrete floor, will serve to prevent proximity effects from train-related vibration to nearby buildings. The vibration analysis indicates there will not be building

damage or human annoyance as a result of trains passing through the new tunnel (see Section 5.7). However, it is recognized that these concerns must continue to be addressed.

Alternative 1 was not selected as the Preferred Alternative because it would not address the Project's Purpose and Need. Additionally, ongoing train operations would continue in the current tunnel with emergency or unplanned repairs potentially required at some point in the future. The tunnel's existing and ongoing structural limitations would eventually require major rehabilitation or replacement of the tunnel.

While Alternative 2 would meet the project's Purpose and Need, it was not selected as the Preferred Alternative. Alternative 2 would employ runaround train operations in an open trench during construction (see Sections 3.7.1.1 and 3.4.2). Although the open trench, which would be completely within the construction area, would not affect the health and safety of both construction workers and nearby residents, runaround operations in an open trench raised several concerns. In addition, the new tunnel would not have a center wall separating the two sets of tracks, which as noted above, provides long-term benefits.

While Alternative 4 would meet certain elements of the Purpose and Need, it would do so to a slightly lower degree than the Preferred Alternative and Alternative 2. Alternative 4 would employ train operations during construction, but instead of its own open trench, train operations would occur within the same trench as other tunnel reconstruction activities (see Sections 3.7.1.6 and 3.4.3). This will make the construction of the tunnel far more complicated and would increase construction duration and impacts. Alternative 4 would have substantially longer construction duration (see Section 3.5.6) and hence much longer construction impacts than the other Build Alternatives. Other disadvantages of Alternative 4 in comparison to the other two Build Alternatives include a greater risk of construction delays due to train operations and/or interruptions to train operations due to construction activity, and longer construction duration within Virginia Avenue Park. For the reasons provided above, Alternative 4 was not selected as the preferred alternative

3.3 Alternative 1 - No Build

Full consideration is given in this Final EIS to the environmental consequences of taking no action to meet Project's Purposes and Need described in Chapter 2. For the purposes of analyzing the impacts of the Project, Alternative 1, or the No Build alternative, provides a baseline condition with which to compare the consequences associated with the proposed action.

Under Alternative 1, the existing single-track tunnel would remain the same, and still in use. It would continue to be part of the mainline eastern seaboard freight rail corridor for commercial freight traffic for the Washington Metropolitan Area and other markets, such as those throughout the Mid-Atlantic and Midwest states. However, the existing Virginia Avenue Tunnel cannot accommodate double-stack intermodal container rail cars -- rail cars that vertically stack two intermodal containers and thus carry twice the load as an ordinary single-stack rail car. Intermodal containers are metal containers that move from ship, to truck, to rail, without any

adjustments needed. Under Alternative 1, modern freight rail operations, which use double-stack intermodal container freight trains, would not be possible along the increasingly busy eastern seaboard freight rail corridor. Virginia Avenue Tunnel would also remain a bottleneck to the network with its single-track configuration, and along with the inability to accommodate double-stack intermodal container trains, makes this single, relatively small segment of the I-95 corridor a limiting factor in preventing substantial improvements to the freight carrying capacity of the entire network in the Mid-Atlantic.

Alternative 1 does not include any major repairs or rehabilitation of the tunnel in the near future. However, given its 100-year plus age, the tunnel could require emergency or unplanned repairs at some point in the future to maintain commercial freight movements and protect the safety of railroad personnel and the public. Such a repair may require closure of at least part of Virginia Avenue SE in order for CSX to make the necessary repairs similar to what occurred in 1985 when a 150-foot section of the tunnel roof collapsed and had to be repaired under emergency conditions. In addition, the tunnel would eventually require rehabilitation or replacement, which may occur under an unplanned condition, and possibly at a time when the surrounding neighborhood is more fully developed with increased traffic as a result. Unplanned repair or rehabilitation would not only inconvenience the surrounding community, but has the potential to severely affect commercial freight rail operations with wide implications to regional and/or national freight movements.

3.4 Build Alternatives

This section provides detailed descriptions of the Preferred Alternative and Alternatives 2 and 4. Together, these alternatives are referred to in this Final EIS as the 'Build Alternatives'. Alternative 1 is referred to as the 'No Action' or 'No Build' Alternative. To meet the Project's Purpose and Need, each of the candidate Build Alternatives will require the demolition of the existing Virginia Avenue Tunnel and the construction of a new Virginia Avenue Tunnel that has two railroad tracks that could accommodate double-stack intermodal container freight trains. Under each of the Build Alternatives, the need to provide proper grading of the existing tracks west of the new rebuilt tunnel will mean that the vertical clearance underneath New Jersey Avenue SE will be able to accommodate double-stack intermodal container freight trains.

The three Build Alternatives were developed from three design concepts, which were among a wider range of design concepts for the Project (see Section 3.7). Following a detailed screening process, some of the concepts were eliminated from further consideration. Concepts 2, 5 and 6 were carried forward as the Project's Build Alternatives (see Section 3.7.3) and subsequent to the series of public meetings leading up to the release of the Draft EIS, additional engineering evaluation was done on the selected Build Alternatives. The notable engineering modifications of the alternatives from their original concepts were made mainly to avoid risking the structural integrity of the nearby and adjacent I-695. In order to assure that the structural integrity of I-695 and associated infrastructure remains intact, most of the existing north wall of the tunnel (the wall nearest to I-695) is expected to remain in place under all three Build Alternatives.

Regardless of Build Alternative, the total length of the rebuilt Virginia Avenue Tunnel will be extended by approximately 330 feet on the east end. The new east tunnel portal will be located northeast of the existing M Street SE / 12th Street SE T-intersection.

Due to the proximity of the new rail line configuration (two tracks) immediately west of the 2nd Street portal, the existing columns supporting the I-695 viaduct near the portal will be strengthened where applicable to meet American Railway Engineering and Maintenance-of-Way (AREMA) requirements for pier protection as well as CSX requirements for pier protection, which are more stringent than the AREMA requirements.

3.4.1 Preferred Alternative (Alternative 3) – Two New Tunnels

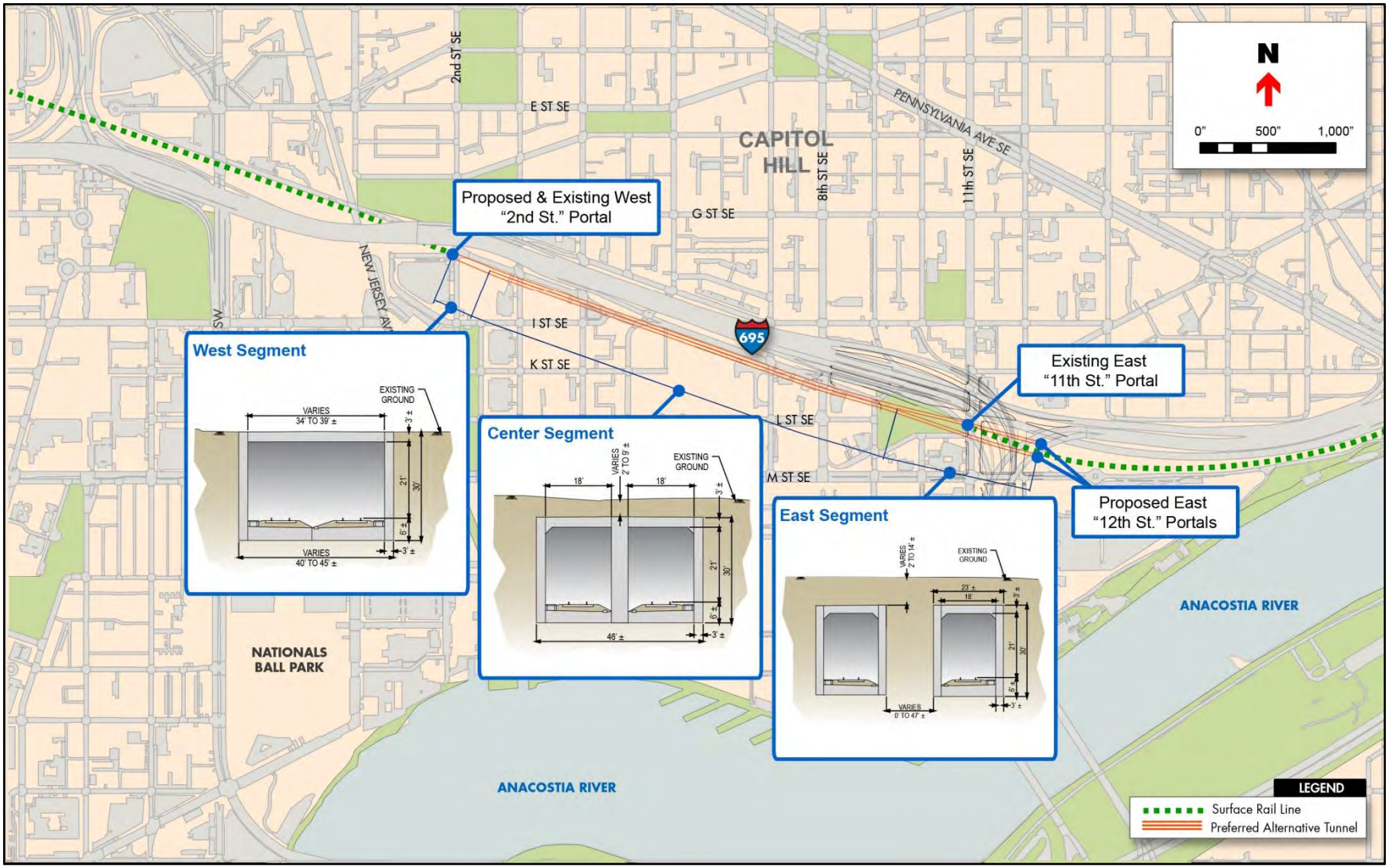
The Preferred Alternative (Alternative 3) was developed from Concept 5 (see Section 3.7.1.5). Essentially, Concept 5 avoids having to construct temporary facilities to maintain freight operations during construction. The south side single-track/double-stack tunnel will be constructed first. During construction of the south side tunnel, freight traffic will continue to use the existing Virginia Avenue Tunnel. After the new south side tunnel is completed, train traffic will cut over to this new tunnel and the existing, older tunnel will be reconstructed and converted into a new single-track/double-stack tunnel.

When developed into Alternative 3, the west portal at 2nd Street SE was changed to a single two-track portal rather than two single-track portals because additional engineering found that there is not sufficient space between the piers of the I-695 viaduct to allow separate tunnels. The double track, single tunnel is shown on Figure 3-1 within the west section, which is approximately 230 feet long and is located immediately east of the 2nd Street portal (within the Virginia Avenue SE section between 2nd and 3rd Streets SE). This modification means that during construction, freight trains will operate in a protected open trench within this west section. Within the remainder of the tunnel limits, freight trains will operate in an enclosed tunnel throughout the construction duration. The construction phasing along the west section of the tunnel is described in Section 3.5.2.

From approximately midway between 2nd and 3rd Streets to just east of 9th Streets SE under Virginia Avenue Park, the two single railroad track tunnels will be separated by a center wall (see center section in Figures 3-1 and 3-2). The centerline of the two tunnels, represented by the center wall, will be aligned approximately 25 feet south of the existing tunnel centerline. The construction phasing along this center section of the tunnel is described in Section 3.5.2.

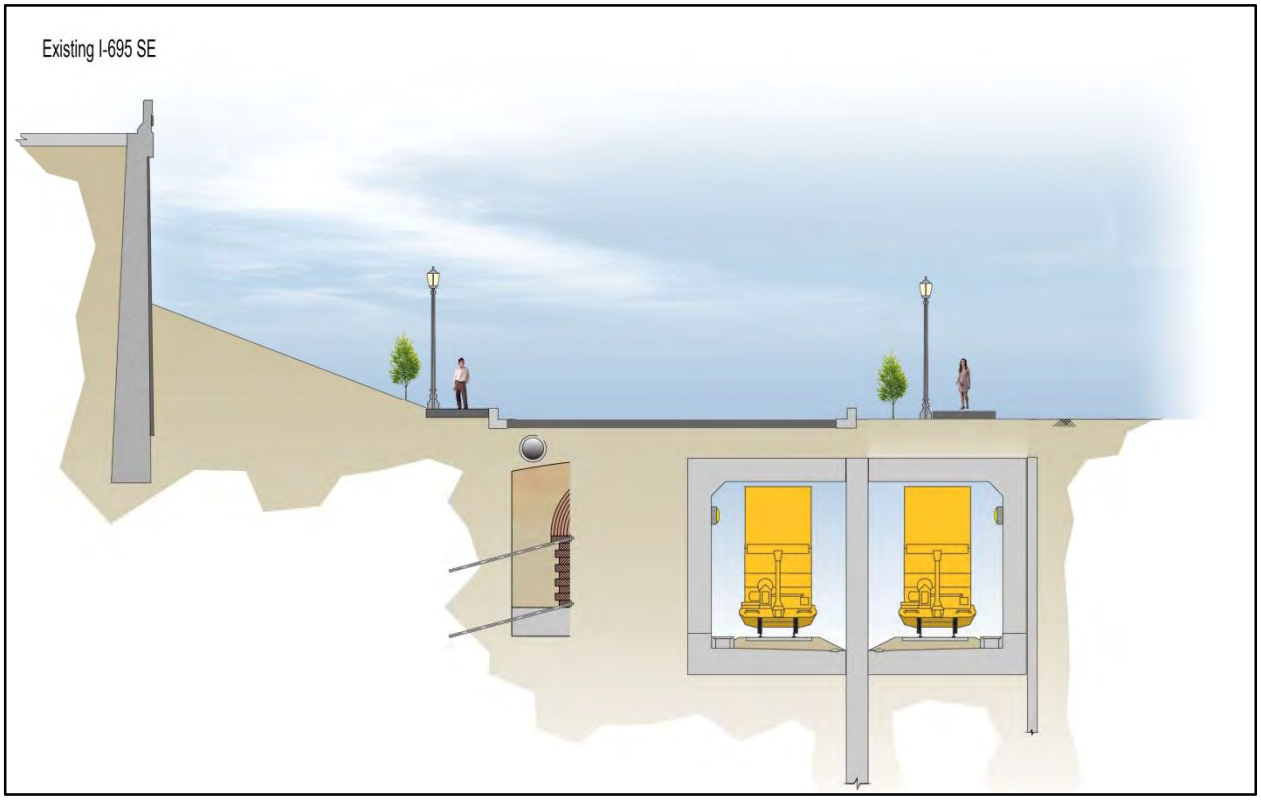
From just east of 9th Street SE to the east portal at 12th Street SE, the tunnels will be separated, resulting in two single-track tunnels (see Figure 3-1). This is due to the locations of new concrete columns associated with the rebuilt 11th Street Bridges. The existing clearance available between these columns does not provide enough space to build a new double track single tunnel box adjacent to the existing tunnel without requiring demolition of the existing tunnel. The existing tunnel needs to remain in place to maintain train operations until construction of the new south tunnel is completed. The separation between the tunnels will be widest at the east tunnel portal where it will be approximately 65 feet centerline to centerline. Therefore, the east

Figure 3-1
Typical Sections of the Preferred Alternative by Section



tunnel portal, at completion, will consist of two single-track tunnel openings and will require more space than under Alternatives 2 and 4.

Figure 3-2
Cross Section View of Post-Construction Preferred Alternative
between 3rd and 9th Streets SE



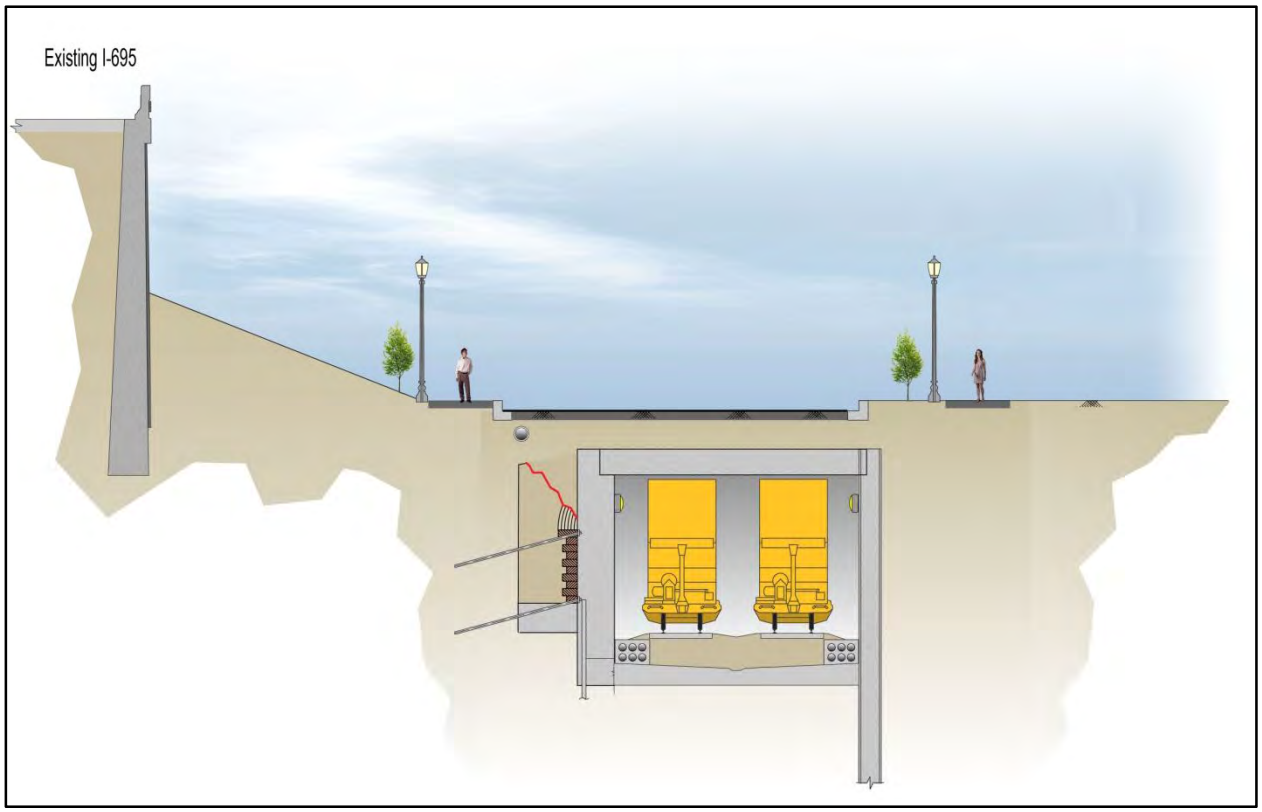
3.4.2 Alternative 2 - Rebuilt Tunnel / Temporary Runaround Track

The Alternative 2 was developed from Concept 2 (see Section 3.7.1.1). Concept 2 maintains freight traffic during construction of the new tunnel by providing a temporary runaround track placed inside a protected trench constructed immediately south of the existing tunnel alignment. While train traffic is shifted to the runaround track, the existing tunnel is demolished and in its place, a new double track tunnel would be constructed. Upon completion of the rebuilt Virginia Avenue Tunnel under Alternative 2, the runaround track would be removed and the protected trench would be backfilled.

When developed into Alternative 2, the temporary runaround track was re-aligned starting just west of Virginia Avenue Park due to new columns associated with the rebuilt 11th Street Bridges. The alignment for the temporary track along this segment would the same as the south side tunnel under the Preferred Alternative. In addition, the centerline of the rebuilt two-track tunnel

would be aligned approximately seven feet south of the existing tunnel centerline. The centerline of the existing tunnel is located approximately at the middle of the existing rails. Concept 2 showed a centerline as being the same as the existing tunnel. The centerline of the rebuilt tunnel under Alternative 2 would be located half way between the two sets of rails. The shift is smallest at the west portal. It becomes approximately 10 feet roughly east of 3rd Street SE. A typical cross section of post-construction Virginia Avenue Tunnel under Alternative 2 between 3rd Street and 9th Street SE is shown at Figure 3-3. Although the surface above the tunnel would vary (e.g., different Virginia Avenue SE streetscapes, restored Virginia Avenue Park, etc.), the cross section of the rebuilt tunnel would be the same from portal to portal, which is unlike the new tunnel under the Preferred Alternative.

Figure 3-3
Cross Section View of Post-Construction Alternative 2
between 3rd and 9th Streets SE



3.4.3 Alternative 4 - New Partitioned Tunnel / Online Rebuild

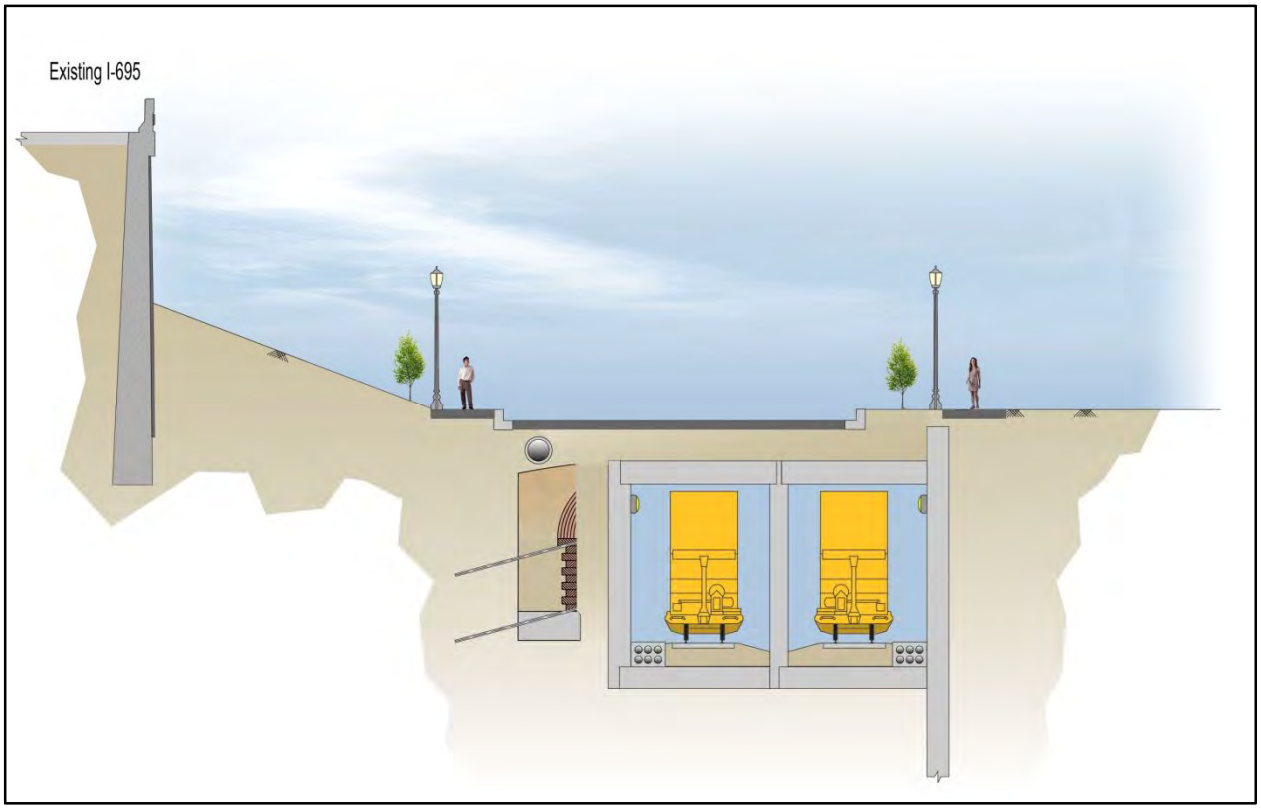
The Alternative 4 was developed from Concept 6 (see Section 3.7.1.6). Concept 6 would involve construction of a new permanent tunnel in short segments while maintaining freight rail traffic in one half of the tunnel or construction trench at all times. Demolition of the old tunnel and construction of the new tunnel would occur in numerous stages with regularly shifting track

alignments and all work occurring in very close proximity to live train traffic, allowing trains to continue to use the tunnel though the construction work area on a daily basis.

When developed into Alternative 4, additional engineering analysis showed that a larger trench would be needed for both maintaining freight rail operations and rebuilding the tunnel. Unlike the other Build Alternatives, Alternative 4 would require removal of the north tunnel wall along the east end of the tunnel in order for this alignment to fit within modifications of the 11th Street Bridges currently being done by DDOT.

From the west portal to the general vicinity of 3rd Street SE, the rebuilt Virginia Avenue Tunnel under Alternative 4 would be the same as under Alternative 2. However, the additional engineering analysis changed the finished tunnel between 3rd Street to the east portal from a single two-track tunnel to a tunnel that would consist of two single-track tunnels separated by a center partition wall (see Figure 3-4). Also, the centerline of the rebuilt tunnel along most of the tunnel length, represented by the center partition wall, would be aligned approximately 17 feet south of the existing tunnel centerline.

Figure 3-4
Cross Section View of Post-Construction Alternative 4
between 3rd and 9th Streets SE



3.5 Construction Period Conditions

Regardless of the Build Alternative, the construction-period conditions will be the same or be very similar. The construction-period description under the Preferred Alternative or the other two Build Alternatives includes:

- Limits of disturbance, which includes the construction staging and stockpiling areas, and identifying streets that will be closed during construction;
- Phasing plan, which describes the general construction methods and activities for each Build Alternative;
- Access points and haul routes for construction vehicles;
- Maintenance of traffic (MOT) plan that will indicate how public traffic will be accommodated with the planned street closures and how properties located along or near street closures will keep their public access;
- Safety and security measures;
- Estimated duration of construction; and
- Estimated construction costs.

3.5.1 Limits of Disturbance

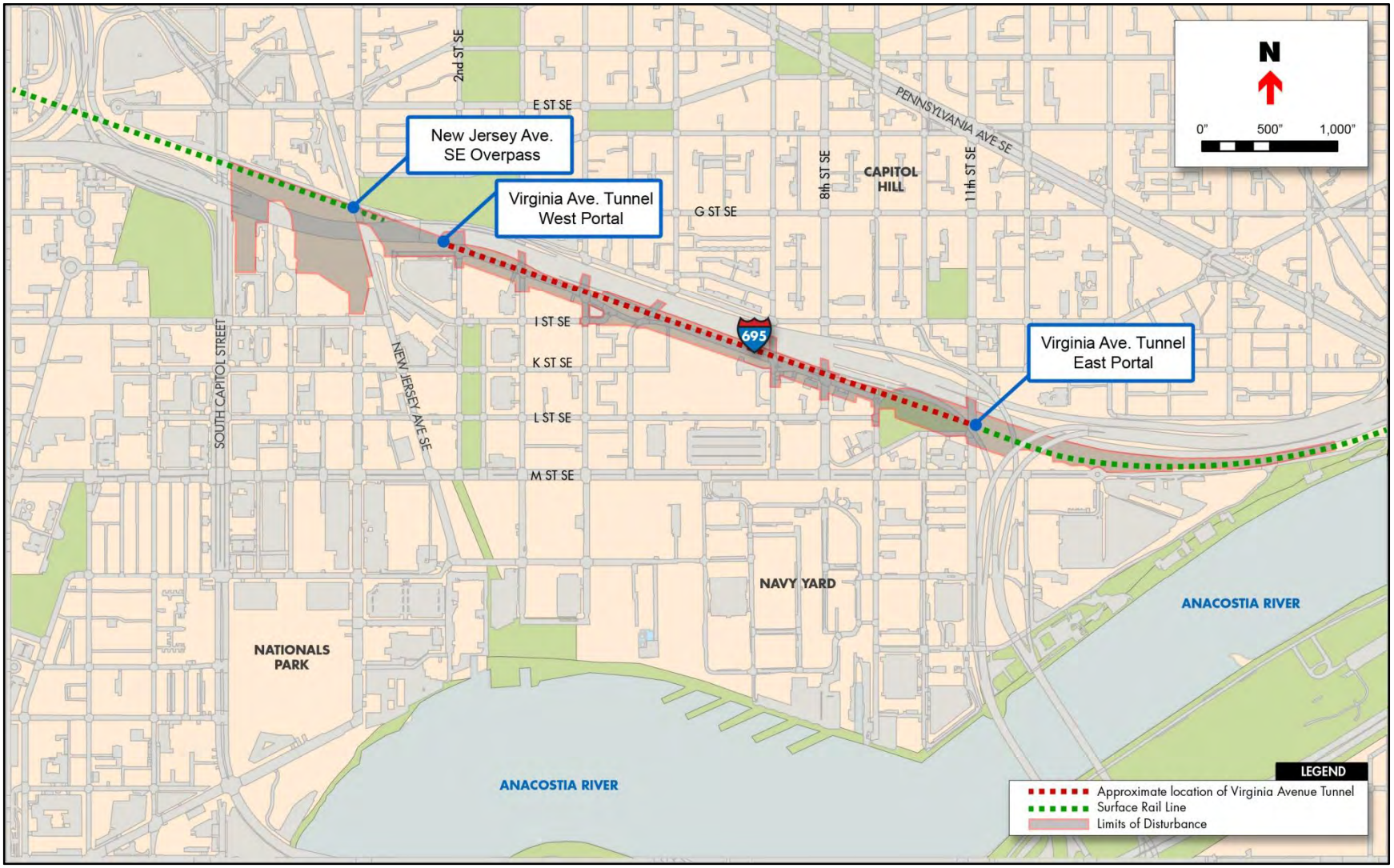
The Limits of Disturbance (LOD), which is depicted in Figure 3-5, means all areas where construction will take place, including areas needed for staging, materials stockpiling, utility relocations, and temporary freight train operations. More detailed depictions of the proposed LOD for the Build Alternatives are provided in Appendix C. The LOD basically represents the areas affected by construction and will be restricted from the general public, except Virginia Avenue's cross streets, which will remain open for public passage throughout construction by means of temporary bridges (see Sections 3.5.2 and 3.5.4). Other areas outside of the LOD will be subject to minor construction work associated with MOT detours, such as re-striping, removing or modifying parking meters, modifying curb lines at intersections for turning movements, modifying existing traffic signal systems including adding temporary signals, widening roadway pavement as required, and resurfacing affected areas. These areas are shown in the depictions provided in Appendix C.

The Preferred Alternative and Alternative 2 have identical LODs because the alignments of the temporary runaround track/trench under Alternative 2 and the new south side single-track tunnel under the Preferred Alternative are the same.

The Preferred Alternative or Alternative 2's LOD will encompass the following areas, and involve various construction activities as noted below:

- CSX-owned rail right-of-way between the South Capitol Street Overpass and the Virginia Avenue Tunnel west portal. For the Preferred Alternative or Alternative 2, this area will be used to convert the single-track configuration to a double-track configuration immediately west of the tunnel portal at 2nd Street SE, and to provide proper grading of the existing tracks west of the new rebuilt tunnel.

Figure 3-5
Limits of Disturbance during Construction under the Preferred Alternative or Alternative 2



- Virginia Avenue SE (eastbound) public right-of-way between 2nd and 9th Streets SE, which will be needed to construct:
  - Temporary runaround track/ protected trench and rebuilt two-track Virginia Avenue Tunnel (Alternative 2), or
  - Partitioned single-track tunnels (Preferred Alternative or Alternative 4).

- Virginia Avenue Park between 9th Street and 11th Street SE: Same as Virginia Avenue SE (eastbound) right-of-way. A portion of the park will be temporarily used for the LOD. This will not include the portion of the park used as a community garden and the picnic benches located along Potomac Avenue SE. For the Preferred Alternative or Alternative 2, the LOD will be wider from just west of Virginia Avenue Park to the 11th Street Bridge right-of-way than under Alternative 4. The alignment of the temporary runaround track (Alternative 2) and the south side permanent single-track tunnel (Preferred Alternative) would bend slightly south to avoid new columns installed for the current 11th Street Bridge Project. This widening will require a section of L Street SE adjacent to the park to be included in the LOD. The park and the affected section of L Street SE will be restored to at least their pre-construction condition at the end of construction.

- Area between Virginia Avenue Park and 11th Street Bridge public right-of-way between I-695 and Potomac Avenue SE: Same as Virginia Avenue SE (eastbound) right-of-way.

- CSX-owned rail right-of-way and DDOT public space between the east tunnel portal and approximately 1700 feet east: For all Build Alternatives, this area will be used to convert the single-track configuration to a two-track configuration immediately east of the tunnel portal just west of 12th Street SE, and to provide for proper grading of the existing tracks east of the tunnel to accommodate the new elevation of the rebuilt tunnel. Under the Preferred Alternative, the two tracks will be split by approximately 75 feet at the two tunnel portals. These tracks will transition back to the existing side-by-side tracks several hundred feet east of the portals, but within the eastern limits noted above.

- Public right-of-way directly beneath the I-695 structure between Garfield Park and Virginia Avenue SE in the vicinity of 2nd Street SE: This area is needed to relocate a large sewer line (Tiber Creek & New Jersey Avenue High Level Intercepting Sewer) under all three Build Alternatives.

- Portions of 2nd to 9th Streets SE public right-of-way at their intersections with Virginia Avenue SE: These areas will be used to maintain surface traffic during construction, including the installation of temporary bridges to maintain cross-street traffic. See Section 3.5.4 for further information.

- L Street between 8th and 9th Streets SE: This area will be used to maintain surface traffic during construction, but no construction will be needed other than installation of

temporary traffic signals and re-striping for two-way operations. This area is not considered part of the LOD. See Section 3.5.4 for further information.

- Approximately 40 feet wide section of U.S. Marine Corps property between Capper Senior Homes and 7th Street SE: This area will be used to construct the temporary runaround track/ protected trench (Alternative 2), or the south side single-track tunnel (Preferred Alternative). The Marine Corps property may also be used to relocate certain utilities affected by the Project. The property will be restored to at least the pre-construction condition at the end of construction.

- Jersey Rail Yard, a CSX-owned property located directly south of the CSX rail right-of-way between New Jersey Avenue SE and South Capitol Street: This area will be used for construction staging, vehicle and equipment storage, worker parking, contractor offices, for the temporary materials stockpiles and a community outreach office.

The LOD for Alternative 4 would be the same as the LOD for the Preferred Alternative or Alternative 2 except along the south edge of Virginia Avenue between 2nd and 11th Streets SE portals, and in Virginia Avenue Park. The Alternative 4's LOD along Virginia Avenue SE would be a few feet narrower and be slightly smaller in the park.

While it is possible that the LOD may be adjusted later during final design or construction due to new information, DDOT will be informed of any adjustment that increases the size of the LOD. Most of the LOD is constrained, especially along Virginia Avenue SE and the CSX right-of-way. The LOD does not include private property, nor will it be expanded into private property during final design.

3.5.2 Phasing

Construction of the Project will be complex. This section provides an explanation of the major steps needed to complete the construction for each of the Build Alternatives, which are illustrated in Tables 3-1 through 3-3. It should be noted that the cross sectional views of the Preferred Alternative and Alternatives 2 and 4 shown on these tables are different than what are described in Sections 2.2.1.1, 2.2.1.5 and 2.2.1.6 for Concepts 2 (Alternative 2), 5 (Preferred Alternative) and 6 (Alternative 4), respectively. This is due to additional engineering design work that was performed specifically on these alternatives. Although completion of final design of the Project is unlikely to change the steps described in Tables 3-1 through 3-3, there may be situations unknown at this time in which deviations from these steps may be necessary.

Table 3-2 shows the construction phasing within the center segment of the Preferred Alternative, which encompasses the majority of the tunnel length (see Figure 3-5). As described in the introduction of this section, the Preferred Alternative's tunnel within the west and east segments will be different from the tunnel in the center segment. Although the east segment tunnels will be spaced apart, the construction phasing as shown in Table 3-2 will be the same, in particular train operations will be within an enclosed tunnel at all times. However, within the 230-foot long west segment, trains will operate within an open trench throughout the majority

Table 3-1
Alternative 2 Construction Phasing

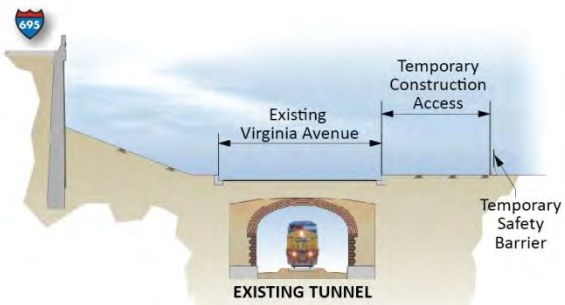
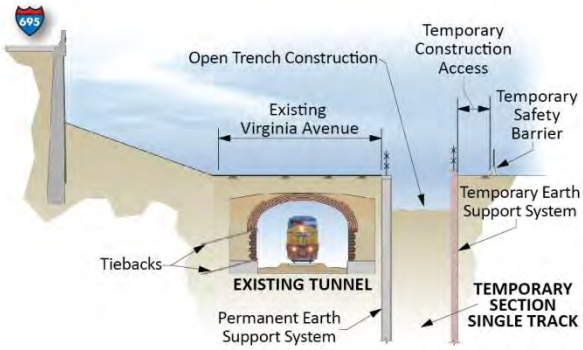
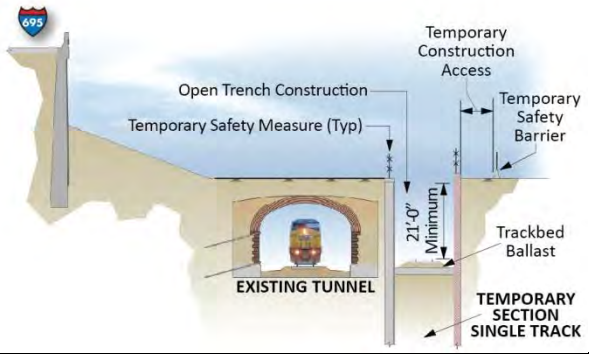
Step	Major Activities
Step 1 	• Set up the maintenance of traffic (MOT) measures • Partially close Virginia Avenue SE to traffic • Initiate utility relocations (concurrent with other activities) • Remove roadway asphalt and other hard surfaces. • Erect temporary bridge crossings at intersections over temporary runaround trench location • Install safety barriers around construction site • Install temporary bridge crossings over runaround trench
Step 2 	• Install a temporary earth support system on the south side of the runaround trench • Install a permanent earth support system on the north side of the runaround trench (this would form the south side wall of the rebuilt tunnel) • Begin excavation of the runaround trench from the top (open trench construction) • Install tiebacks in the existing tunnel's north side wall
Step 3 	• Complete trench excavation • Install track bed ballast, temporary tracks and other train operations signals and communication equipment

Table 3-1 (Continued)
Alternative 2 Construction Phasing

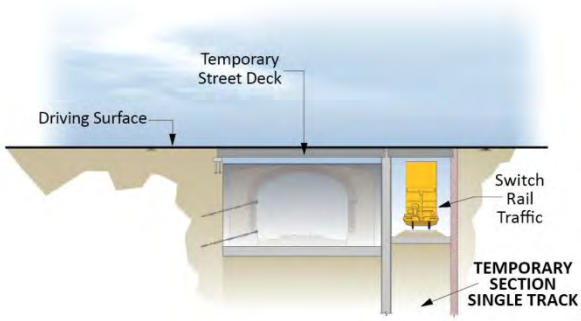
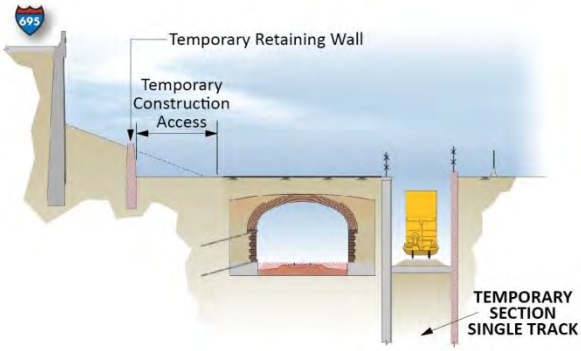
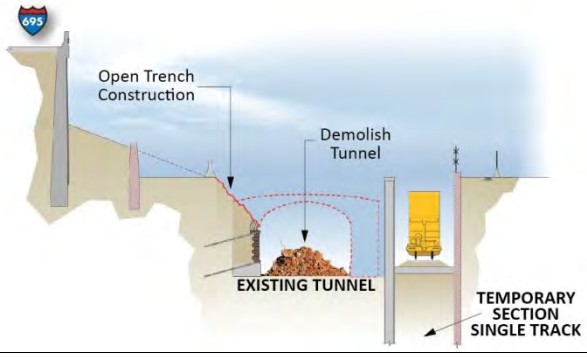
Step	Major Activities
Step 4 	• Install temporary bridge crossings over existing tunnel alignment • Install track cut-over at each end of the tunnel to switch train route from the existing tunnel to the temporary runaround trench • Begin operating trains through the temporary runaround trench and remove all train operations from existing tunnel
Step 5 	• Partially cut toe of embankment slope on the north side of Virginia Avenue SE and install temporary retain wall • Provide construction access on the north side of the existing tunnel
Step 6 	• Demolish the tunnel (roof, south side wall, utilities, track work) from the top (open trench construction); north side wall remain

Table 3-1 (Continued)
Alternative 2 Construction Phasing

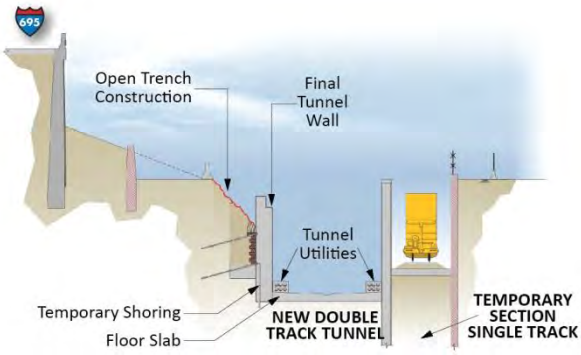
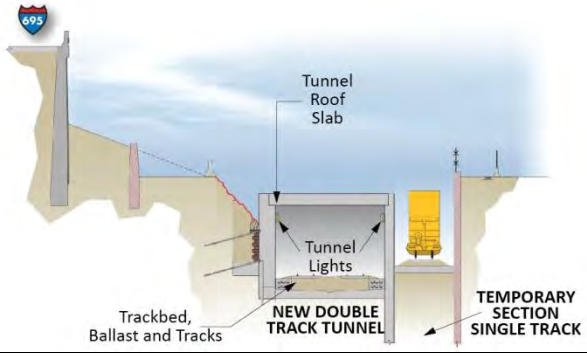
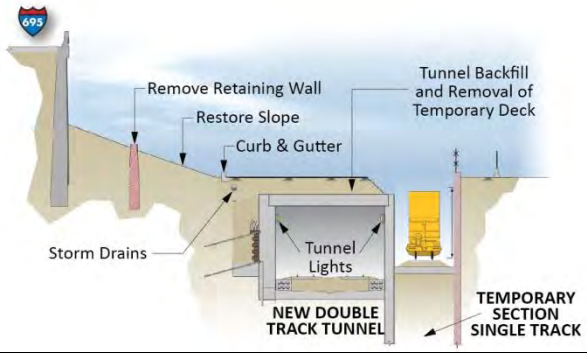
Step	Major Activities
Step 7 	• Install temporary shoring along north side wall • Complete excavation of the new tunnel floor • Install concrete floor • Install new north side wall (inside old north side wall) • Begin utility installations
Step 8 	• Install new track bed and ballast • Install tunnel roof slab • Install new tracks and related equipment (e.g., lighting)
Step 9 	• Backfill on top of tunnel roof • Remove embankment retaining wall and restore slope on the north side of Virginia Avenue SE • Remove temporary street decks over the rebuilt tunnel • Install storm drains • Begin construction of curbs and gutters

Table 3-1 (Continued)
Alternative 2 Construction Phasing

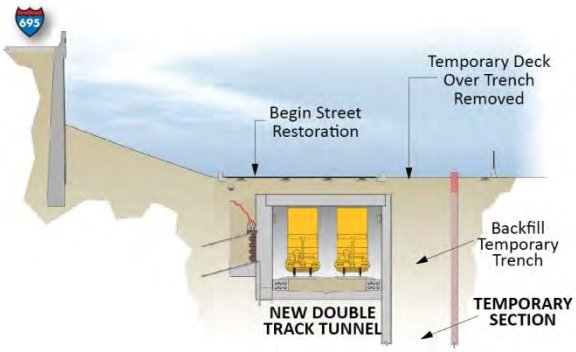
Step	Major Activities
Step 10 	• Move trains to rebuilt tunnel • Remove temporary track work in the runaround trench • Backfill runaround trench and remove upper portion of temporary earth support on the south side of the trench (the bottom portion would remain) • Remove temporary street deck over temporary trench • Begin street restoration • Continue construction of storm drains, curbs and gutters
Step 11 	• Complete roadway surface restoration (street paving, sidewalks, lighting, striping etc.) and landscaping • Remove all remaining temporary barriers • Open Virginia Avenue SE to traffic

Table 3-2
Preferred Alternative Construction Phasing

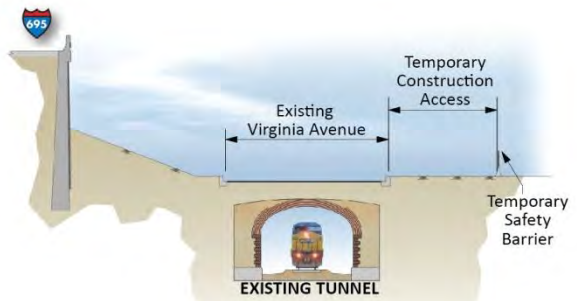
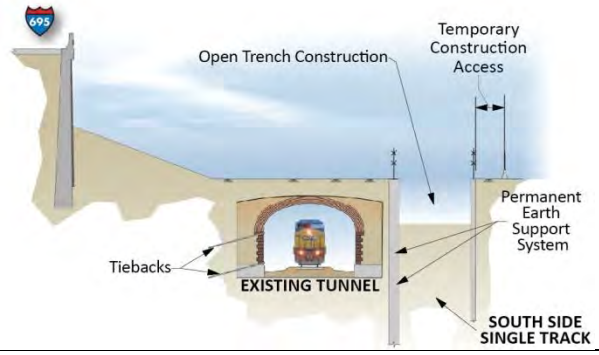
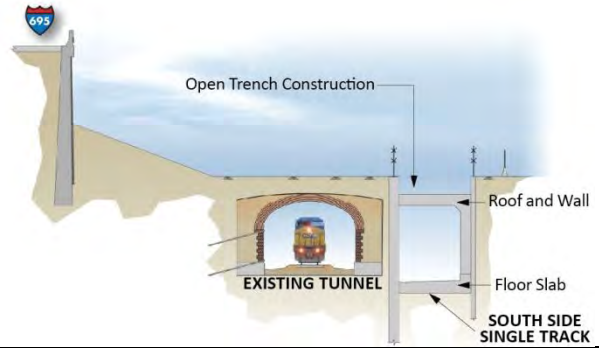
Step	Major Activities
Step 1  	• Set up the maintenance of traffic (MOT) measures • Partially close Virginia Avenue SE to traffic • Initiate utility relocations (concurrent with other activities) • Remove roadway asphalt and other hard surfaces. • Erect temporary bridge crossings at intersections over south side tunnel alignment • Install safety barriers around construction site • Install temporary bridge crossings over excavation of new south side tunnel Estimated Duration: 5 to 6 Months.
Step 2  	• Install permanent earth support systems on both the north and south side of the south side tunnel alignment (north side support system would form the tunnel wall for both the south and north tunnels) • Begin excavation for the south side tunnel from the top (open trench construction) • Install tiebacks in the existing tunnel's north side wall Estimated Duration: 3 to 4 Months.
Step 3  	• Complete excavation needed for the south side tunnel • Install concrete floor slab for the south side tunnel • Install south side tunnel's roof and south wall Estimated Duration: 6 to 8 Months.

Table 3-2 (Continued)
Preferred Alternative Construction Phasing

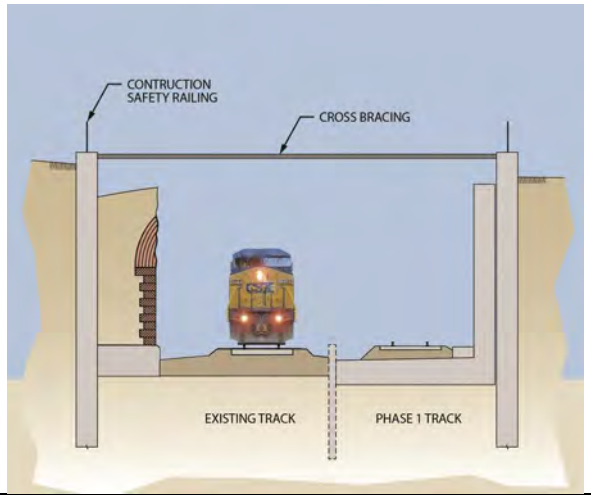
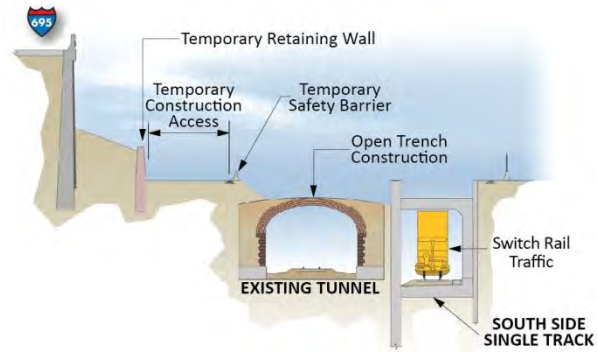
Step	Major Activities
Step 3A (West Segment)  	• For west segment, trains will continue operating on the existing tracks while the portion of tunnel with the new south side track is being constructed
Step 4  	• Install utilities in the tunnel • Install track bed ballast, tracks and other train operations signals and communication equipment for the south side tunnel Estimated Duration: 1 to 2 Months.
Step 5 (Between Intersections)  	• Install track cut-over from existing tunnel to south side at each end of the tunnel • Begin to operate trains through the south side tunnel, and remove all train operations from existing tunnel • Partially cut toe of embankment slope on the north side of Virginia Avenue SE and install temporary retain wall • Provide construction access on the north side of the existing tunnel • Begin excavation over the existing tunnel • Install temporary bridge crossings over existing tunnel alignment at intersections Estimated Duration: 1 to 2 Months.

Table 3-2 (Continued)
Preferred Alternative Construction Phasing

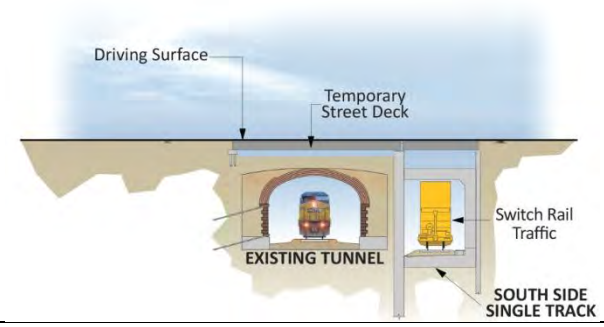
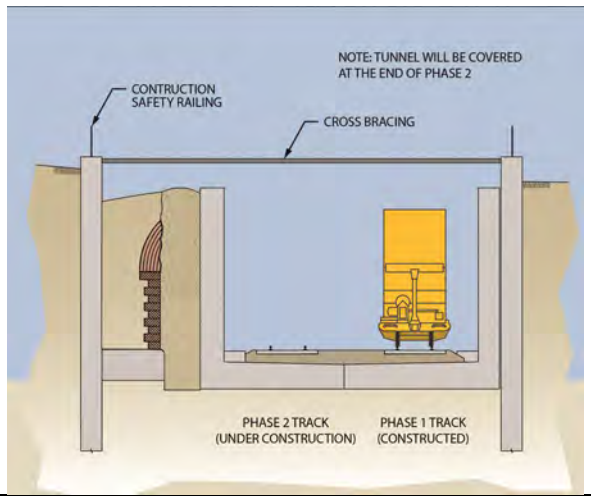
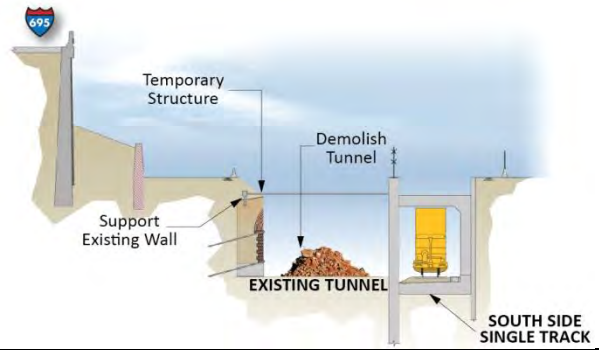
Step	Major Activities
Step 5 (At Intersections)  	
Step 5A (West Segment)  	• At west segment, train traffic will switch to the south side track while the north side of the tunnel and track are being constructed
Step 6  	• Install temporary struts between existing wall and new wall • Demolish the tunnel (roof, south side wall, utilities, track work) from the top (open trench construction); north side wall remain Estimated Duration: 2 to 3 Months.

Table 3-2 (Continued)
Preferred Alternative Construction Phasing

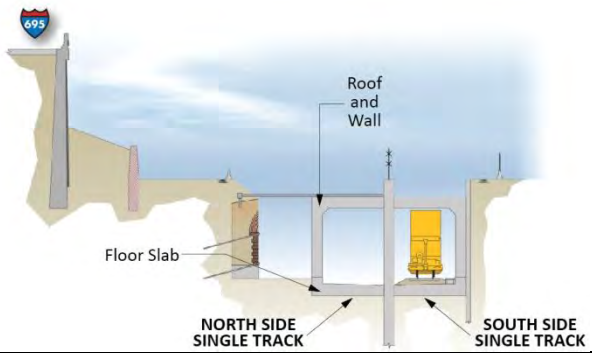
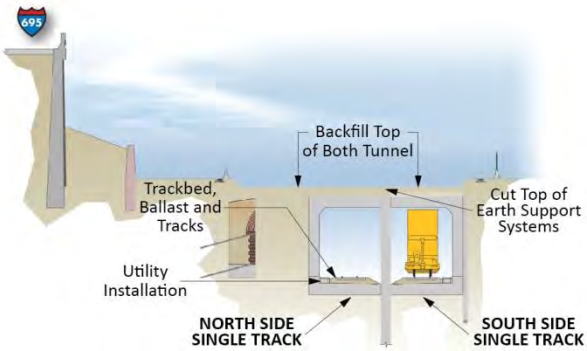
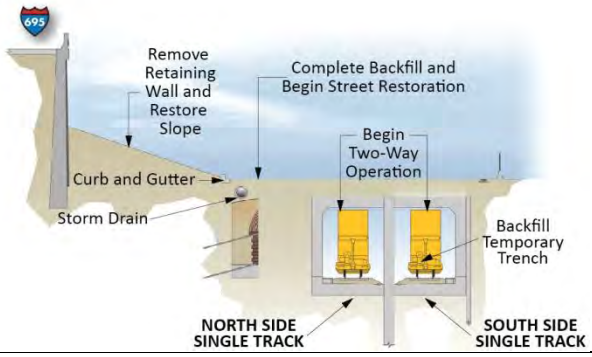
Step	Major Activities
Step 7 	• Install concrete floor slab for the north side tunnel • Install north side tunnel's roof and north wall Estimated Duration: 6 to 8 Months.
Step 8 	• Install track bed ballast, tracks and other train operational signals and communication equipment for the north side tunnel • Complete utility installation in rebuilt tunnel • Remove the temporary struts • Backfill on top of both tunnels' roof • Remove temporary decks over the both tunnels • Cut top of the earth support systems Estimated Duration: 1 to 2 Months.
Step 9 	• Provide track connections for the north side tunnel at both ends of the tunnel portal • Begin two-way train operations utilizing both tunnels • Complete backfill over both tunnels • Remove embankment retaining wall and restore slope on the north side of Virginia Avenue SE • Install storm drains • Begin construction of curbs and gutters • Begin street utility restoration Estimated Duration: 2 to 3 Months.

Table 3-2 (Continued)
Preferred Alternative Construction Phasing

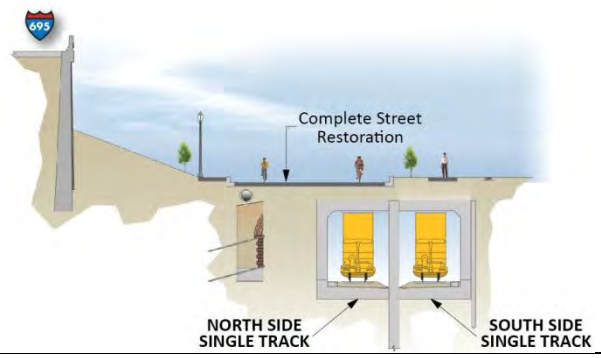
Step	Major Activities
Step 10  	• Complete roadway surface restoration (street paving, sidewalks, lighting, striping etc.) and landscaping • Continue construction of storm drains, curbs and gutters • Remove all remaining temporary barriers • Open Virginia Avenue SE to traffic Estimated Duration: 3 to 4 Months.

Table 3-3
Alternative 4 Construction Phasing

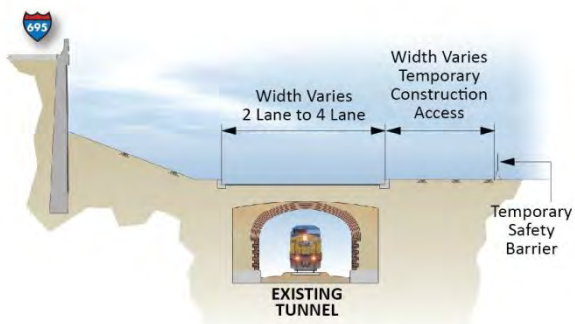
Step	Major Activities
Step 1 	• Set up the maintenance of traffic (MOT) measures • Close Virginia Avenue SE to traffic (section between 4th and 9th Streets SE will remain open in the first several months of construction) • Initiate utility relocations (concurrent with other activities) • Remove roadway asphalt and other hard surfaces. • Erect temporary bridge crossings at intersections • Install safety barriers around construction site
Step 2 	• Install permanent earth support systems on the south side of the existing tunnel alignment • Install temporary anti-fall barrier over existing rail line in the tunnel • Establish temporary construction access on the south side of existing tunnel • Install temporary bridge crossings over trench
Step 3 	• Partially cut toe of embankment slope on the north side of Virginia Avenue SE and install temporary retain wall • Provide construction access on the north side of the existing tunnel • Install tiebacks in the existing tunnel's north side wall • Initiate excavation over the existing tunnel and south up to the earth support system

Table 3-3 (Continued)
Alternative 4 Construction Phasing

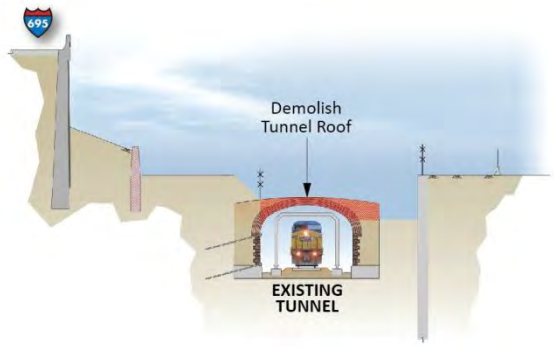
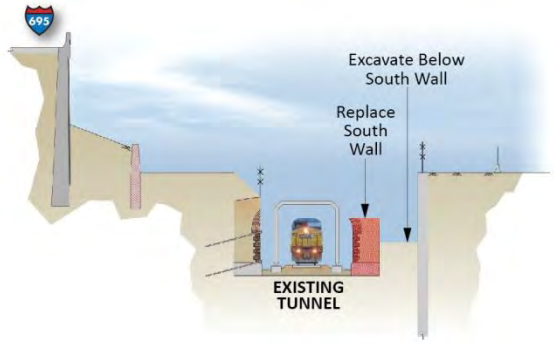
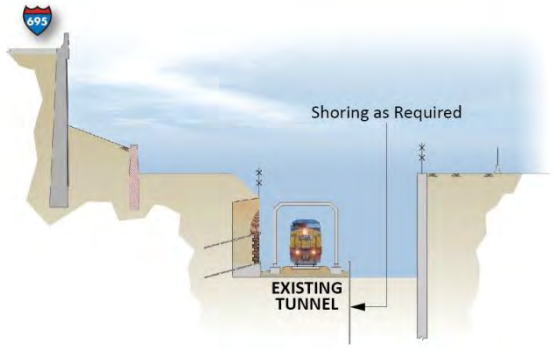
Step	Major Activities
Step 4 	• Demolish tunnel roof (open trench construction)
Step 5 	• Remove south wall of existing tunnel • Excavate below the south wall
Step 6 	• Install track shoring as required to protect the integrity of the existing track bed ballast

Table 3-3 (Continued)
Alternative 4 Construction Phasing

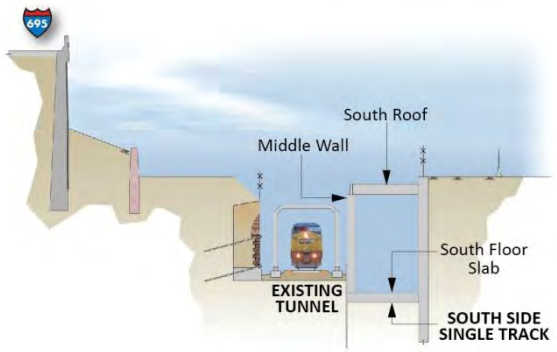
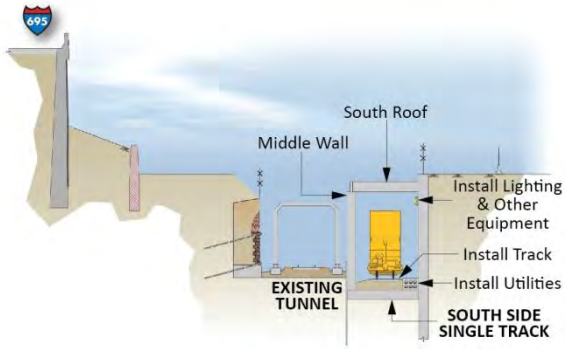
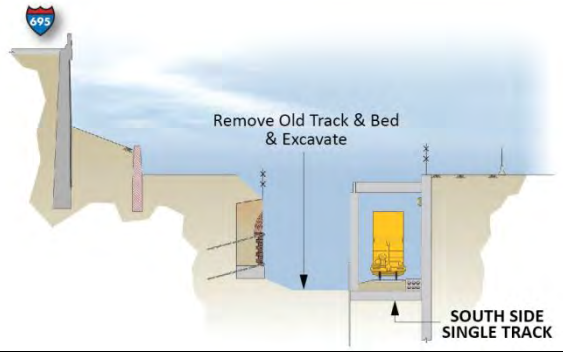
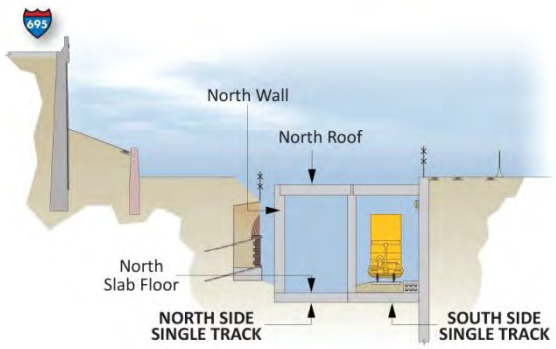
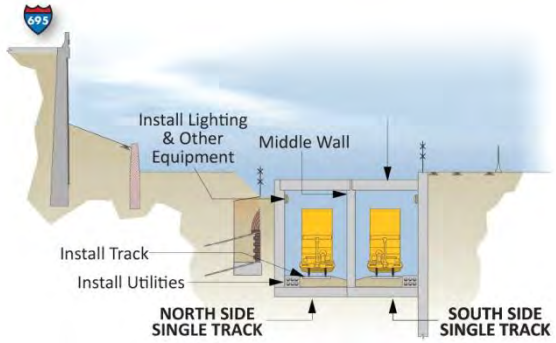
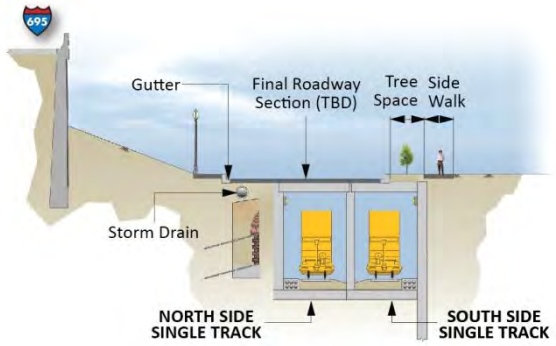
Step	Major Activities
Step 7 	• Construct south side tunnel floor • Construct middle wall and roof for the south side single-track tunnel
Step 8 	• Install track bed ballast, tracks and other train operations signals and communication equipment for the south side tunnel • Install utilities in the south side tunnel • Install track cut-over from existing tunnel to south side at each end of the tunnel • Begin to operate trains through the south side tunnel, and remove all train operations from existing tunnel
Step 9 	• Remove old rails and track bed ballast • Excavate down to a depth matching the depth of the new south side single railroad track tunnel

Table 3-3 (Continued)
Alternative 4 Construction Phasing

Step	Major Activities
Step 10 	• Construct north side tunnel floor • Construct north side wall and roof for the north side single-track tunnel
Step 11 	• Install track bed ballast, tracks and other train operational signals and communication equipment for the north side tunnel • Complete utility installation in the rebuilt tunnel • Provide track connections for the north side tunnel at both ends of the tunnel portal • Begin two-way train operations utilizing both tunnels
Step 12 	• Backfill on top of both tunnels' roof • Remove temporary decks over the both tunnels • Remove embankment retaining wall and restore slope on the north side of Virginia Avenue SE • Install storm drains • Complete roadway surface restoration (street paving, sidewalks, lighting, striping etc.) and landscaping Continue construction of storm drains, curbs and gutters • Remove all remaining temporary barriers • Open Virginia Avenue SE to traffic

of the construction period. The phasing of train operations within the west segment is shown in Table 3-2. Plan views of the west end and other segments in the construction area are provided in Appendices C and M.

Construction of the Project will be accomplished in segments, with some activities being potentially more noticeable than others. Although construction will proceed in phases or segments, the LOD, as described in Section 3.5.1, will remain secured throughout most of construction.

3.5.3 Access and Haul Routes

In addition to the LOD, construction area access points for construction vehicles and designated haul routes were identified and are shown in Figure 3-6. The access points apply to all three Build Alternatives. The haul routes correspond to designated construction area access points at the following locations that match the numbered spots shown in Figure 3-6:

1. South Capitol Street from the Jersey Rail Yard
2. I Street SE from the Jersey Rail Yard
3. 1st Street SE and H Street SE
4. 2nd Street SE at Virginia Avenue SE
5. 3rd Street at Virginia Avenue SE
6. 4th Street at Virginia Avenue SE
7. I Street SE at Virginia Avenue SE
8. 5th and 6th Street SE at Virginia Avenue SE
9. 7th Street SE at Virginia Avenue SE
10. 8th Street SE at Virginia Avenue SE
11. 9th Street SE at Virginia Avenue SE
12. L Street SE between 10th and 11th Streets SE
13. L Street SE and 11th Street SE
14. M Street SE adjacent to the CSX rail right-of-way

The haul trucks will enter or exit the construction area from I-395, South Capitol Street and the 11th Street Bridge (I-695). The latter two roadways provide connections to I-295. I-395 connections will be made through South Capitol Street and I and M Streets SE, in addition to I-695 ramps at 3rd and 6th Streets SE. South Capitol Street connections will be made through I and M Streets SE. 11th Street Bridge connections will be made through M Street SE.

At any given day, haul routes noted on Figure 3-6 could be modified due to a number of reasons, such as road closures and vehicle accidents. Any permanent changes to these designated haul routes will be coordinated with DDOT.

3.5.4 Maintenance of Traffic and Property Access

As described in Section 3.5.1, the Project's construction LOD will include Virginia Avenue SE from 2nd to 11th Streets SE. Within these limits, Virginia Avenue SE will be closed to traffic throughout most of the construction duration. In order to maintain the same level of

Figure 3-6
Construction Haul Routes and Access Points

transportation connectivity during construction, (including ensuring that every property with street access maintains alternative access), a maintenance of traffic (MOT) plan was developed. This section contains a summary of the MOT. Certain properties currently have direct driveway access from Virginia Avenue SE within the LOD. Special provisions will be made during construction to keep access open on these properties for owners, users, and fire and emergency response vehicles.

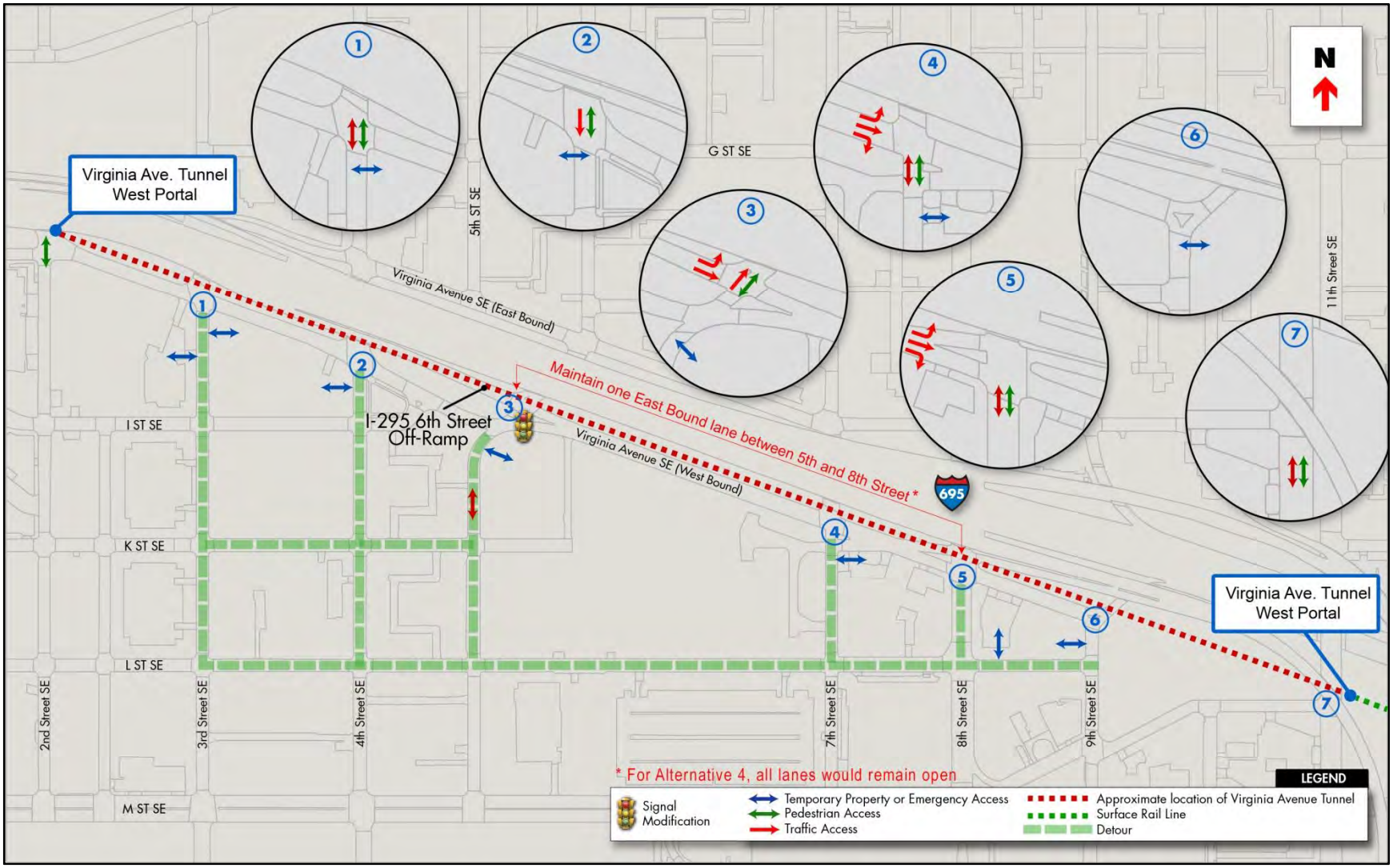
The MOT plan took into account other construction activities located in the general vicinity of the Project that are projected to overlap with the Project's construction, and will be re-evaluated during final design to determine the status of these and other construction projects in the general vicinity of the LOD.

Under the Preferred Alternative or Alternative 2, a two-phased MOT will be implemented because portion of construction dedicated to the building of the temporary runaround track/trench (Alternative 2) or the south side single-track tunnel (Preferred Alternative) does not require closure of all of Virginia Avenue SE. Alternative 4's MOT would have the same phasing, but timed differently than the Preferred Alternative or Alternative 2. Additional detail about Alternative 4's MOT is provided at the end of this section.

Under MOT Phase 1, a single eastbound lane on Virginia Avenue SE (northernmost lane) could be maintained between the I-695 off-ramp at 6th Street SE and the 8th Street SE intersections. Keeping this lane open will allow traffic exiting I-695 to make left turns at 7th and 8th Streets SE from the eastbound Virginia Avenue SE, the same movements currently allowed. For I-695 exiting traffic wishing to proceed to the south of Virginia Avenue SE, they would turn left at 6th Street SE, left on westbound Virginia Avenue SE (north side of I-695) and left on 4th Street SE. The other lanes and pedestrian facilities on Virginia Avenue SE within these limits will be closed. In addition, Virginia Avenue SE from 2nd to 5th Streets SE and from 8th to 9th Streets SE will be closed with traffic diverted to the parallel K and L Streets SE, and temporary decks over the temporary runaround trench (Alternative 2) or south side tunnel (Preferred Alternative) will be provided along all cross streets from 2nd to 8th Streets SE and 11th Streets SE (the deck at 2nd Street SE is only for pedestrians and cyclists). These and other elements of the MOT Phase 1 plan, including how properties adjacent to Virginia Avenue SE within the project limits will maintain access to the street grid, are shown in Figure 3-7.

MOT Phase 2 for the Preferred Alternative or Alternative 2 will start when work on either the two-lane rebuilt tunnel (Alternative 2) or the north side tunnel (Preferred Alternative) begins, which will require closure of all of Virginia Avenue SE between 6th and 8th Streets SE. In order to maintain access for traffic exiting I-695 at the 6th Street off-ramp to the surrounding community, Virginia Avenue SE, on the north side of I-695, will be converted from one-way westbound to two-way operations between 6th and 8th Street SE. Between 6th and 7th Streets SE, one westbound lane and two eastbound lanes will be provided throughout Phase 2. Between 7th and 8th Streets SE, one lane each direction will be provided throughout Phase 2.

Figure 3-7
Maintenance of Traffic Plan, Phase 1



Traffic from the freeway at 6th Street SE will be diverted to the reconfigured Virginia Avenue SE on the north side of I-695. From this location, traffic could proceed into three different directions (currently two directions are available): westbound, northbound or eastbound. For traffic exiting I-695 wishing to proceed to the south of Virginia Avenue SE, they would turn left at 6th Street SE. At the intersection with Virginia Avenue SE (north side of I-695), traffic could either turn left (as noted above under Phase 1) or turn right and make right turns at either 7th or 8th Street SE. The temporary decks at 2nd to 8th Streets SE and 11th Street SE will be extended over the expanded construction area. These and other elements of the MOT Phase 2 plan are shown in Figure 3-8.

As noted above, the MOT for Alternative 4 would be phased. The first several months of construction would be concentrated in the area between 2nd and 5th/6th Streets SE. The I-695 6th Street off-ramp and the section of Virginia Avenue SE between 6th and 9th Streets SE would be unaffected. The MOT for Alternative 4 during these initial months would be similar to the Phase 1 MOT for the Preferred Alternative or Alternative 2 except that all the lanes would be available between 6th and 9th Streets SE. When construction moves east of the 5th/6th Street intersection, the detour for traffic exiting I-695 would start from the Phase 2 MOT plan noted above throughout the rest of construction. Similar to the Preferred Alternative or Alternative 2, temporary decks over the would be provided along all cross streets from 2nd to 8th Streets SE and 11th Streets SE, and all properties adjacent to Virginia Avenue SE within the project limits would maintain access to the street grid through various measures as noted on Figures 3-7 and 3-8.

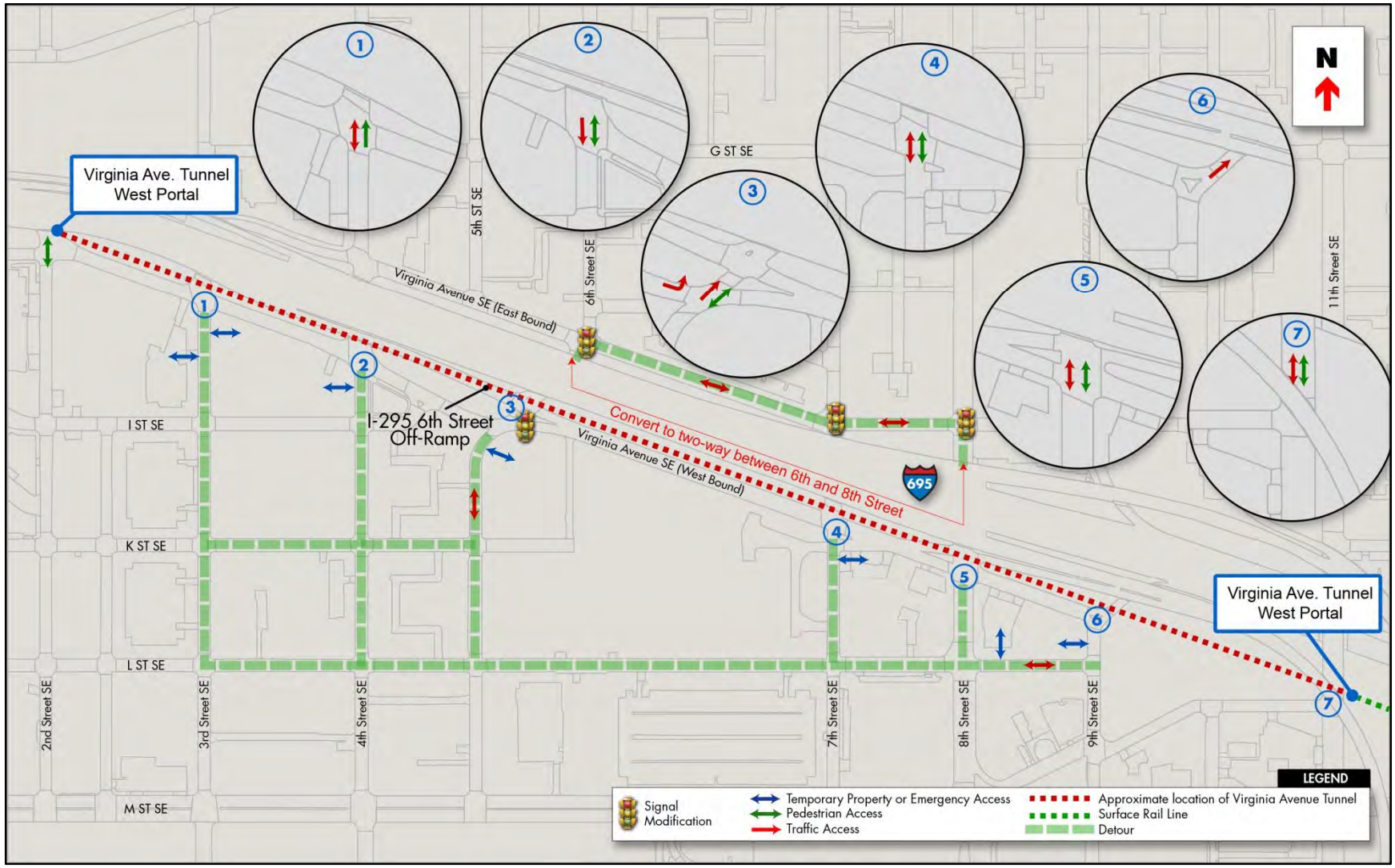
Temporary wayfinding signs will be included among the detours to assist motorists, pedestrians and cyclists in navigating finding their destinations, which may include important gathering places in the community, such as Barracks Row, Eastern Market, the Washington Navy Yard and Garfield Park. The project sponsor will work with the local business and civic groups to determine the important gathering places that should be identified by temporary signage.

3.5.5 Safety and Security

The construction area will be in proximity to residences, many of which have families with children. Therefore, to be consistent with Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks, the construction area for the Project will be secured to prevent unintended intrusion, including the areas used for temporary train operations. The general public will not be allowed to access construction areas or areas used for train operations, such as the runaround track/trench under Alternative 2. Safety and security measures will be implemented during construction, such as:

- Secure fencing at least eight feet high along the perimeter of the construction area, including around the areas with trains running in a protected trench, and at cross streets where vehicles, pedestrians and cyclists will be allowed to cross the construction zone (see photographs of sample fencing and barriers around construction sites);
- Suitable lighting for the construction area;
- Regular patrols by railroad police officers assigned to the Project;

Figure 3-8
Maintenance of Traffic Plan, Phase 2



- Access for first response and emergency vehicles to all property fronting the LOD (see Section 3.5.4); and
- Rodent control program initiated prior to the start of construction and maintained during entire duration of construction.

Tunnel safety and stability will be monitored through a comprehensive instrumentation program with devices placed both inside and outside the tunnel as well as on adjacent structures that may be susceptible to vibration damage. In addition, a full-time safety officer will be present at all times when construction activities are taking place to oversee the safety protocols and measures.

The Federal Railroad Administration (FRA) regulates safety procedures of freight trains owned by Class I railroad companies, such as CSX, operating within construction sites. In accordance with FRA safety regulations, the railroad company is required to follow specific protocols to ensure the safety of trains moving through construction sites in order to protect workers involved in construction as well as the general public.

As required by the FRA regulations, all persons (CSX employees and its contractors) working on or near railroad tracks are required to be formally trained in "Roadway Worker Protection Training" (RWT). On an annual basis, all persons must complete the course and pass a written test to work on or near railroad tracks. In addition, all workers will be required to take security training, and those working for contractors must undergo a criminal background check every two years under the requirements of the e-RAILSAFE System program.

For the Project, a CSX employee will be assigned as the "railroad employee-in-charge" and will have all the requisite training, testing and qualifications to properly perform this job. The railroad employee-in-charge will control all train movements through the work limits whenever construction activities are being performed. The work limits encompass the construction site and both approaches to the current/new tunnel.

Stockade Fence Mounted on Traffic Barrier

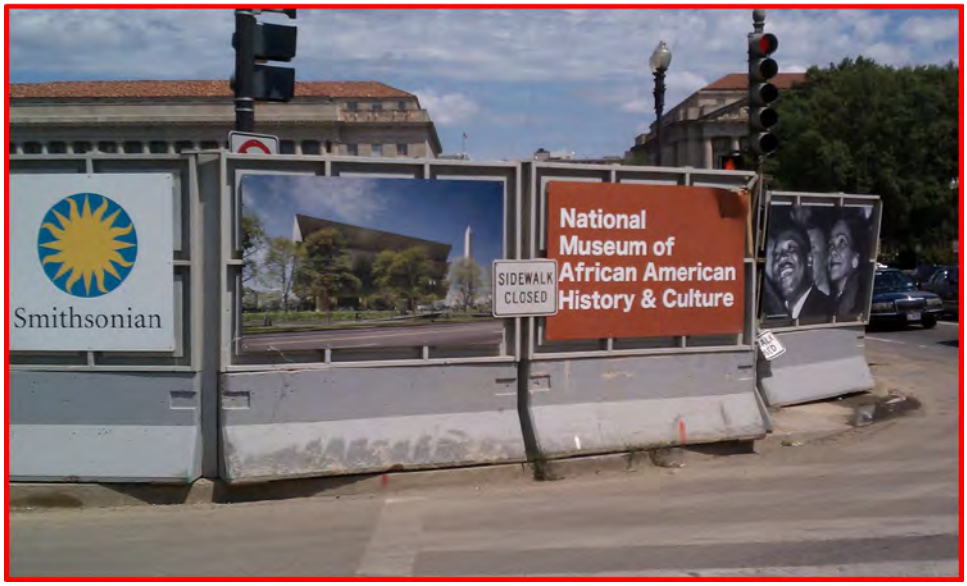
The locomotive operator of trains approaching the work limits will be required to receive permission from the "railroad employee-in-charge" before entering or making any movement within the work limits. Before granting this permission, the

employee-in-charge must check that all workers and equipment are clear from the railroad tracks at a predetermined distance of safety, and confirm that the tracks, tunnel and all supporting structures are in a condition to allow the safe passage of trains.

Chain Link Fence Mounted on Traffic Barrier

Typical Stockade Fencing

Banner-Mounted Fencing



All CSX train crews operating on a route that includes the Project work limits will receive a computer generated message prior to departure from their originating terminal alerting them that they must receive permission from the railroad employee-in-charge for the Project before traversing through the work limits. In addition, signs will be erected no less than two miles from the work limits to provide advance warning to train crews that they are required to stop before entering the work limits unless advised by the railroad employee-in-charge that the work limits are safe for train passage. Conditional stop signs will be placed at each end of the work limits as a reminder to train crews that they must stop unless given permission to enter the work limits by the railroad employee-in-charge.

CSX radios at frequencies dedicated to railroad use will be used for all communications between train crews and the railroad employee-in-charge. All voice communication is repeated to ensure positive identification and an understanding of the specifics with each permission granted. If for some reason the railroad employee-in-charge cannot respond to a train requesting permission to enter the work limits, the train will be required to stop and cannot enter the work limits until such time the employee-in-charge is contacted. All permissions to traverse the work area are recorded and documented.

3.5.6 Duration

For the Preferred Alternative and Alternatives 2 and 4, construction work hours would be the same in accordance with District regulations. Standard construction work hours are between 7 AM and 7 PM, Monday to Friday. Work on Saturday, Sunday or at night would require a permit from the District. The District government would apply its customary criteria, which would

weigh community benefit versus community impacts, in deciding whether to issue such a permit. Based on the standard work hours, estimated construction durations for each alternative were developed and presented on Table 3-4. This table also includes the estimated durations of the MOT phases described in Section 3.5.4.

Table 3-4
Estimated Construction Duration by Alternative

Alternative	MOT Phase		Total Estimated Duration
	Phase 1	Phase 2	
Alternative 1	Not Applicable	Not Applicable	Not Applicable
Alternative 2	10-16 months	20-26 months	30-42 months
Preferred Alternative	16-22 months	14-20 months	30-42 months
Alternative 4	32-38 months	22-28 months	54-66 months

The estimated construction duration for each Build Alternative was based on certain factors including, among others, the proposed sequence of work, access restrictions, allowable work hours, known utility impacts, and available information about comparable construction projects.

The main reason that Alternative 4 is projected to take substantially longer to complete is because construction has to be conducted in a single, linear segment, starting at one end of the tunnel and continuing to the other end so that freight operations and rebuilding activities could be conducted at the same time within the same trench. The other two Build Alternatives are not restricted in such a manner. For example, the Preferred Alternative or Alternative 2 allows for the same or similar construction activities (e.g., excavation) to occur simultaneously along different areas of the LOD, an option not available to Alternative 4. In addition, construction activities are anticipated to be slowed along the entire length of the Alternative 4's construction zone because of the close proximity between active rail operations and construction work areas. Also, additional safety regulations and safe work zone practices would need to be implemented for Alternative 4. These regulations and practices make the construction schedule for Alternative 4 highly dependent on railroad operational needs and customer service requirements.

3.5.7 Cost

As noted on Table 3-5, the total costs for the Preferred Alternative and Alternative 2 would be similar (within approximately $7 million). At approximately $208 million, the total cost for Alternative 4, however, would be approximately 20 to 24 percent higher than Alternative 2 and the Preferred Alternative, respectively. The primary reasons for the higher cost for Alternative 4 is the longer construction duration and the extra safety precautions to accommodate construction and freight rail operations in the same trench.

Table 3-5
Estimated Cost Breakdowns by Alternative

Alternative	Estimated Cost (or Millions)*
Alternative 1	Not Applicable
Alternative 2	$175
Preferred Alternative	$168
Alternative 4	$208

Notes: * Includes site preparation, demolition, construction, track work, MOT, environmental measures, landscaping, roadway restorations, professional services and indirect costs.

3.6 Proposed Virginia Avenue SE Streetscape

Upon completion of tunnel construction, the street and other affected areas, such as Virginia Avenue Park and the Marine Corps Recreation Facility, will be restored. The rebuilding of Virginia Avenue Tunnel provides the opportunity to construct a new streetscape for Virginia Avenue SE and be incorporated as part of the Preferred Alternative or the other two Build Alternatives. In the rebuilding the Virginia Avenue SE streetscape, certain improvements will be made. A plan view of the proposed changes to the Virginia Avenue SE streetscape is provided in Appendix M. Figures 3-9 and 3-9A through 9E show proposed changes to the streetscape of Virginia Avenue SE by block. Descriptions of these changes are provided below.

Between 2nd and 4th Streets, the existing two-way traffic lanes will be maintained as well as the existing on-street parking on both sides of the road (see Figure 3-9A). The only substantive changes will be the conversion of the south-side pedestrian way into a 10-foot wide shared use path, and the provision of a north-side pedestrian way.

Between 4th and 5th/6th Streets, the existing two one-way (eastbound) traffic lanes and south-side pedestrian way will be maintained, but the curved alignment will be straightened to be more consistent with the L'Enfant Plan of Washington D.C. (see Figure 3-9B). The south-side on-street parking will be kept, but the north-side on-street parking will be eliminated. A south-side bike path will be provided between the pedestrian way and the street. Due to the elimination of the north-side on-street parking and the provision of a bike path, the curb to curb space will be narrower within the 400 block than under existing conditions. In addition, I Street SE, which currently curves north to intersect with Virginia Avenue SE, will be converted into a two-way cul-de-sac within the 400 block, with its only function to provide access to the Capitol Quarter driveway. The area reclaimed from roadway paving between Virginia Avenue SE and the Capitol Quarter residences within the 400 block will be converted to vegetative and/or grassy landscaping. A bike path will be provided connecting the I Street cul-de-sac with the new Virginia Avenue SE bike path.

Figure 3-9
Location Key for Proposed Roadway Typical Sections

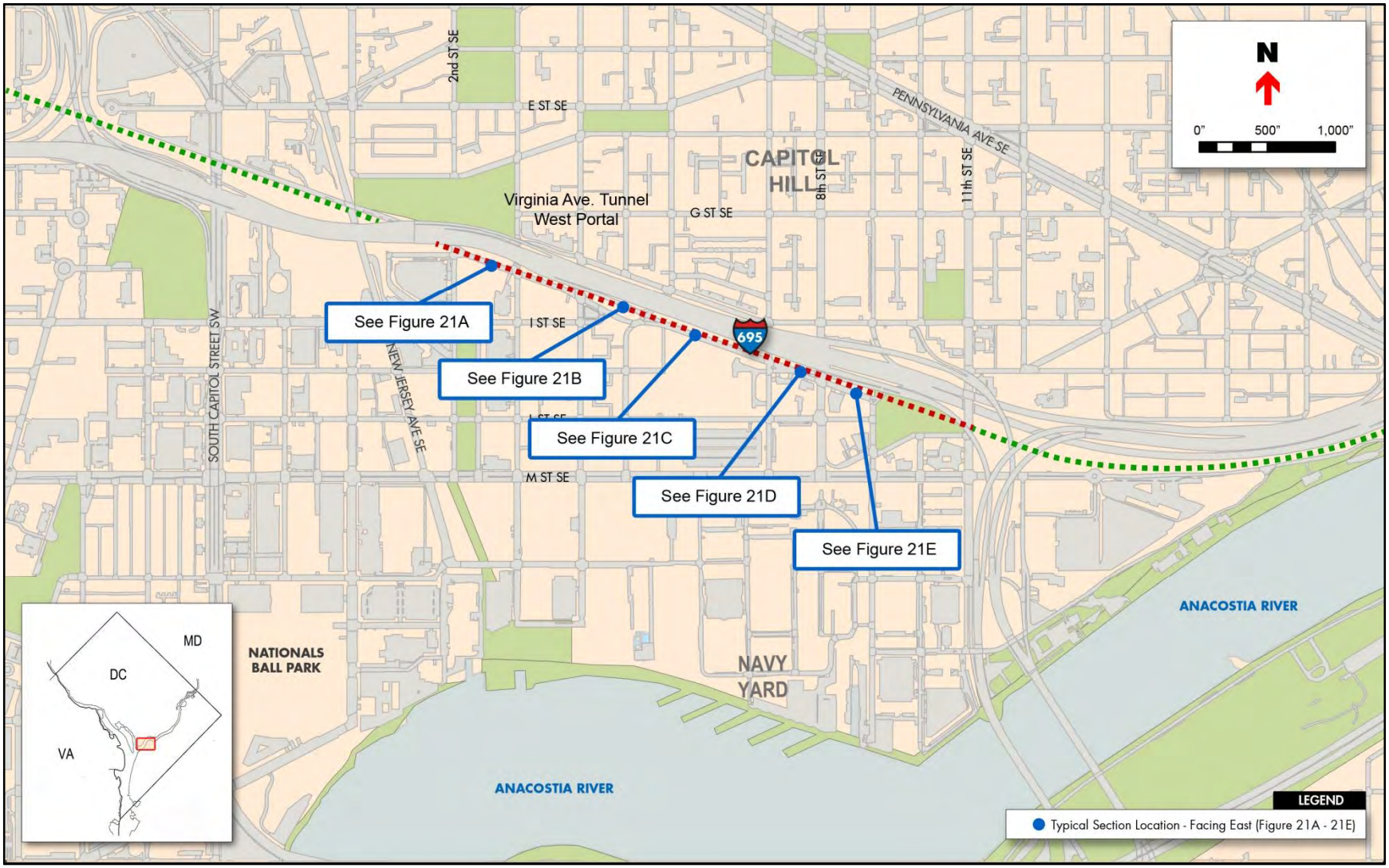


Figure 3-9A
Proposed Typical Section between 2nd and 4th Streets

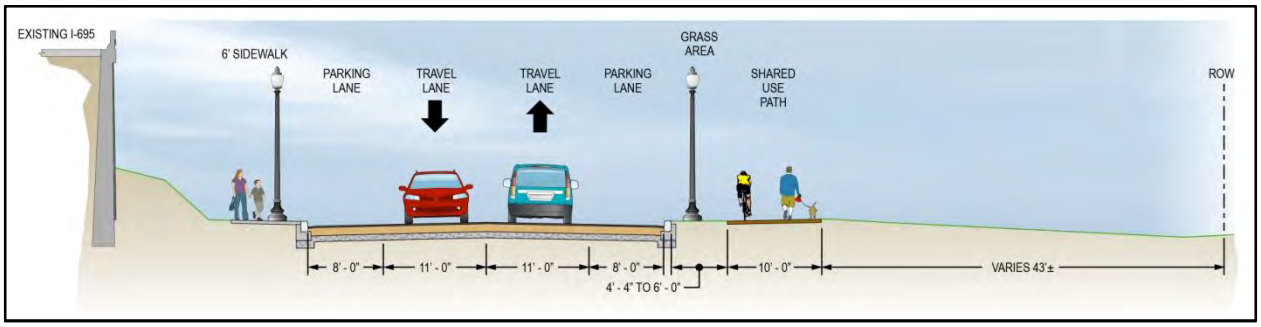


Figure 3-9B
Proposed Typical Section between 4th and 5th/6th Streets

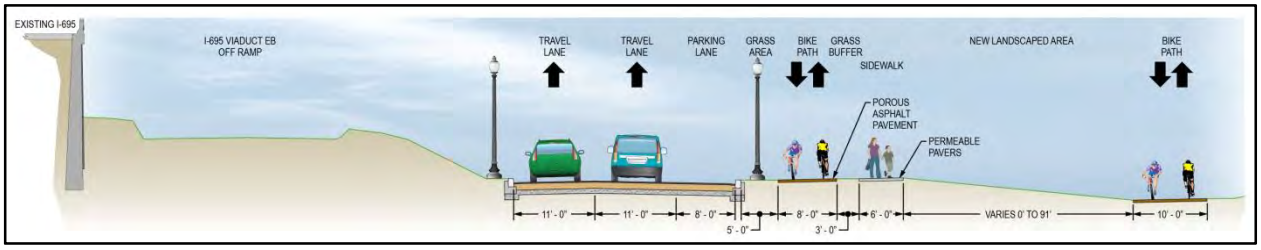


Figure 3-9C
Proposed Typical Section between 5th/6th and 7th Streets

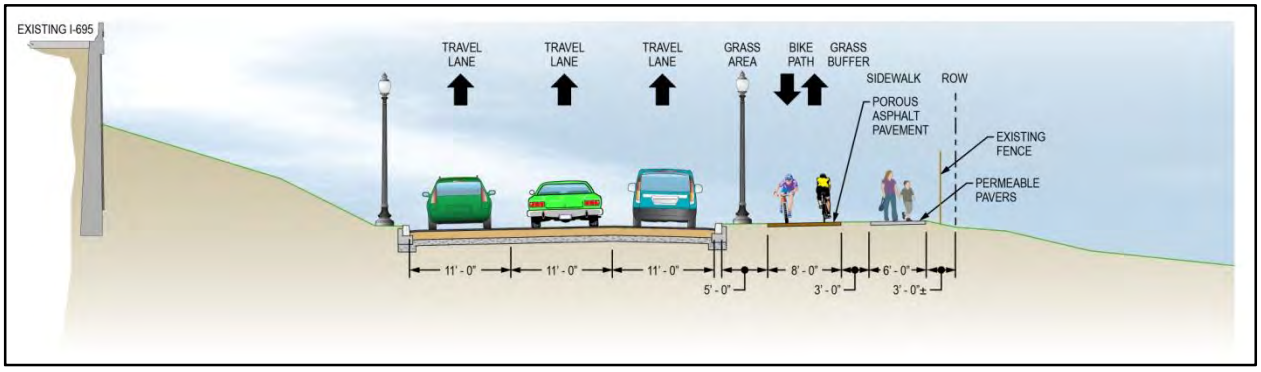


Figure 3-9D
Proposed Typical Section between 7th and 8th Streets

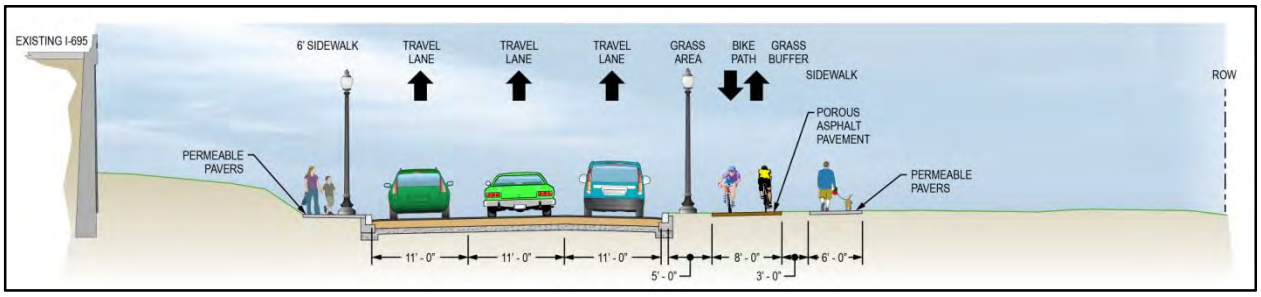
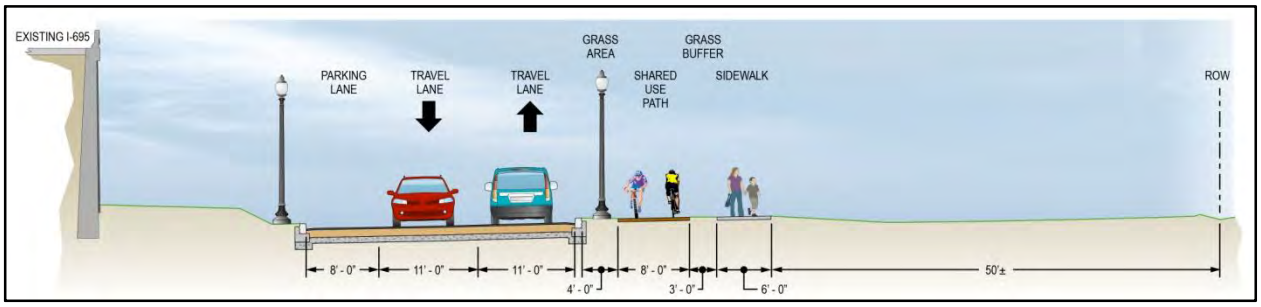


Figure 3-9E
Proposed Typical Section between 8th and 9th Streets



Between 5th/6th and 7th Streets, the number of one-way (eastbound) traffic lanes will be changed from four to three (see Figure 3-9C). Currently, no on-street parking is provided within this block and this will not change under the proposed new streetscape. The existing south-side concrete pedestrian way will remain, but converted to permeable pavers. Between this pedestrian way and the street, a bike path will be provided.

The section between 7th and 8th Streets will be the same as the section between 5th/6th and 7th Streets, except that a pedestrian way will be provided on the north side of the street (see Figure 3-9).

The two lanes between 8th and 9th Streets will be converted from one-way (eastbound) to two-way traffic (see Figure 3-9E). The existing south-side permeable paver pedestrian way will remain. As with other proposed sections along Virginia Avenue SE, a bike path will be provided on the south side of the street, which will make the curb to curb space narrower through the elimination of the south-side on-street parking. The north-side on-street parking will remain.

3.7 Alternative Concepts Considered But Rejected

NEPA requires federal agencies to "rigorously explore and objectively evaluate all reasonable alternatives, and for alternatives which were eliminated from detailed study, briefly discuss the reasons for their having been eliminated (40 CFR §1502.14(a))". According to the Council on Environmental Quality (CEQ) guidance, reasonable alternatives include those that are practical or feasible from the technical and economic standpoint and using common sense, rather than simply desirable from the standpoint of the applicant (CEQ, NEPA's Forty Most Asked Questions). At the same time, when considering a proposal from a private applicant for federal approval, NEPA's "rule of reason" directs federal agencies to look at the general goals of a project in developing an appropriate range of alternatives. Therefore, unlike a proposed public infrastructure project, such as a new public road or bridge, that needs to compete with other projects for public funds, this Project represents CSX's judgment of the action it needs to take to satisfy its common carrier obligation as one of the nation's leading freight rail companies.

This section introduces the 12 preliminary concepts that were considered as candidates for the Project, and describes how the concepts were evaluated to determine which would be developed into alternatives carried forward for a more detailed analysis through the EIS process. The evaluation was based on the following eight criteria, which are based on the Purpose and Need for the Project and economic and feasibility factors:

- Criterion 1: The concept, upon completion, will address the deficiencies of the Virginia Avenue Tunnel.
- Criterion 2: The concept, upon completion, will provide the necessary improvements for operating double-stack intermodal containers and have two railroad tracks for the efficient flow of commercial rail freight through the Washington Metropolitan Area.
- Criterion 3: The concept will avoid major impacts to the structures, traffic or access to or from I-695.
- Criterion 4: The concept must allow for the maintenance of traffic across Virginia Avenue and along adjacent streets throughout the duration of construction.
- Criterion 5: The concept will maintain interstate rail commerce without a substantial negative impact to the level of service during construction.
- Criterion 6: The concept will be implemented in a time frame that accommodates the near term anticipated increase in freight traffic.
- Criterion 7: The concept has a comparatively reasonable duration of construction in the vicinity of the existing tunnel.
- Criterion 8: The concept has a comparatively low cost.

3.7.1 Alternative Concepts Overview

In order to develop reasonable alternatives to address the Project's Purpose and Need, a preliminary assessment of the engineering and physical constraints was conducted along the alignment of the existing tunnel. In addition, DDOT and FHWA sought input from Federal and District agencies, interested parties and the general public. From these activities, the following 12 preliminary concepts were developed.

- Concept 1 is the no action or no build condition. It automatically is carried through the EIS process and was developed as Alternative 1 described in Section 3.3.
- Concepts 2 through 7 involve the rebuilding or reconfiguration of the Virginia Avenue Tunnel. Among these concepts is Concept 3A, which was developed in response to public comment during analysis of the 11 original preliminary concepts, and increased the total number of concepts considered for the Project to 12.
- Concepts 8 through 11 involve rerouting the main rail line outside of the existing Virginia Avenue SE, but the tunnel would remain to service Washington Metropolitan Area regional customers.

The remainder of this section includes descriptions of each of the concepts that were then evaluated, and resulted in the selection of the four NEPA alternatives retained for further detailed consideration.

After the 12 concepts were screened to produce four candidate alternatives, the additional engineering efforts to further develop the candidate alternatives, as described in this chapter, are not of final design level precision with respect to the description of facility locations (e.g., tunnel alignments and portal locations) within the public space (including subsurface) at or near Virginia Avenue. These final design details would be developed after the NEPA process is concluded, and if a Build Alternative for the Project is approved. For this document, each alternative is described with the precision necessary to identify and address reasonably foreseeable environmental and social impacts. Because all three Build Alternatives described in this Final EIS contemplate that the reconstructed tunnel would only be located within CSX-owned or public property, rather than intruding into or under any private property, no additional detail beyond those already presented here is warranted. As the concepts and Build Alternatives were being developed through a series of public meetings and consultation with agencies, additional engineering was conducted for each of the selected Build Alternatives and minor changes continue to be made to their specific descriptions (e.g., construction phasing and tunnel alignments).

<u>Concepts 2 through 7: Rebuild Virginia Avenue Tunnel</u>

Concepts 2 through 7 involve the rebuilding of the existing Virginia Avenue Tunnel generally within the existing tunnel envelope but with sufficient vertical clearance to allow for double-stacking of intermodal containers. Although not all freight trains are double-stacked (only intermodal containers are double-stacked), allowing double-stack intermodal container freight operations during construction will not present any additional impacts as compared to a situation in which only single-stacking were allowed. Following construction, freight traffic would operate more efficiently by the use of double-stack intermodal container cars because at least 21 feet of vertical clearance would be provided within the rebuilt tunnel. In addition, all of these rebuild concepts would provide two sets of permanent tracks within the tunnel corridor to improve the fluidity and operations of the railroad. Trains moving in opposite directions would be able to traverse the rebuilt tunnel simultaneously. Under Concepts 2, 3, 4, 6 and 7, the rebuilt Virginia Avenue Tunnel would largely be the same design, two sets of track

within a single tunnel. Concepts 3A and 5, on the other hand, involve the construction of two tunnels, each containing a single set of tracks, and both having the necessary vertical clearance to accommodate double-stack intermodal container freight trains. (Note that Concept 6, which became Alternative 4, was changed to include a partitioned tunnel.)

The rebuild concepts differ in how each would maintain freight operations during construction. Concepts 2, 3 and 4 would provide a temporary detour or "runaround" track in a protected trench. A range of design options are available to maintain a protected trench, such as various forms of safety barriers to isolate the trench from access by passersby and trespassers. These include stockade and chain link fencing, and Jersey barriers. Additional detail about trench safety and security is provided in Section 3.5.5. Concepts 3A and 5 would not require temporary facilities to maintain freight rail operations. The new single railroad track tunnel would be built outside of the existing tunnel alignment and would accommodate train traffic while the second tunnel would be built within the existing tunnel alignment. Concept 6 would maintain freight operations within the existing envelope of the Virginia Avenue Tunnel. Concept 7 would temporarily reroute freight trains outside the District during construction.

Among the rebuild concepts all have approximately the same layout (i.e., they would cover approximately the same surface area during and after construction). On the west end, the temporary runaround or permanent track would connect with the existing track near the New Jersey Avenue overpass. At the east end, the temporary runaround or permanent track would connect with the existing track in the vicinity of 14th Street SE.

Upon completion of the rebuilt Virginia Avenue Tunnel, the surface of Virginia Avenue SE and other disturbed areas would be restored under all rebuild concepts.

During and following construction, Washington Metropolitan Area regional customers would continue to receive freight transportation service through the Virginia Avenue Tunnel under the rebuild concepts. However, Concept 7 would not be able to maintain the same level of freight service for Washington Metropolitan Area regional customers during construction because train operations through the Virginia Avenue corridor would not be available under this concept.

All temporary measures to maintain freight rail operations within the Virginia Avenue SE corridor during construction (Concepts 2 through 6) would allow for the operation of double-stack intermodal container freight trains.

Brief descriptions of Concepts 2 through 7 are provided in Sections 2.2.1.1 to 2.2.1.7.

Concepts 8 through 11: Reroute Concepts

The "reroute" concepts (Concepts 8 through 11) would all involve rerouting mainline freight rail traffic out of the Virginia Avenue Tunnel at its present depth and location in lieu of near-term reconstruction of the tunnel (Concepts 2 through 7). Under Concepts 8 through 11, new mainline freight rail routes would be constructed within or outside of the District of Columbia.

Concepts 8 through 11 would result in projects of considerable magnitude because they would require either digging an approximately nine-mile deep tunnel (Concept 8) or establishing new mainline freight rail lines that would entirely bypass the District of Columbia (Concepts 9, 10 and 11). Concepts 8 through 10 would require a new Potomac River crossing (tunnel or bridge) because the Long Bridge (see Section 1.2) is the only freight rail bridge crossing the Potomac River, between Harpers Ferry, WV and the Chesapeake Bay.

Upon completion of any of the reroute concepts, freight rail trains would continue to use the Virginia Avenue Tunnel to service customers in the Washington, DC area. Because the existing Virginia Avenue Tunnel must remain operational, Concepts 8 through 11 may involve emergency or unplanned repairs of the tunnel at some point in the future, which might require closure of at least part of Virginia Avenue SE in order to make the repairs. In other words, the tunnel's structural deficiency described in Section 2.1.3 would remain, and the Virginia Avenue Tunnel would eventually require major rehabilitation or replacement, possibly at a time when the surrounding neighborhood is more fully developed and with increased traffic as a result.

Descriptions of Concept 8 through 11 are provided in Sections 3.2.1.8 to 3.2.1.11.

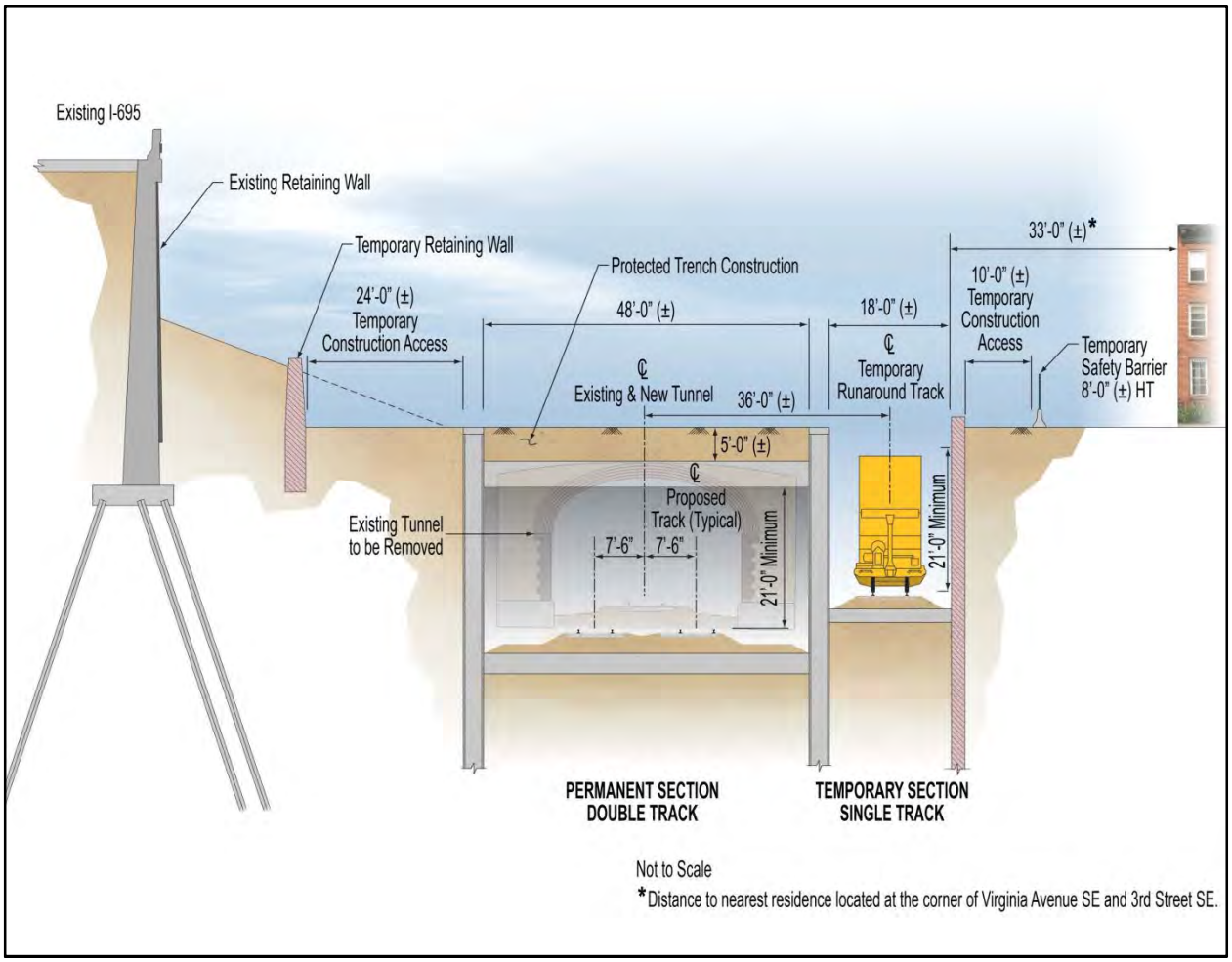
3.7.1.1 Concept 2: Rebuild, Temporary South Side Runaround

The Project under Concept 2 would reconstruct the existing single-track Virginia Avenue Tunnel into a new double track/double stack tunnel within the approximate existing horizontal envelope or alignment of Virginia Avenue Tunnel (see Figure 3-10). To maintain freight traffic during construction of the new tunnel, Concept 2 would provide a temporary runaround track placed inside a protected trench constructed immediately south of the existing tunnel alignment, as shown in Figure 3-10.

I-695 Off-Ramp at 6th Street SE

Placing the temporary runaround track/trench for Concept 2 on the south side of the existing tunnel would avoid the long-term closure of the Interstate 695 (I-695) off- and on-ramps located at 6th and 8th Streets SE (I-695 ramps), respectively, during construction (see photograph of I-695 Off-Ramp). Intermittent short-term closures of the I-695 ramps may be required for maintenance of traffic shifts. Upon completion of the rebuilt Virginia Avenue Tunnel, the runaround track would be removed and the protected trench would be backfilled.

Figure 3-10
Concept 2 Typical Section



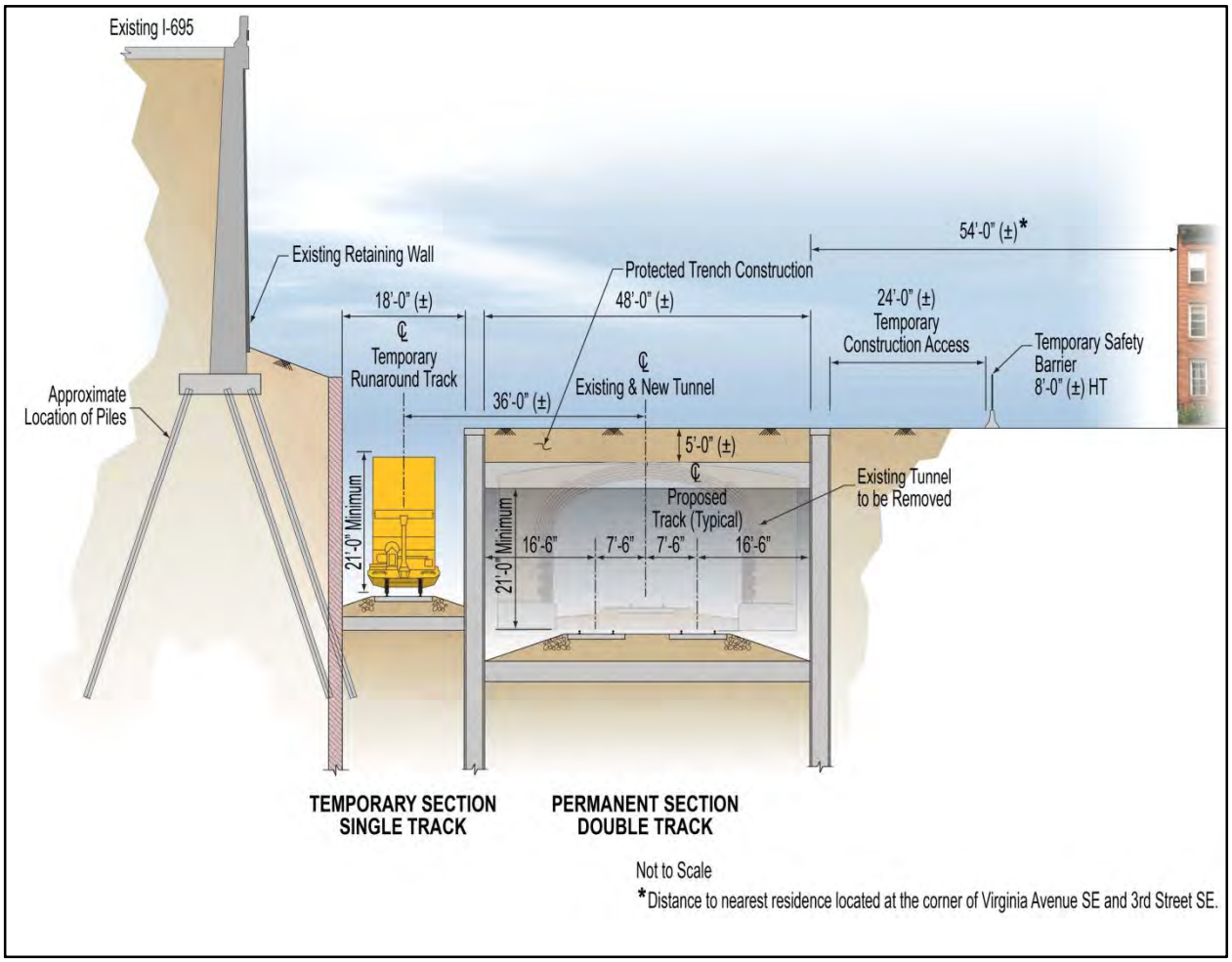
3.7.1.2 Concept 3: Rebuild, Temporary North Side Runaround

Concept 3 is similar to Concept 2, except that instead of placing the temporary runaround track in a protected trench on the south side of the existing tunnel alignment, it would be placed in a protected trench immediately north of the existing tunnel alignment, or located between the existing tunnel and I-695 (see Figure 3-11).

Aligning the temporary runaround track on the north side of the existing tunnel would place temporary freight operations as far as feasibly possible from land uses on the south side of Virginia Avenue, but still within the confines of the public right-of-way. Due to the temporary runaround track's proximity to I-695, long-term (throughout most of the construction duration) closures of the I-695 ramps would be required. It may be possible to stagger these closures so only one of the ramps is closed at a time, but long-term closure and disruptions would still be required. Similar to Concept 2, the runaround track would be removed and the protected

trench would be backfilled upon completion of the rebuilt Virginia Avenue Tunnel. The I-695 ramps would also be reopened.

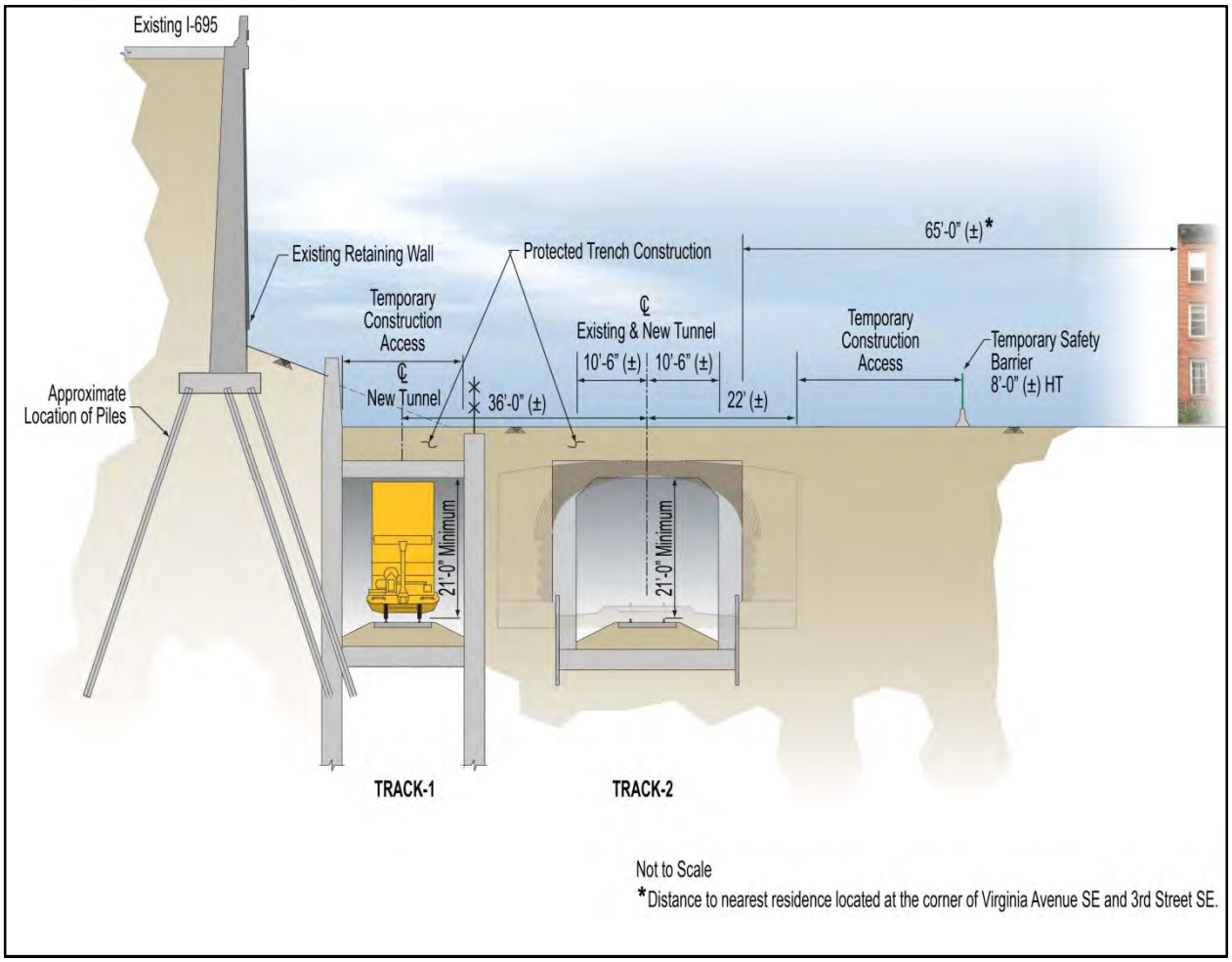
Figure 3-11
Concept 3 Typical Section



3.7.1.3 Concept 3A: Rebuild, Permanent Two Tunnels (New Tunnel on North Side of Existing Virginia Avenue Tunnel)

Concept 3A was developed during discussions with the public during community meetings where the original 11 project concepts were presented. This concept combines the elements of Concepts 3 and 5. Like Concept 5, Concept 3A would result in the construction of two single-track/double-stack tunnels (see Figure 3-12). The new, second single-track/double-stack tunnel would be set along the same alignment as the temporary northern runaround track/trench as presented under Concept 3.

Figure 3-12
Concept 3A Typical Section

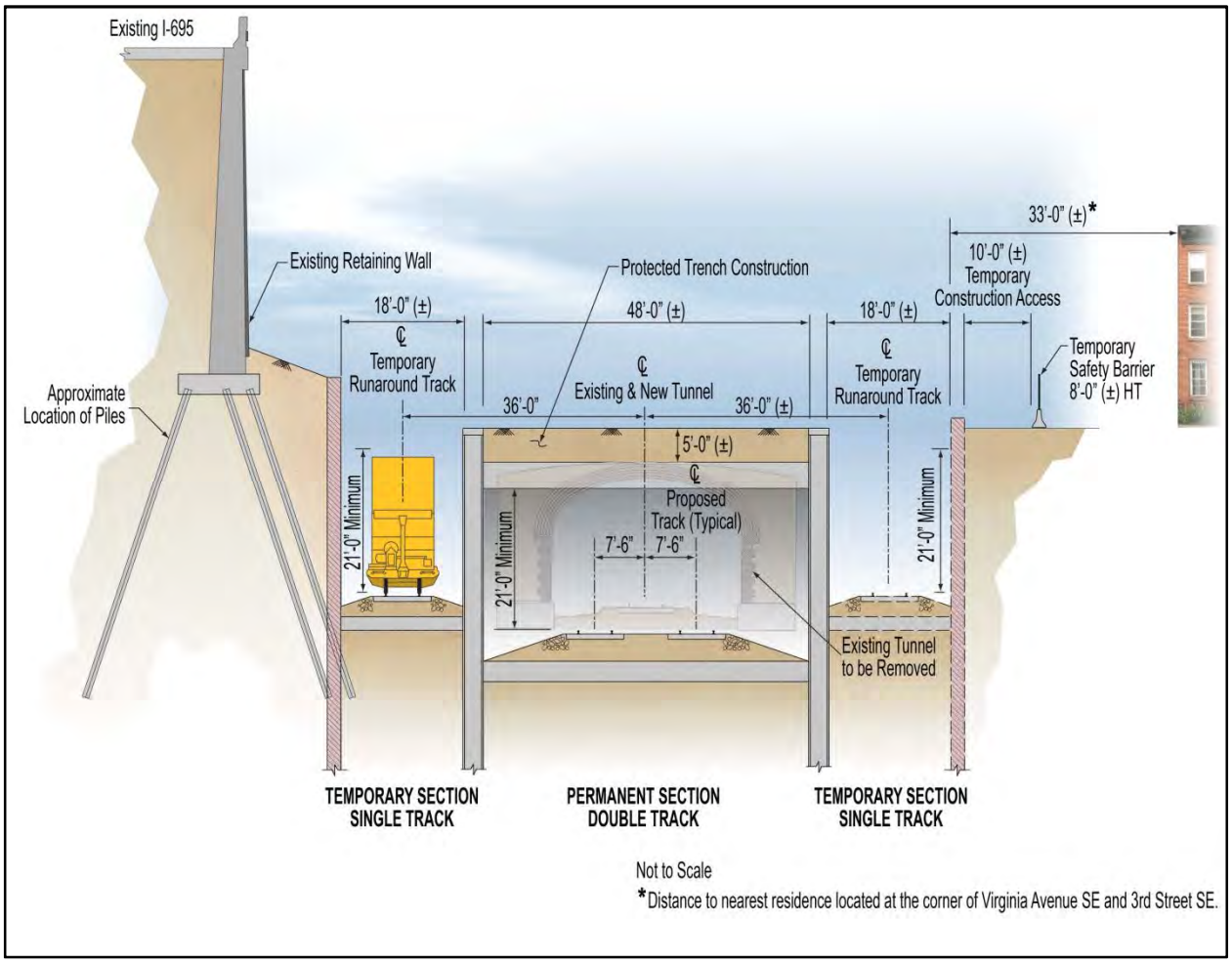


Similar to Concept 5, this second tunnel would be constructed first. On the west end, the new permanent track would connect with the existing track near the New Jersey Avenue overpass. Both permanent tunnels would be constructed using a cut-and-cover method. Due to the proximity of the new tunnel to I-695, long-term (throughout most of the construction duration) closures of the I-695-ramps would be required. It may be possible to stagger these closures so only one of the ramps is closed at a time, but long-term closure and disruptions would still be required. Once completed, the new permanent single-track/double-stack tunnel would serve as a route for two-way train traffic while the existing tunnel is reconstructed and converted into a new single-track/double-stack tunnel. Upon completion of the second single-track/double-stack Virginia Avenue Tunnel, train traffic would be split with one-way traffic in each tunnel.

3.7.1.4 Concept 4: Rebuild, Temporary Combination Runaround

Concept 4 is also similar to the Concepts 2 and 3 in that the rebuilt Virginia Avenue Tunnel would be reconstructed generally within the existing horizontal envelope of the existing tunnel. Instead of placing the temporary runaround track/protected trench on the north or south side of the existing tunnel, it would have a serpentine alignment, crossing the existing tunnel at two locations (see Figure 3-13).

Figure 3-13
Concept 4 Typical Section



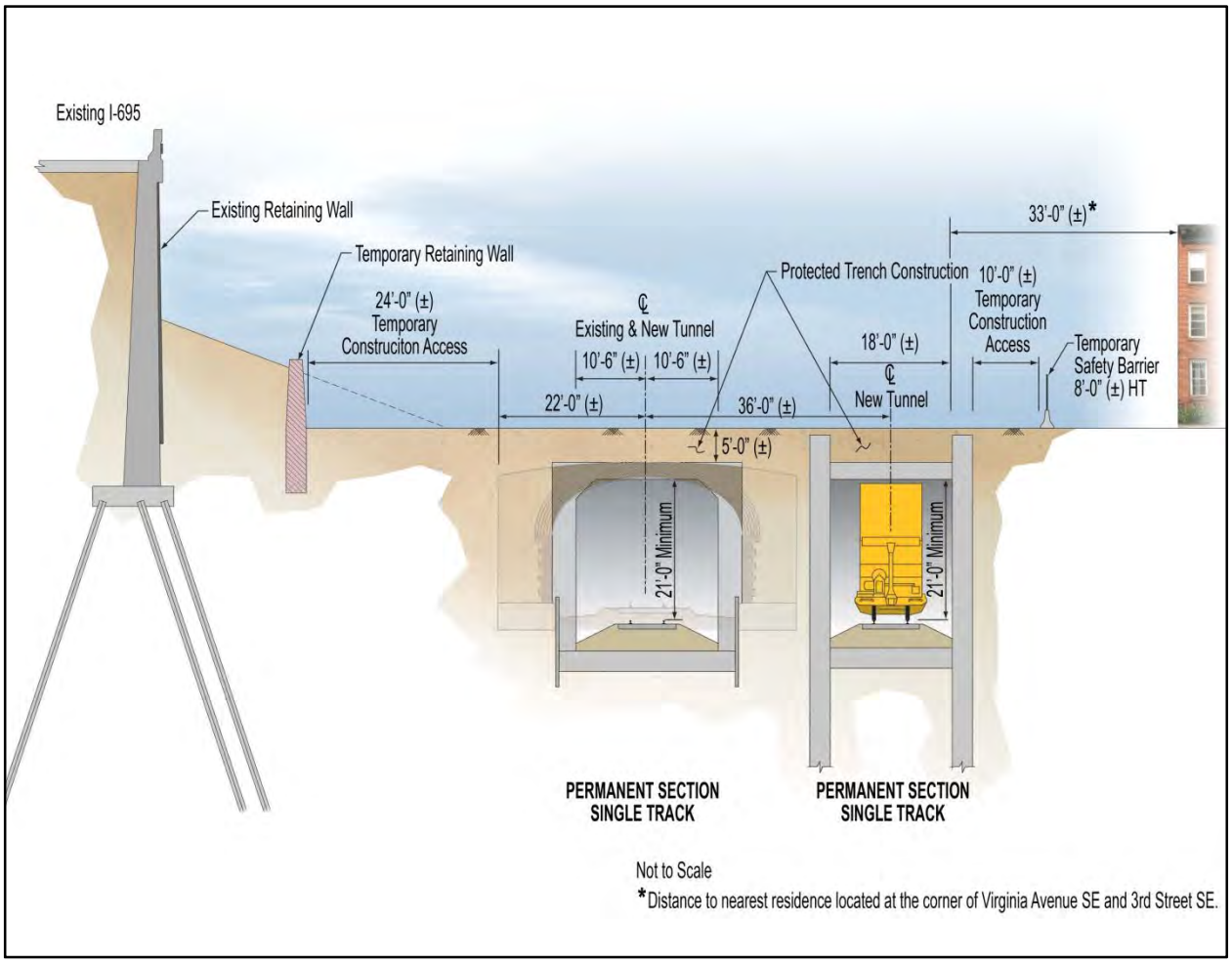
The rationale behind the configuration of the serpentine temporary runaround track under Concept 4 was to explore the possibility of placing temporary freight operations as far as feasibly possible from land uses on the south side of Virginia Avenue, but still within the confines of the public right-of-way, while avoiding the long-term closure of the I-695 ramps on the north side. On the west end, the runaround track would be the same as Concept 2, and

continue on the south side of the existing tunnel between 2nd and 5th Streets SE within a protected trench. At 5th Street SE, the temporary runaround track/trench would transition to the north side of the existing tunnel. At 8th Street SE, the temporary runaround track/trench would transition back to the south side of the existing tunnel. It should be noted that when the runaround track is moved to the north side of the existing tunnel between 2nd and 5th Streets SE, this concept conforms essentially to Concept 3. As is under Concepts 2 and 3, the runaround track would be removed upon completion of the rebuilt Virginia Avenue Tunnel.

3.7.1.5 Concept 5: Rebuild, Permanent Two Tunnels (New Tunnel on South Side of Existing Virginia Avenue Tunnel)

The rebuilt Virginia Avenue Tunnel under Concept 5 would be different than any of the previously described rebuild concepts with the exception of Concept 3A, which was added after the identification of the original 11 concepts. Concept 5 would result in the construction of two single-track/double-stack tunnels (see Figure 3-14).

Figure 3-14
Concept 5 Typical Section



Concept 5 would avoid having to construct temporary facilities to maintain freight operations during construction. One of the single-track/double-stack tunnels would occupy the space generally within the existing tunnel envelope. The other would have an alignment very similar to the alignment of the temporary runaround track/trench under Concept 2, or along the south side of the existing tunnel. The south side single-track/double-stack tunnel would be constructed first. During construction of the south side tunnel, freight traffic would continue to use the existing Virginia Avenue Tunnel. After the new south side tunnel is completed, train traffic would cut over to this new tunnel and the existing, older tunnel would be reconstructed and converted into a new single-track/double-stack tunnel. Both new tunnels would be constructed using a cut-and-cover method. Upon completion of Concept 5, train traffic would be split with traffic in each tunnel.

3.7.1.6 Concept 6: Rebuild with On-Line Construction

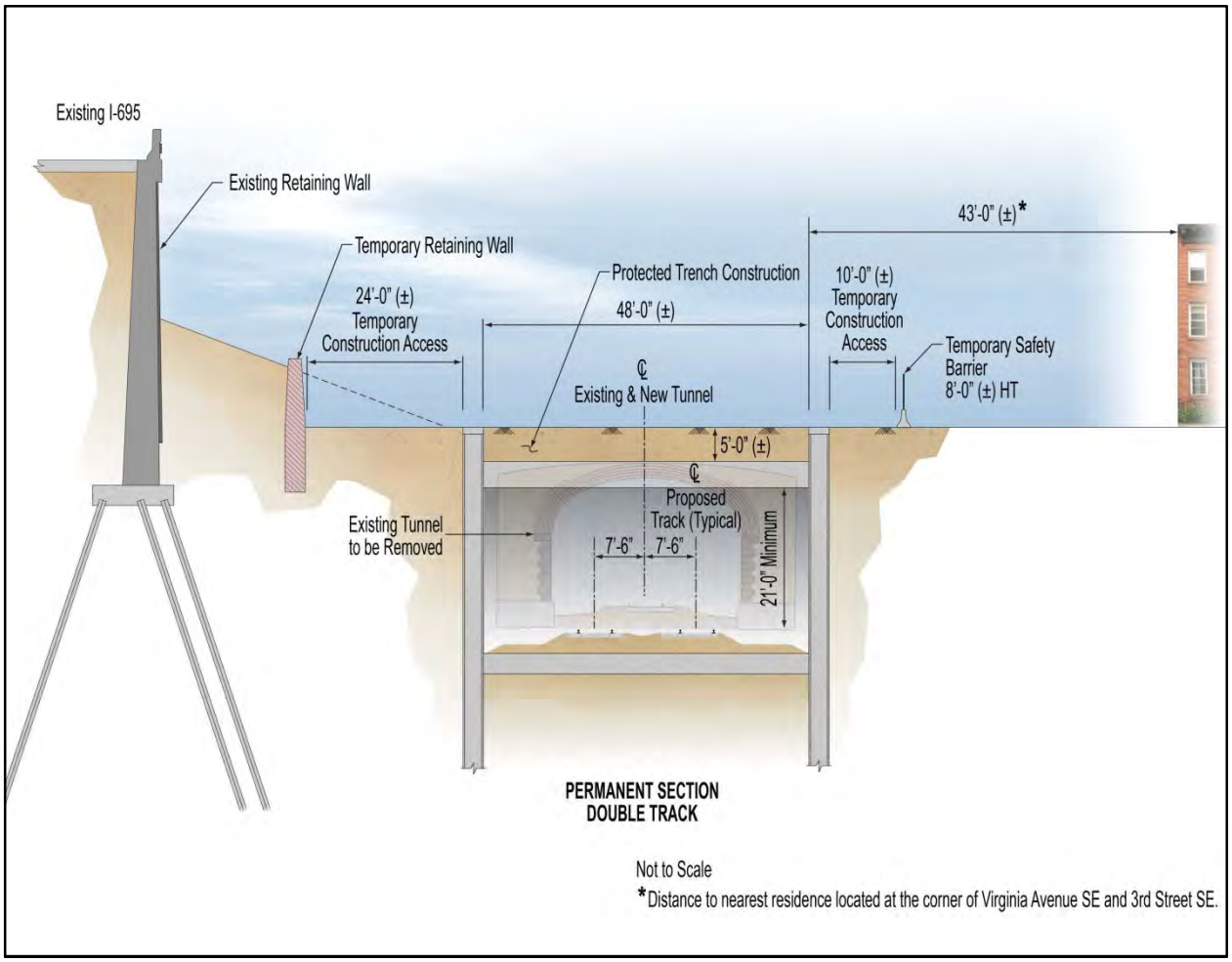
Concept 6 would be similar to Concepts 2, 3 and 4 in that it would result in largely the same kind of new two-track/double-stack tunnel within the existing tunnel envelope (see Figure 3-15). Concept 6 is different from Concepts 2 to 5 in that a runaround track/trench or new single-track tunnel would not be used to maintain freight rail traffic during construction. Instead, Concept 6 would involve construction of a new permanent tunnel in short segments while maintaining freight rail traffic in one half of the tunnel at all times. Demolition of the old tunnel and construction of the new tunnel would occur in numerous stages with regularly shifting track alignments and all work occurring in very close proximity to live train traffic, allowing trains to continue to use the tunnel though the construction work area on a daily basis. (Note that additional engineering analysis on Concept 6, after it was developed into Alternative 4, showed that a larger trench would be needed for both maintaining freight rail operations and rebuilding the tunnel).

Concept 6 would require substantial daily coordination between the train operators and the construction contractor to safely allow trains to pass through the construction zone on set schedules. Inevitably, this extremely complicated coordination has the potential to cause delays to both freight rail operations and construction, as well as increase community impacts because of the increased duration of construction in the Virginia Avenue SE neighborhood. The contractor would be under the daily obligation to ensure the rail lines through the work area are operational at all times.

3.7.1.7 Concept 7: Rebuild, Temporary Reroute

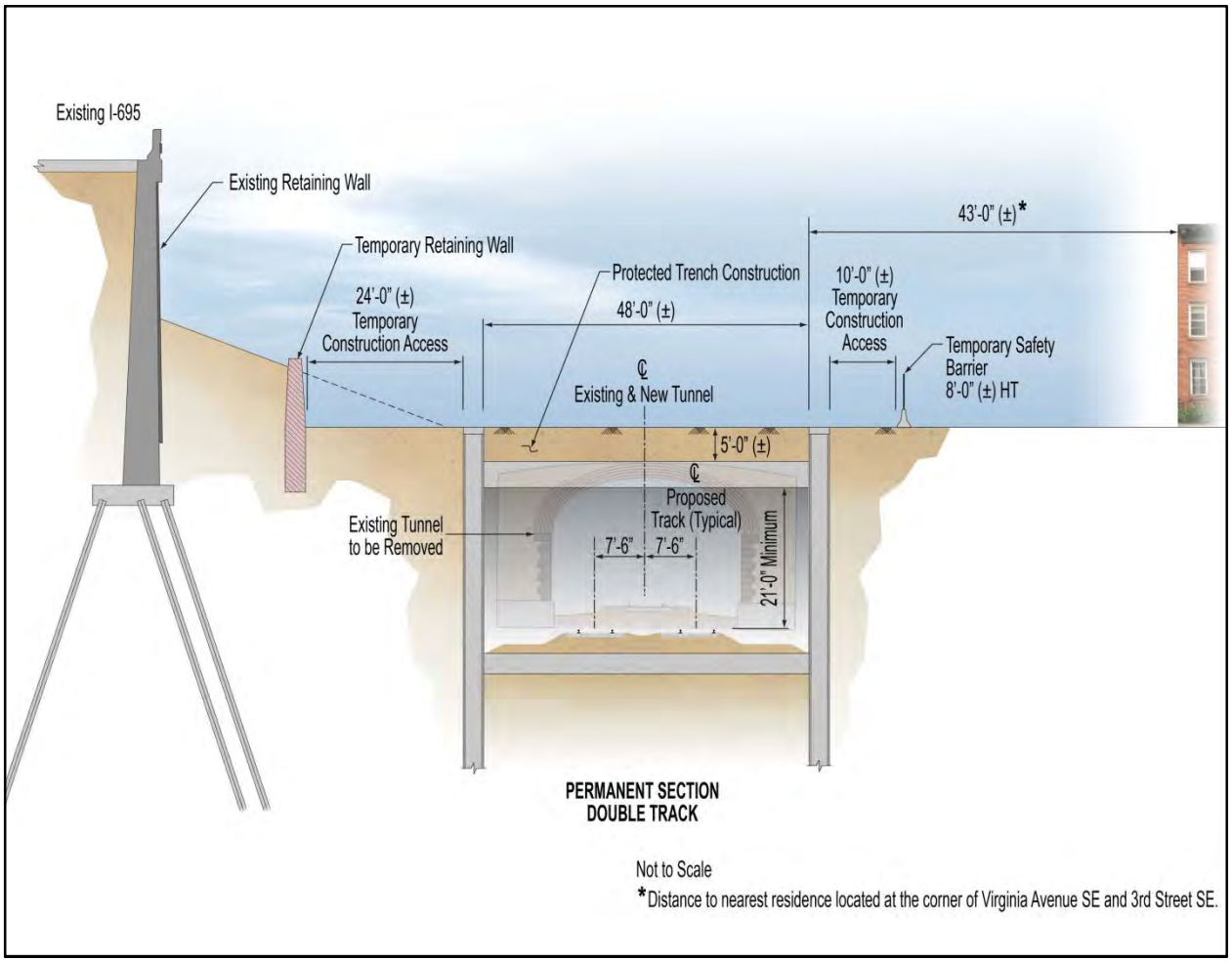
Concept 7 is similar to the Concepts 2, 3, 4 and 6 in that the rebuilt Virginia Avenue Tunnel would be reconstructed generally within the existing horizontal envelope of the existing tunnel (see Figure 3-16). Instead of accommodating the train traffic within the Virginia Avenue SE corridor as would be done under Concepts 2 through 6, Concept 7 would close the tunnel to all traffic during construction. Therefore, Concept 7 unlike the other concepts would not be able to maintain the same level of service to Washington Metropolitan Area regional customers during construction. It would create logistical problems in the rerouting of trains to maintain service to these customers.

Figure 3-15
Concept 6 Typical Section



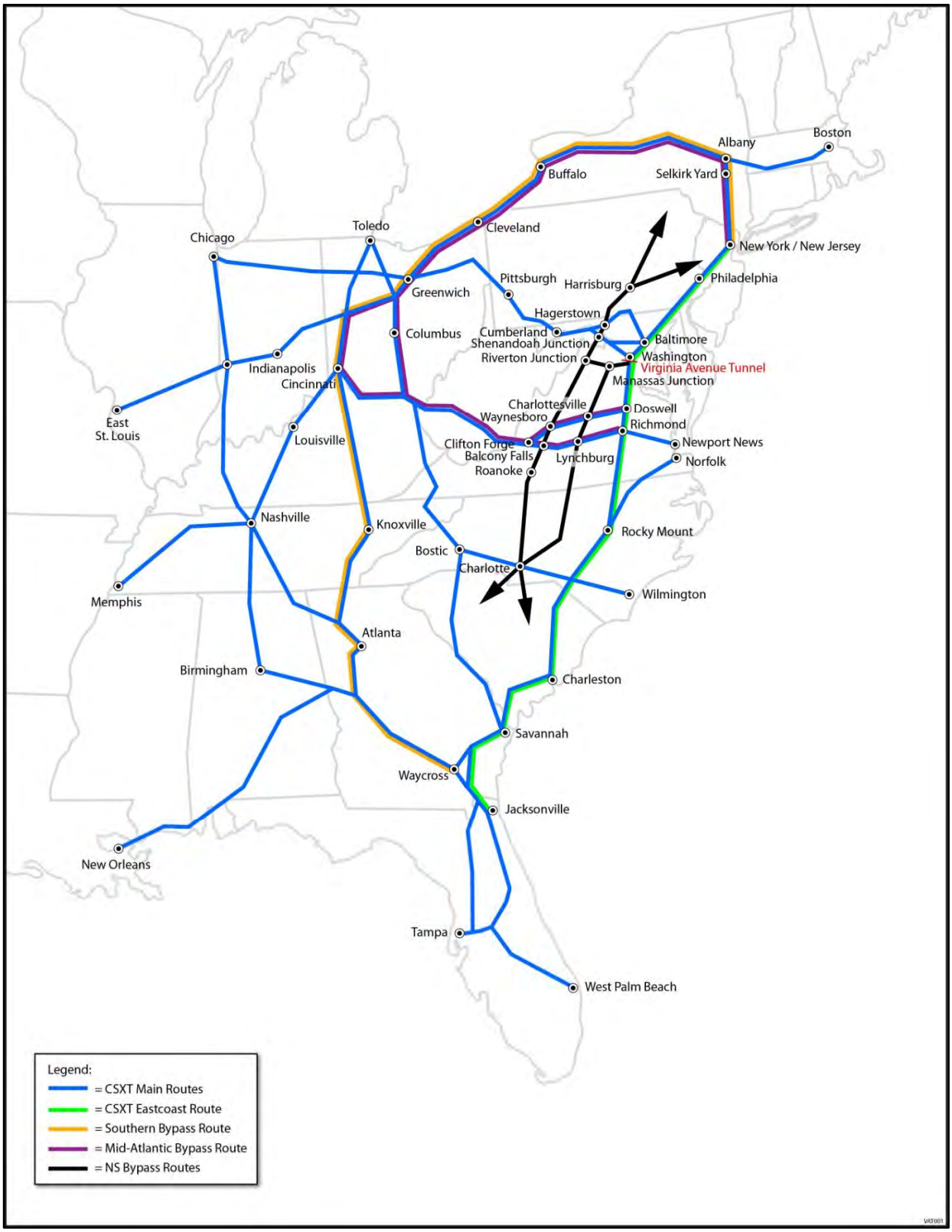
Concept 7 would temporarily detour freight trains through other rail routes within and outside the District. Figure 1-3 in Chapter 1 depicts the existing rail network in the District of Columbia, including the rail lines used by passenger carriers, such as AMTRAK and VRE. Routing freight trains through Union Station (a passenger train station) would maintain the connectivity of the freight rail network through the District. However, a maximum of one freight train per day would be able to move through Union Station in each direction, due to the constraints of existing passenger rail service. In addition, each freight train would require equipment changes before it could traverse Union Station. Because of the capacity constraints of the route through Union Station, freight rail traffic must operate over other principal routes throughout the eastern seaboard. Each of these bypass options involve substantial additional train mileage and transit time. Figure 3-17 displays the potential bypass routes, which are briefly discussed below.

Figure 3-16
Concept 7 Typical Section



CSXT Southern Bypass Route – Northbound trains originating in Florida and destined for northeastern points would divert from the eastern seaboard freight rail corridor route at Waycross, GA and be routed through Atlanta GA, Knoxville TN, Cincinnati and Cleveland OH, Buffalo NY, and into Selkirk Yard (located in the vicinity of Albany NY). Southbound trains originating at Selkirk Yard would use the reverse routing to Waycross GA. From Selkirk Yard, freight trains could access markets in New Jersey, New York City, and New England. Baltimore/Philadelphia markets could be accessed via route running through Pittsburgh PA and Cumberland MD. The segment between Waycross, GA and Cleveland (Greenwich), OH is essentially a single-track rail line with passing sidings, and much of it is already at or near capacity.

Figure 3-17
Temporary Detours outside the District under Concept 7



CSXT Mid-Atlantic Bypass Route - Northbound trains originating in the Carolinas would use the eastern seaboard freight rail corridor route to Richmond VA, then divert to the Mid-Atlantic Route and proceed through Lynchburg and Clifton Forge VA, Huntington WV, Columbus and Cleveland OH, and on to Selkirk Yard. As with the Southern Bypass, the Mid-Atlantic Bypass adds over 800 miles to the overall route to New Jersey points. Half of the segment between Richmond, VA and Huntington, WV is a single-track rail line, and is in mountainous areas used frequently by coal trains. In addition, westbound trains traveling from Richmond have no efficient means to connect with Lynchburg and head north. A complicated and time-consuming maneuver involving the uncoupling of locomotives from one end of the train and coupling the locomotives on the other end would be required. Moreover, each of these train movements requires crossing over mainline tracks that are used by approximately 20 AMTRAK trains daily. Essentially, using the Mid-Atlantic Bypass Route is not a feasible operation for multiple freight trains per day.

CSXT Mid-Atlantic Bypass Route (Doswell) – A variation Mid-Atlantic Bypass would deviate from eastern seaboard freight rail corridor route in Doswell VA, rejoining the bypass route in Clifton Ford, VA. The route segment between Doswell and Clifton Forge is operated by the Buckingham Branch Railroad. Although CSX has rights to use this rail line primarily as a relief route for returning empty coal trains, it is not feasible to support high density freight traffic due to its low speed limit (25 mph), and lack of sufficient siding length and space (distance between each siding) and steep grades.

Norfolk Southern (NS) I-83 Hagerstown Route – Another possible bypass route involves using the NS I-83 freight rail route that traverses the Shenandoah Valley from Charlotte NC through Roanoke VA, Hagerstown MD and Harrisburg PA. Beyond Harrisburg PA, a number of NS routes are available that enable access to the New Jersey area. As a NS route, train movement and track sharing would have to be negotiated before any CSX trains could use it. NS would maintain absolute control of dispatching and the guest railroad trains (CSX) are allowed access as the opportunity permits. Although rerouting is a common railroad practice under emergency conditions that are usually short in duration, negotiating a 2 plus-year operating agreement that would maintain CSX's current level of operational service may not be possible. Notwithstanding agreement issues, using the I-83 NS route presents operational challenges. Essentially, the NS I-83 corridor route has extremely limited in line capacity. The corridor has a single railroad track, a limited number of sidings, and much of the corridor consists of curved track and low speed limits.

3.7.1.8 Concept 8: Reroute, Deep Bore Tunnel

Concept 8 would establish a new two-track/double-stack tunnel approximately 80 feet below the surface of Virginia Avenue SE (i.e. approximately 45 feet below the existing tunnel) (see Figure 3-18). This depth is needed to maintain a stable foundation under the existing tunnel while the new tunnel is being excavated. The purpose of Concept 8 would be to maintain the existing mainline freight rail route through Washington, DC, but avoid the need for construction on Virginia Avenue SE. Rail operations would continue using the existing Virginia Avenue

Tunnel for service Washington Metropolitan Area and regional customers. Constructing this tunnel would require the use of tunnel boring equipment, and would not require any major construction activity on city streets, including Virginia Avenue SE. The diameter of the tunnel would be approximately 44 feet wide, which would be wide enough to accommodate two-track/double-stack facilities. In order to reach a depth of 80 feet in the area of the existing tunnel while also maintaining appropriate separation from other existing features along the route (i.e., river crossings and WMATA tunneling), the portals of the new tunnel would be located no closer than an area near the south of Reagan National Airport in Alexandria, VA on the west end and near the Deanwood Metrorail Station on the east end, making the minimum length of the tunnel approximately nine miles (see Figure 3-19). For the construction of the transition area at each portal, a minimum of 14-16 acres would be required. In addition, numerous ventilation shafts along the entire tunnel length would be needed, most of which would be sited in urban areas.

There are several reasons for the 9-mile tunnel length. The maximum permissible grade for freight trains operating on this corridor is 1.25 percent. The portal would have to be located at least 6,400 feet from the bottom of the slope. With a 1.25 percent grade and with the existing tunnel at approximately 3,800 feet long, a deep bore tunnel would be no shorter than approximately 16,600 feet, or a little more than three miles. Second, several natural and manmade obstructions would prevent the minimum length of a deep bore tunnel with grades of 1.25 percent. The natural obstructions include the Anacostia and Potomac Rivers. For example, because of the relatively close proximity of the Anacostia River to the current east portal, the deep bore tunnel's rise to surface level elevation could not begin until the tunnel is on the east side of the river. The manmade obstructions include underground structures associated with freeway over- and under-passes, underground utilities including large combined sewer overflow (CSO) trunk lines, and underground transportation facilities, such as Metrorail tunnels and the 12th Street, 1st Street and I-395 tunnels. The manmade obstructions would affect the tunnel length and depth on the west side, and would force the deep bore tunnel's rise to surface level elevation to begin on the west side of the Potomac River. Finally, the length of the deep bore tunnel under Concept 8 would be affected by keeping the tunnel within the existing CSX right-of-way within the District, Maryland and Virginia.

3.7.1.9 Concept 9: Reroute NCPC Indian Head Alignment

Concept 9 was taken from a study conducted by the National Capital Planning Commission (NCPC) in 2007 titled, the Railroad Realignment Feasibility Study. The NCPC study identified alternative routes to divert the majority of the freight traffic on the I-95 corridor away from the District, but still within the Washington Metropolitan Area. Concept 9 would use an alignment called the Indian Head Alignment, which was identified in the NCPC study (see Figure 3-20). Under Concept 9, a new mainline rail route would be established through the greater Washington Metropolitan Area.

Figure 3-18
Concept 8 Typical Section

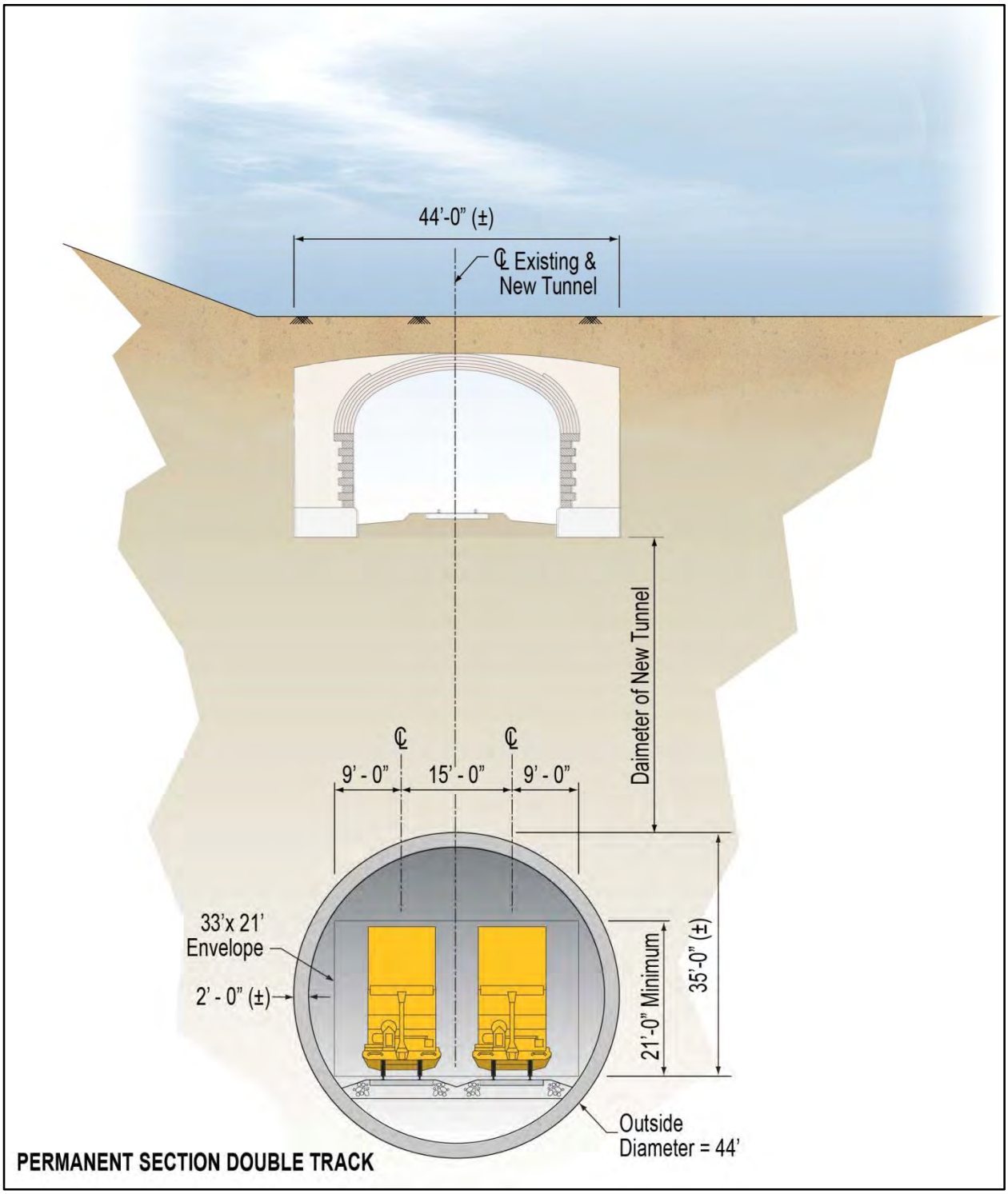
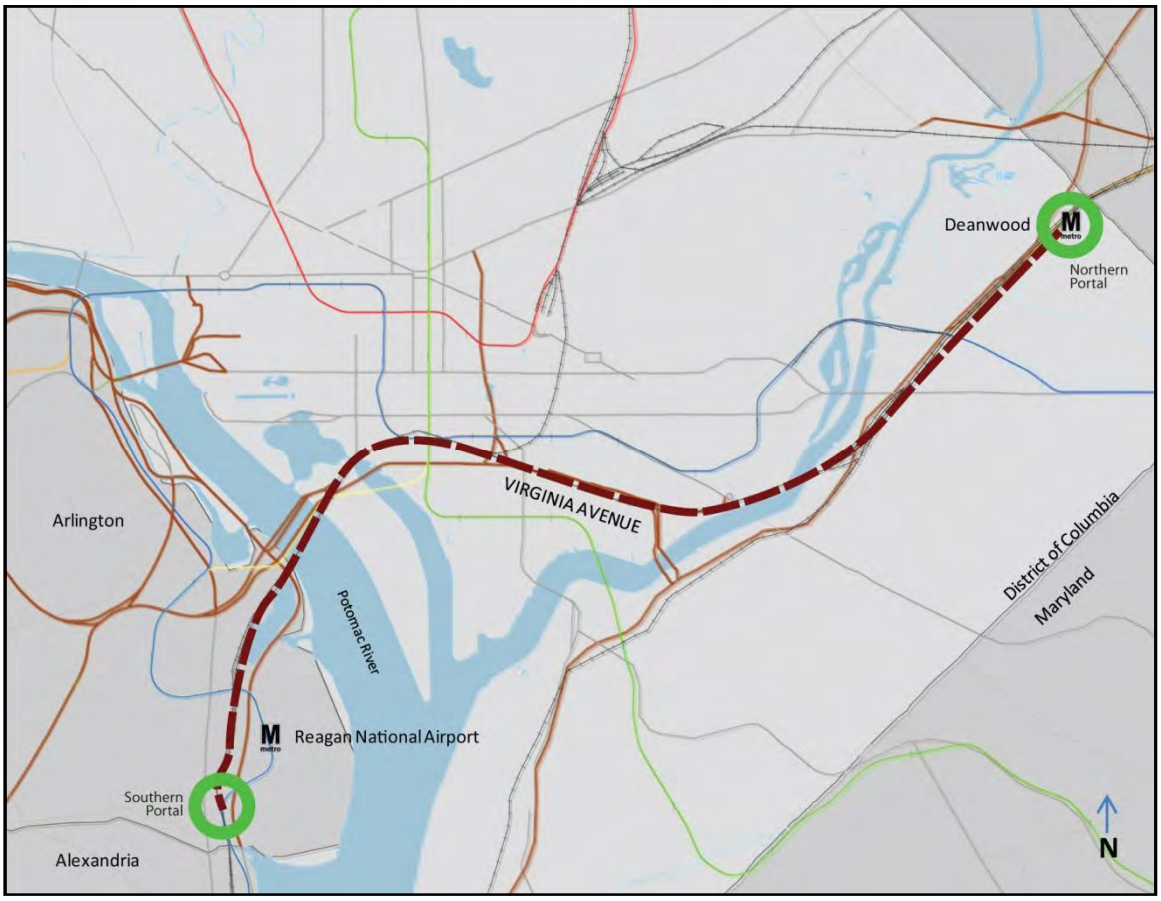
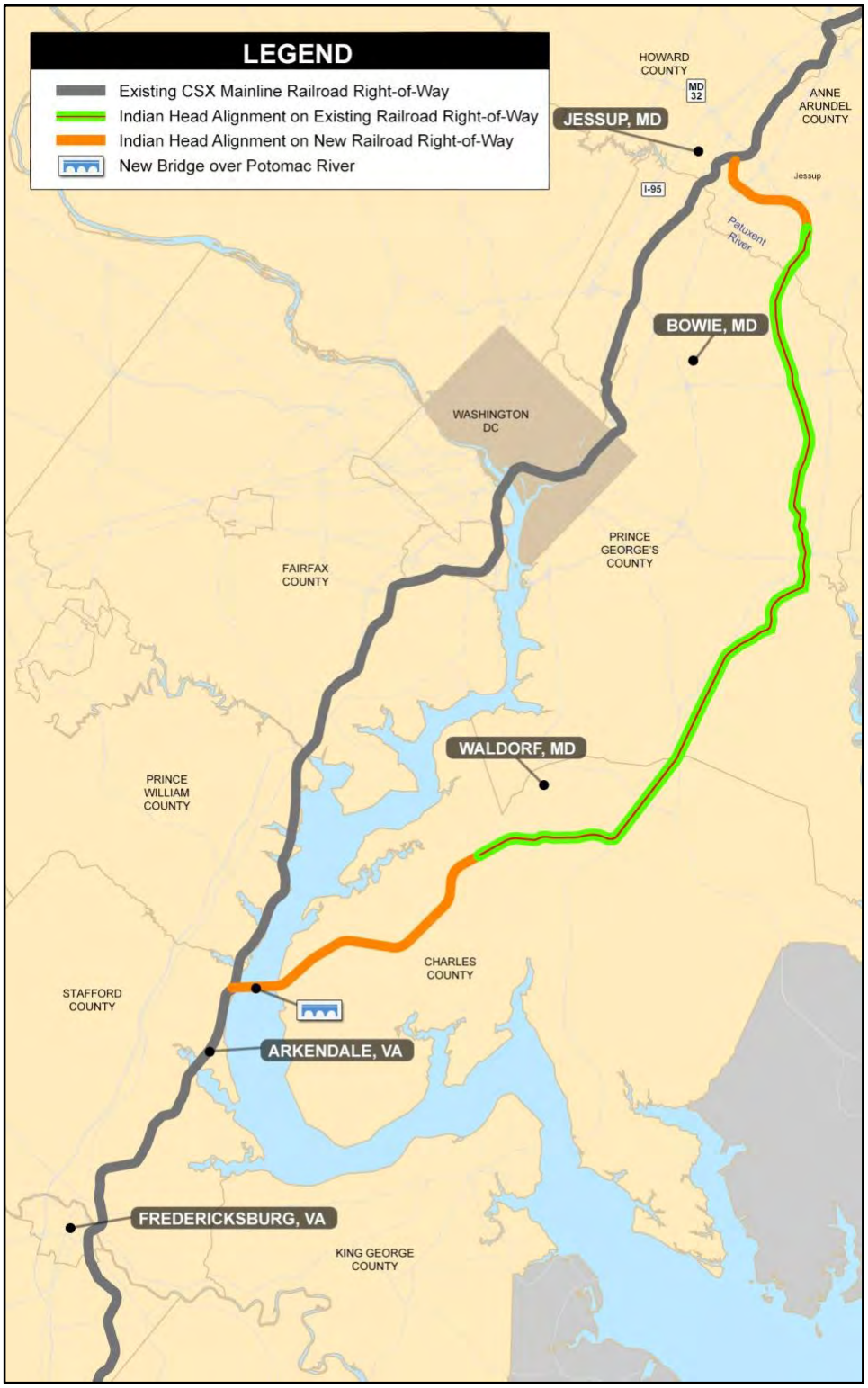


Figure 3-19
Concept 8 Tunnel Alignment and Portal Locations



From Virginia, the Indian Head alignment would diverge from the existing mainline rail tracks north of Arkendale, and cross the Potomac River via a new two-track 2.5-mile-long bridge. On the east side of the river, a new two-track railroad would be built and connect with the existing single-track Indian Head Branch, and the single-track Pope's Creek Branch. The sections of the Indian Head and Pope's Creek Branch affected by this alignment would require two-track expansion, including, where necessary, changes in grades or bridge or overpass structures to allow double-stack operations. North of Bowie, MD the alignment would run parallel to the Amtrak Northeast Corridor, and a new two-track railroad would be built between the Patuxent River and MD 32 to the mainline traversing through Jessup, MD.

Figure 3-20
Concept 9, NCPC Indian Head Alignment



3.7.1.10 Concept 10: Reroute, NCPC Dahlgren Alignment

Concept 10 was also taken from the 2007 NCPC study. It would use an alignment called the Dahlgren Alignment (see Figure 3-21). The purpose of Concept 10 is the same from Concept 9: instead of making the necessary capital improvements to maintain the existing mainline route through Washington, DC, it would establish a new mainline route through the greater Washington Metropolitan Area.

From Virginia, the Dahlgren alignment would diverge from the existing mainline rail tracks just south of Fredericksburg where a new two-track railroad would be constructed that would traverse across King George County. From just south of Fredericksburg, the alignment of Concept 10 would follow an existing utility corridor right-of-way, cross the Rappahannock River and connect with the abandoned Dahlgren rail line, which would be restored to a functioning two-track railroad. This restored rail line would then parallel the recently completed Dahlgren Railroad Heritage Trail for a short distance before establishing new rail line that would partially be aligned with the U.S. 301 to the Potomac River. At the Potomac River, a new two-mile-long railroad drawbridge would be constructed near the existing U.S. 301 Bridge. The alignment would connect with the southern terminus of single-track Pope's Creek Branch, which would require two-track expansion. At and north of Waldorf, the Dahlgren alignment is the same as the Indian Head alignment.

3.7.1.11 Concept 11: Reroute, Permanent Reroute

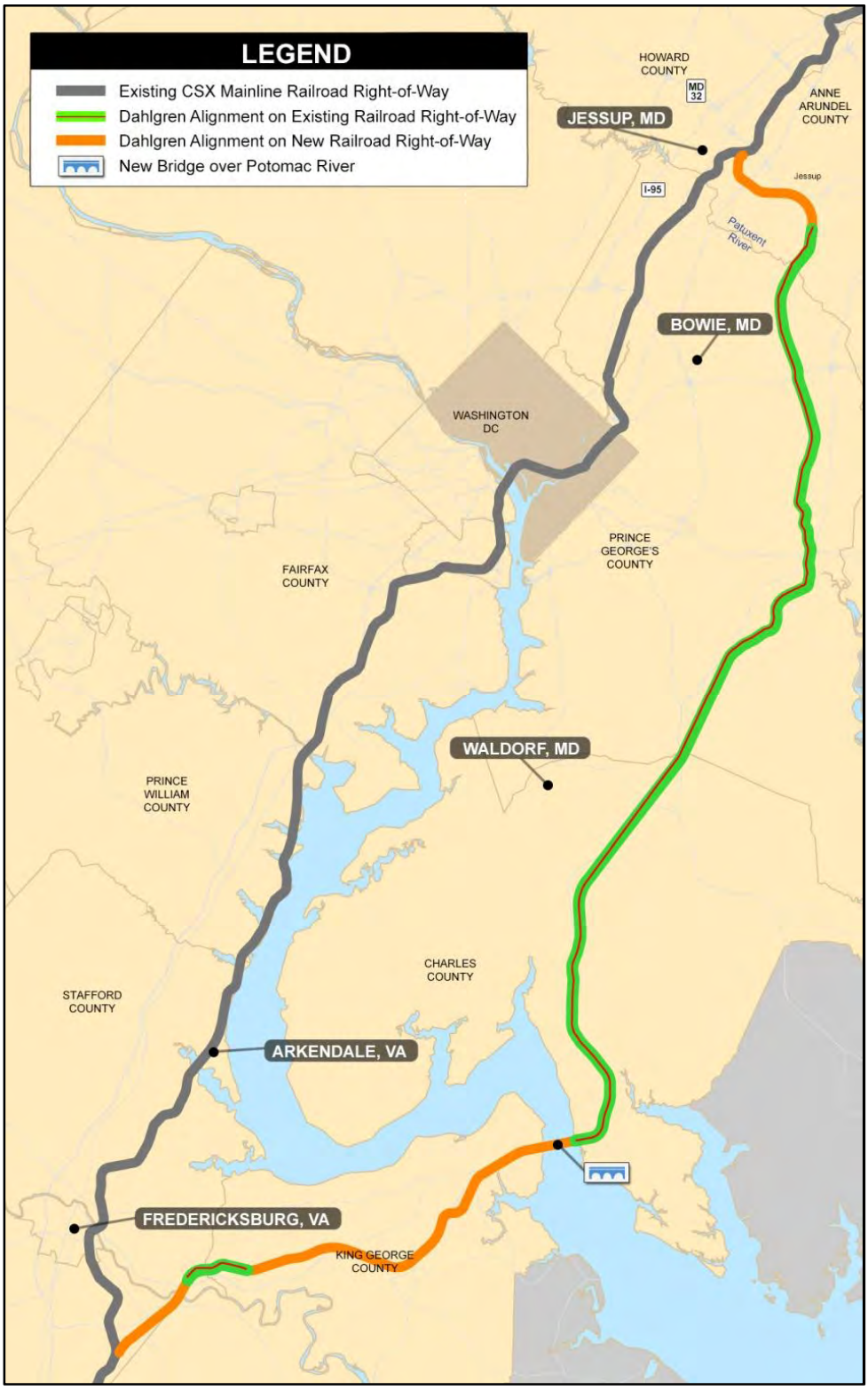
Concept 11 involves no proposed construction or upgrades to the existing Virginia Avenue Tunnel, and would establish new permanent routes using existing railroads owned by CSX throughout the eastern part of the U.S. This concept would continue operations in the existing Virginia Avenue Tunnel SE while permanently routing freight trains outside the District (see Figure 3-17). Concept 11 would use the same routes as Concept 7. However, the reroutes would be permanent under this concept, and would require substantial upgrades.

The differences between Concepts 7 and 11 is the duration of rerouting (temporary versus permanent), and the impacts associated with the durations. Similar to Concept 7, freight traffic must operate over other principal routes and all bypass options involve significant additional train mileage and running time. These potential bypass routes are discussed under Concept 7 and are illustrated in Figure 3-17.

3.7.2 Evaluation Criteria and Screening Process

This section describes the eight evaluation criteria and explains how each concept was measured against the criteria. The project concepts were introduced to the public during the November 30, 2011 public meeting. Following this and other smaller group meetings, the concepts evaluation criteria were developed and applied.

Figure 3-21
Concept 10, NCPC Dahlgren Alignment



Criteria 1 through 4 are based on the Project Purpose and Need described in Chapter 1. Criteria 5 through 8 address issues of technical and economic feasibility, such as impacts on freight traffic and cost, as well as impacts to the community, including the duration of construction along Virginia Avenue SE. Detailed descriptions of the criteria are provided in the Concepts Evaluation Technical Report provided in Appendix B. The criteria and their application are described below.

Criterion 1: The concept, upon completion, will address the deficiencies of the Virginia Avenue Tunnel.

In order for a concept to meet Criterion 1, Virginia Avenue Tunnel must be rebuilt to modern engineering standards, while at the same time eliminating the bottleneck on the I-95 mainline rail corridor, a vital segment of the nation's rail network. The elimination of the bottleneck does not necessarily have to be through the Virginia Avenue corridor in order to partially meet this objective.

Criterion 2: The concept, upon completion, will provide the necessary improvements for operating double-stack intermodal containers and have two tracks for the efficient flow of commercial rail freight through the Washington Metropolitan Area.

In order for a concept to meet Criterion 2, the Project must result in two railroad tracks with sufficient clearance to accommodate double-stack containers on rail cars throughout the Washington Metropolitan Area.

Criterion 3: The concept will avoid major impacts to the structures, traffic or access to or from I-695.

Only rebuild concepts (Concepts 2 through 7) that involve a short-term temporary closure of I-695 ramps meet Criterion 3. Rebuild concepts that involve long-term closure of an I-695 ramp or re-construction of any structural element of I-695 (e.g., columns, retaining walls, etc.) do not meet Criterion 3. Obviously, Concepts 8 through 11, which do not require construction along the surface streets, including Virginia Avenue SE, would meet Criterion 3. However, it is uncertain, and beyond the scope of this analysis, to predict how the massive railroad construction contemplated by any of these concepts (including construction of a new rail bridge across the Potomac River) could affect interstate highways and other major roads.

Criterion 4: The concept must allow for the maintenance of traffic across Virginia Avenue and along adjacent streets throughout the duration of construction.

In order to meet Criterion 4, the concept must have the potential to include effective traffic management measures to maintain cross-street traffic across Virginia Avenue for motorists, pedestrians and cyclists, and vehicle access to and from I-695.

Criterion 5: The concept will maintain interstate rail commerce without a substantial negative impact to the level of service during construction.

This criterion requires a dependable level of timely freight transportation services in the Washington Metropolitan Area throughout the duration of construction. If a concept is unable to maintain the existing level of service, it would fail to meet Criterion 5.

Criterion 6: The concept will be implemented in a time frame that accommodates the near term anticipated increase in freight traffic.

As a practical matter, Criterion 6 requires that double-stack intermodal container train operations be available through the Washington Metropolitan Area by 2015, the year in which the Panama Canal is projected to be expanded allowing passage of larger vessels with higher freight capacity. A concept does not necessarily have to be fully constructed by 2015 in order to meet Criterion 6 if it includes temporary measures that maintain freight operations through the Washington Metropolitan Area with the ability to operate double-stack intermodal container freight trains.

Criterion 7: The concept has a comparatively reasonable duration of construction in the vicinity of the existing tunnel.

In order to determine if a concept meets Criterion 7, the expected length of construction for each of the 12 concepts were compared. The concepts with the shorter construction periods within the Virginia Avenue SE corridor satisfy Criterion 7.

Criterion 8: The concept has a comparatively low cost.

Under Criterion 8, a comparatively low cost essentially means a cost that is practical and feasible from an economic standpoint. To apply Criterion 8, a cost comparison of the 12 concepts was conducted. The concepts in the lower range of overall costs meet Criterion 8. Concepts with costs orders of magnitude greater than the lower cost concepts would not satisfy Criterion 8.

3.7.3 Concepts Dismissed from Further Consideration

This section provides a summary of how each concept was evaluated and rated against the eight criteria described in Section 3.7.2. Table 3-6 summarizes the findings of the concepts screening evaluation. The table qualitatively scores each concept against the eight evaluation criteria. Scoring is based on ability of each concept to either meet the criteria, failure to meet the criteria, or uncertainty in meeting the criteria and where further study would needed through the EIS process. The scores on the table also reflect situations where the criteria are simply not applicable to concepts. The Concepts Evaluation Technical Report in Appendix B contains a point-by-point descriptive evaluation of the alternative concepts against the criteria. It also provides more information on why certain concepts were eliminated from detail study as formal alternatives in the EIS process.

Table 3-6
Concepts Evaluation Matrix

	Project Criteria	No Build	Rebuild Tunnel Concepts							Reroute Freight Traffic Concepts			
		1	2	3	3A	4	5	6	7	8	9	10	11
1	The concept, upon completion, will address the deficiencies of the Virginia Avenue Tunnel.		Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No
2	The concept, upon completion, will provide the necessary improvements for operating double-stack intermodal containers and have two tracks for the efficient flow of commercial rail freight through the Washington Metropolitan Area.		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
3	The concept will avoid major impacts to the structures, traffic or access to or from I-695.		Yes	No	No	Requires more study	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4	The concept must allow for the maintenance of traffic across Virginia Avenue and along adjacent streets throughout the duration of construction.		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
5	The concept will maintain interstate rail commerce without a substantial negative impact to the level of service during construction.		Yes	Yes	Yes	No	Yes	Requires more study	No	Yes	Yes	Yes	Yes
6	The concept will be implemented in a time frame that accommodates the near term anticipated increase in freight traffic.		Requires more study	Requires more study	Requires more study	Requires more study	Requires more study	Requires more study	No	No	No	No	No
7	The concept has a comparatively reasonable duration of construction in the vicinity of the existing tunnel.		Requires more study	Requires more study	Requires more study	Requires more study	Requires more study	Requires more study	Yes	N/A	N/A	N/A	N/A
8	The concept has a comparatively low cost.		Yes	Requires more study	Requires more study	Requires more study	Yes	Requires more study	Requires more study	No	No	No	No

Legend:
- Yes
- Requires more study
- No
- N/A

Based on the evaluation, all of the reroute concepts (Concepts 8 through 11) were eliminated from further consideration. In summary, the major reasons for eliminating the reroute concepts include:

- Concept 8, Reroute, Deep Bore Tunnel, which failed three of the evaluation criteria, would require acquisition of 14 to 16 acres at portal locations and the construction of ventilation shafts in urban areas. It would have an extremely high cost (estimated to cost approximately $2 billion) and require extensive planning efforts across multiple jurisdictions.
- Concept 9, Reroute, NCPC Indian Head Alignment, which failed three of the evaluation criteria, would require a new bridge over the Potomac River and 31 miles of new rail line. It would traverse several communities, would affect diverse natural resources, would have an extremely high cost (NCPC estimated to cost between $3.2 and $4.2 billion), and would require extensive planning efforts across multiple jurisdictions.
- Concept 10, Reroute, NCPC Dahlgren Alignment, which failed three of the evaluation criteria, would require a new bridge over the Potomac River and 38 miles of new rail line. Like Concept 9, it would traverse several communities, would affect diverse natural resources, would have an extremely high cost (NCPC estimated to cost between $3.5 and $4.7 billion), and would require extensive planning efforts across multiple jurisdictions.
- Concept 11, Permanent Reroute, which failed four of the evaluation criteria, would include substantial diversion of freight traffic to trucks or other modes of transportation, with associated impacts to interstate highway congestion, higher fuel consumption, and increased pollution.

Concepts 3, 3A, 4 and 7 were also eliminated from further consideration. Concepts 3 and 3A failed to meet one of the criteria based on the Project's Purpose and Need. Concept 4 failed to meet Criterion 5. Concept 7 failed to meet Criteria 5 and 6. In summary, the major reasons for eliminating these concepts include:

- Concept 3, Rebuild, Temporary North Side Runaround, would result in major impacts to I-695 during construction.
- Concept 3A, Rebuild, Permanent Two Tunnels (New Tunnel on North Side of Existing Virginia Avenue Tunnel), would also result in major impacts to I-695 during construction.
- Concept 4, Rebuild, Combination Runaround, would require two major disruptions to freight rail operations, causing stoppages of freight train movements for several weeks for each disruption.
- Concept 7, Rebuild, Temporary Reroute, would result in a substantial degradation of freight rail service to growing customer demands in the I-95 corridor

The following remaining concepts were retained as Build Alternatives for detailed evaluation in the EIS process, including further study with regards to Criteria 6 to 8 on Table 3-6:

- Concept 2: Rebuild Virginia Avenue Tunnel, Temporary South Side Runaround

- Concept 5: Permanent Two Tunnels (New Tunnel on South Side of Existing Virginia Avenue Tunnel)
- Concept 6: Rebuild Virginia Avenue Tunnel, Rebuild With On-Line Construction

The retained concepts were developed as project alternatives, and given descriptive names (see Section 3.4):

- Alternative 1: No Build
- Alternative 2: Rebuilt Tunnel / Temporary Runaround Track
- Alternative 3: Two New Tunnels
- Alternative 4: New Partitioned Tunnel / Online Rebuild