Chapter 2
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The proposed action is to reconstruct the existing Virginia Avenue Tunnel and its single railroad track configuration with a new two-track, double-stack tunnel. Two-track means that there would be two separate railroad tracks in the tunnel. Double-stack means that trains operating within the tunnel would be able to pull rail cars carrying two vertically stacked intermodal freight containers. These types of containers are among other types of freight rail traffic that use the tunnel, such as coal and other merchandise. The new tunnel would allow freight trains, including those pulling double-stack intermodal containers, to move in both directions, simultaneously, if necessary, and enabling more efficient freight movement.

The purpose of the proposed action is to preserve, over the long-term, the continued ability to provide efficient freight transportation services in the District of Columbia, the Washington Metropolitan Area and the eastern seaboard. These services would continue if the following needs are met:

1. Address the structural and operational deficiencies of the century-old Virginia Avenue Tunnel;
2. Accommodate expected increases in freight transportation that, in part, would stem from the Panama Canal expansion scheduled for 2015; and
3. Ensure that during construction freight transportation services remain uninterrupted while the functions of the tunnel are being replaced with a new facility.

Each of these needs is discussed in this chapter.

2.1 Virginia Avenue Tunnel Deficiencies

The existing Virginia Avenue Tunnel is deficient for the following reasons:

- With a horizontal clearance (i.e., width distance between the interior tunnel walls) that only allows a single railroad track, the tunnel is a major bottleneck for freight rail movement not only within the District, but also on the eastern seaboard generally;
- The tunnel has insufficient vertical clearance (i.e., height distance between the tunnel floor and ceiling) to operate double-stack intermodal container freight trains; and
- At over 100 years old, the tunnel is nearing the end of its useful life, and is subject to an ever increasing level of maintenance and repairs and higher risks of structural failure.

2.1.1 Tunnel Width

For a mainline freight rail line, the current industry standard for this type of transportation infrastructure is at least two railroad tracks (to allow for simultaneous two-way traffic) with a minimum operating speed of 40 mph. As described in Section 1.2, the rail route through the Southwest and Southeast areas of DC is an integral part of CSX's mainline freight rail network. Although Virginia Avenue Tunnel was originally constructed to accommodate two railroad tracks, freight trains have increased in size since the original construction and safety clearance

requirements for opposing traffic increased, thereby necessitating the conversion of the rails within the existing tunnel to a single railroad track arrangement several decades ago. The existing tunnel is approximately 28 feet wide (inside the tunnel walls). A minimum tunnel width of 33 feet is needed to accommodate two railroad tracks, or five feet more than the existing width of the tunnel.

The Mid-Atlantic Rail Operations Phase II Study (December 2009), prepared for the I-95 Corridor Coalition made up of Departments of Transportation from Delaware, New Jersey, Pennsylvania, Maryland and Virginia, identified Virginia Avenue Tunnel as a primary congestion point and major bottleneck for both freight and passenger traffic. CSX operates approximately 20 miles of freight rail lines in the District. In addition to freight movement, more than 90 commuter trains operate on CSX tracks through the District daily, including 24 AMTRAK, 30 VRE, and 38 MARC trains (Freight Forum, January 2012).

The single railroad track within Virginia Avenue Tunnel represents the single greatest constraint on rail headway (the frequency of passing trains within a given time period) on CSX's mainline freight rail network. It is a bottleneck to the eastern seaboard freight rail corridor because only a single freight train can pass through the tunnel at any one time. As a train passes through the tunnel, freight trains moving in the opposite direction near the tunnel must stop to allow the oncoming train to safely clear the tunnel, thus, limiting the total number of trains that could pass through the tunnel in a given time period. Freight trains often queue for long periods of time on either end of the tunnel to wait their turn to pass through the tunnel. Ordinarily, just freight trains are affected by this delay. However, if more than one eastbound train is delayed, the queue could extend beyond the junction at 1st Street SW, which is located just one-half-mile from the Virginia Avenue Tunnel portal at 2nd Street SE, or less than the length of a typical freight train, at which point any queue could cause delays to passenger rail service traveling between Virginia and Union Station.

2.1.2 Tunnel Height

As a century-old facility, Virginia Avenue Tunnel was not built to accommodate modern freight rail transportation, namely the double-stacking of intermodal containers. Trains pulling double-stacked intermodal container cars have become the industry's operational practice for intermodal freight transportation in the U.S. where the rail networks allow it (i.e., vertical obstructions, such as a roadway overpasses and tunnels, along the entire network allow double-stack intermodal container trains to pass underneath). In order to operate double-stack freight trains through a tunnel or other vertical obstruction, a minimum vertical clearance of at least 21 feet must be provided. The existing vertical clearance within Virginia Avenue Tunnel is about 18 feet, or deficient by about three feet. The complications and inefficiencies created by this aspect of the old tunnel is similar to what the highway transportation industry would experience if an overpass did not meet modern standards for vertical clearance on a heavily-used highway that must accommodate tractor-trailer truck traffic.

The existing Virginia Avenue Tunnel was built to accommodate the industry practices of the late 19th and early 20th centuries. For many years after construction, the tunnel satisfactorily met

the needs of the freight transportation in terms of having adequate vertical clearance. However, freight transportation changed dramatically, as noted, with the invention and wide-spread adoption of the intermodal shipping container as the principal means to move goods between manufacturing centers and consumer markets, regardless of whether the transport is between local, regional, national or international markets.

The last several decades have witnessed a steady growth in the demand for freight transportation due to population growth and the increasing globalization of commerce. Consequently, freight railroad companies, such as CSX, are carrying ever increasing quantities of intermodal freight, but are often still operating on the same rail network established decades or even more than a century ago. In addition, these same rail networks are increasingly being shared with other users, in particular passenger rail service, as noted in Section 1.2. The industry solution to meeting higher freight transportation demands while still operating on the same network is to carry more freight per train. The ability to double-stack intermodal containers allows a single freight train to essentially double its intermodal freight capacity, if needed. In other words, double stacking intermodal containers is a way to increase capacity without increasing the number of trains, or the need to construct new rail lines.

Thus, this inadequate vertical clearance of Virginia Avenue Tunnel effectively prevents CSX from operating double-stack intermodal container freight trains along its eastern seaboard freight rail corridor. As a result, the inadequate vertical clearance of the tunnel represents both a major deficiency of the tunnel and the ability to provide efficient service in the rail corridor. Although there are other locations in the District with inadequate vertical clearances, addressing them would require only minor modifications to the rail line. For example, the inadequate vertical clearance at New Jersey Avenue SE, which is part of the Project area, would be resolved by lowering the grade beneath the crossing, a relatively minor construction activity that would not disrupt the surrounding community. Other crossings with inadequate vertical clearances in the District would be handled in a similar manner.

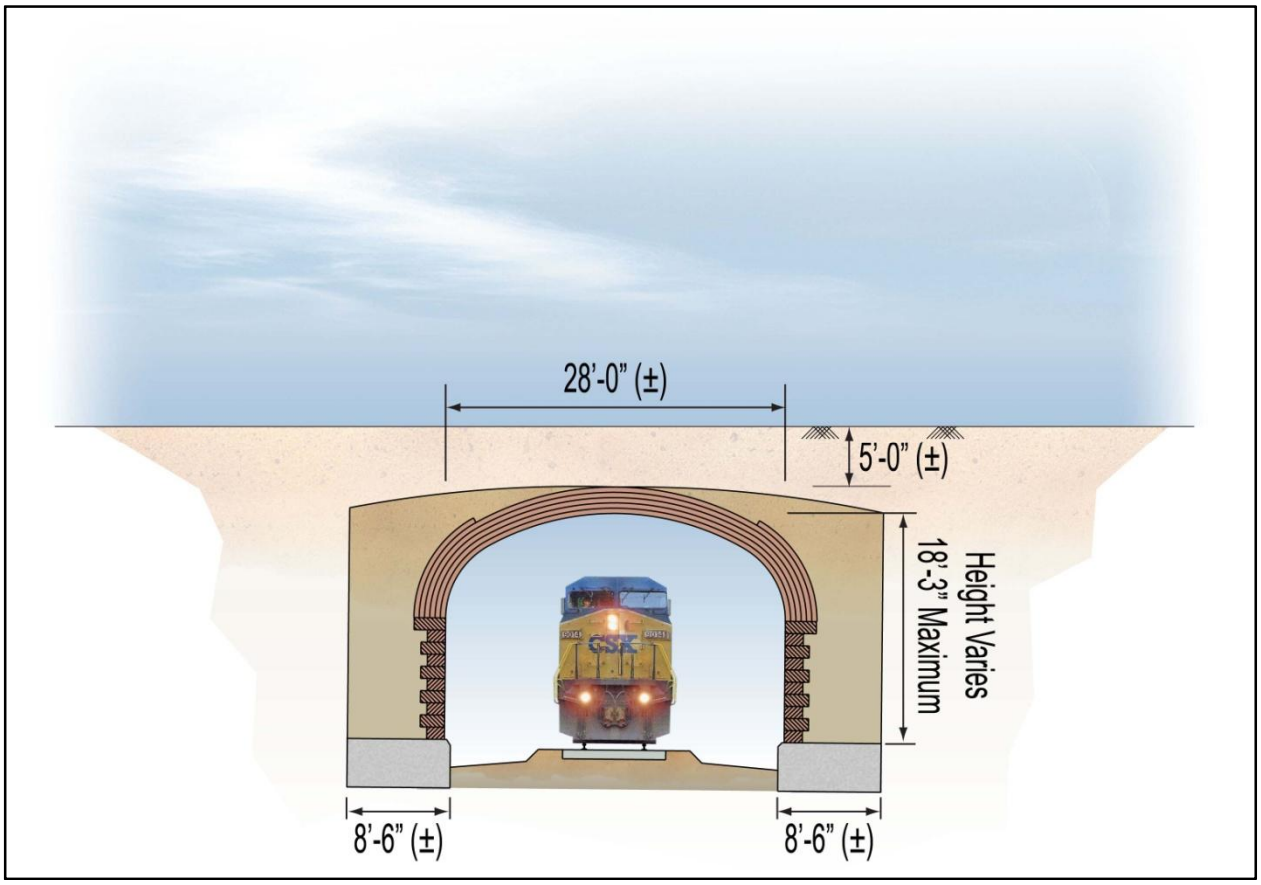
2.1.3 Tunnel Condition

In addition to the capacity and height deficiencies of Virginia Avenue Tunnel, the tunnel is also nearing the end of its useful life. The tunnel requires increasingly frequent inspection and preventative maintenance for safe rail operations. These frequent inspections or preventive maintenance activities are difficult to conduct without compromising normal rail operations, and are likely to increasingly cause service disruptions to become longer than what is acceptable for a mainline freight rail line.

Transportation infrastructures, such as highways, bridges and tunnels, are eventually replaced or undergo major rehabilitation at some point. Alternatively, if a particular element of infrastructure were not replaced, it would continue to require higher levels of investment in maintenance and repair, resulting in more frequent service interruptions and higher risks for localized disturbances.

A typical cross-section of the existing Virginia Avenue Tunnel is shown in Figure 2-1. The tunnel's structural shell consists of walls approximately 8½ feet thick and an arched roof. The walls and roof are of masonry construction. As noted in Section 1.2, the tunnel contains a single set of track (rails and ties) on top of the track ballast. The ballast, which normally consists of a bed of crushed stone, is used to hold the track in place as trains pass through. It is also used to facilitate drainage. The track ballast in and around Virginia Avenue Tunnel consists of crushed stone.

Figure 2-1
Cross-Section of Existing Virginia Avenue Tunnel



Virginia Avenue Tunnel is showing signs of its age. While the overall structure is in relatively good shape, indicators of localized distress are evident, such as cracking in the tunnel's masonry, active water infiltration, spalling (i.e., flaking) of liner brick and the deterioration of mortar in masonry joints. In addition to these tunnel wall conditions, the tunnel's drainage system, made up of a network of ditches, wood trenches, corrugated metal and reinforced concrete pipes, and sump pits and pumps, are severely compromised by overall deterioration and fouling by sediment and debris. This is in part due to the tunnel tracks and drainage system being built directly on top of soil instead of a hard surface, a design no longer used under

today's standard engineering practices for most freight rail tunnels. The drainage system is the most critical element in disrepair because this affects the sub-grade load bearing condition of the tunnel floor. The poor drainage system has led to increased moisture in the tunnel and an overall weakening and deterioration of the ground underneath the ballast. Train loadings (i.e., weight of passing trains) are more than double than when the tunnel was first built, which have contributed to the wear and tear on the track bed. Along with the cyclic train loadings, the integrity of the tunnel ballast has also been compromised. In order to maintain safe train passage over areas of substandard track beds, the operating speed limit through the entire tunnel was reduced to 15 mph (up to 40 mph is allowed immediately outside the tunnel), which has further contributed to the tunnel being a bottleneck of the CSX mainline freight rail network. In addition, poor load bearing of the track bed requires excessive levels of maintenance to ensure the reliable passage of trains.

Just as the techniques for highway and road construction have changed to accommodate the heavier weight of vehicles, so too have railroad construction practices changed to accommodate the increased weight, size and shape of locomotives and rail cars. Not surprisingly, Virginia Avenue Tunnel reflects the engineering practices and construction methods that are more than 100 years old and are effectively obsolete. For example, today's standard engineering practices would recommend a structural floor (e.g., concrete foundation) when the ground of the Virginia Avenue Tunnel is made up of soils.

Despite the signs of distress noted above, the tunnel is in no danger of collapsing in part due to tunnel reinforcements and reconstruction made in late 1985 and early 1986 (see Section 1.1). Nevertheless, even with CSX's active maintenance and inspection program, a major structural deficiency could materialize over the next few decades, possibly due to the continued aging of the tunnel's masonry structure. This would create a major disruption to freight transportation, and would likely disrupt the surface roadway network in the community as CSX would be forced to conduct emergency reconstruction of the affected section of the tunnel.

2.2 Freight Transportation Demand

According to the FHWA's 2011 Freight Analysis Framework (FAF) forecasts, overall freight tonnage would increase by 50 percent in 2040 from 2010 levels. This projection is independent of the Project. According to a U.S. DOT November 3, 2010 press release, freight tonnage is expected to increase 1.6 percent per year, reaching over 27 billion tons by 2040. It was 18.3 billion tons in 2010 back to levels before the U.S. recession in 2008. The press release also noted that intermodal container movement accounted for 18 percent of the value of freight transportation in 2007 and is forecast to grow to nearly 27 percent by 2040. It is likely that rail would accommodate a substantial share of the future increase demand for freight land transportation in the U.S. for the following reasons:

- Highway capacity (freight truck transport) is expanding too slowly to keep up with the FHWA projected demand.
- Certain metropolitan areas have extremely high traffic congestion levels, making highway transport of freight extremely inefficient and time-consuming. For example,

according to the 2011 Urban Mobility Report produced by the Texas Transportation Institute (TTI), the Washington Metropolitan Area ranks among the top very large metropolitan areas in the U.S. in terms of congestion.

- Freight trains are almost three times more fuel efficient than freight trucking according to the TTI and the Center for Ports and Waterways in a 2007 report (amended in 2009).
- Greenhouse Gas (GHG) emissions from freight transportation are tied closely to freight energy use. Although energy efficiency improvements have been made in the truck freight sector, GHG emissions are still growing in this sector because energy efficiencies have not kept pace with growth in freight demand. As noted above, freight rail transportation is approximately three times more energy efficient than freight trucking.

The Panama Canal will soon be expanded to allow vessels carrying 12,000 intermodal containers, more than doubling the maximum freight-carrying capacity (5,000 intermodal containers) of vessels that currently use the canal. Upon its projected completion in 2015, freight throughput from east coast and Gulf of Mexico ports is expected to increase substantially. Freight transporters in Asia could increasingly choose to use east coast and Gulf ports instead of west coast ports to reach inland markets (e.g., Midwest) in the U.S. for their goods due to the cost efficiencies of using larger vessels, even though the water route would be substantially longer than using a west coast port. Currently, it is more economical for shippers of Asian goods to use a west coast port and land transportation (rail and highway) to reach many inland markets in the U.S even though these markets are geographically closer to east coast or Gulf ports. A Panama Canal that could accommodate a 12,000 container vessel may change the equation between east and west coast freight market shares. It may favor a shift in market shares to east and gulf coast ports, notwithstanding other factors affecting freight market shares. Conversely, freight transporters in the U.S. could increasingly choose to use an east coast port to reach destinations in Asia. Ports along the east coast, such as in Savannah, GA and Charleston, SC are investing hundreds of millions of dollars to upgrade their facilities to accommodate the larger intermodal vessels and capture a greater market share.

As the largest freight railroad company on the east coast, CSX is anticipating the impact of an expanded Panama Canal on freight transportation demand from east coast ports, and is anticipating the need to carry a greater amount of freight between east coast ports and Midwest markets. CSX's existing mainline freight rail network in the mid-Atlantic and Midwest would be able to accommodate anticipated demand provided that at least two railroad tracks are provided throughout the network, and CSX is able to operate double-stack freight trains. CSX implemented a National Gateway initiative to improve the flow of rail traffic throughout the nation by increasing the use of double-stack intermodal container freight trains by creating a more efficient rail route that links mid-Atlantic ports with mid-Atlantic and Midwestern markets.

As shown on Figure 1-2, the CSX rail line through the District, including Virginia Avenue Tunnel, is part of the eastern seaboard freight rail corridor, a mainline route linking mid-Atlantic ports with mid-Atlantic and Midwestern markets. Due to the tunnel's "bottleneck" conditions noted in Section 2.1 (single railroad track and its inability to accommodate double-stack intermodal

container freight trains), the tunnel represents a constraint to increasing the freight carrying capacity along much of the rail network in order to meet expected increases in freight transportation demand. Due to the integrated nature of freight rail lines, a single point along a freight rail network (e.g., Virginia Avenue Tunnel) could affect the capacity of the entire network.

2.3 Commerce Demands

The ability to quickly and efficiently move goods to markets throughout the country is vital to the U.S. economy. As one of the nation's major freight railroad companies, CSX provides a valuable public service by facilitating the shipment of goods and services to the general public. It is not feasible to stop freight rail service during the period of time when the Virginia Avenue Tunnel is reconstructed. Currently, CSX operates between 20 and 30 trains through the tunnel daily. The railroad's need to meet its Common Carrier Obligation, including the statutory duty to provide ``transportation or service on reasonable request'' (49 U.S.C. 11101(a)) will continue unabated throughout the period of time that the tunnel is rebuilt. This duty means that CSX may not decline to provide common carrier service merely because doing so might be inconvenient or unprofitable, or somehow disruptive to others. As with other aspects of interstate commerce that could have profound economic consequences if interrupted, the preservation and maintenance of these transportation services are in the national interest. Just as service cannot be halted during tunnel reconstruction, it would also be inconsistent with the railroad's Common Carrier Obligation to allow such transportation services to be unduly delayed. An increasing amount of railroad traffic is time-sensitive, reflecting economic decisions by shippers to use "just-in-time" approaches to manufacturing. Just-in-time approaches seek to reduce inventory, and allow for the arrival of critical parts that dependably arrive exactly when they are needed by the manufacturer.

As shown on Figure 1-2, severing the rail network in the District would effectively cut-off freight transport between the mid-Atlantic and Midwestern states because CSX does not own rail lines within or near the Washington Metropolitan Area that could serve as an alternate route through or around the District during construction. In particular, the Long Bridge (see Section 1.2) is CSX's only Potomac River crossing other than in Harpers Ferry, WV, which is located approximately 50 miles northwest of the District.

During construction, CSX will need to continue providing its customers with the same level of timely and efficient freight service as it currently provides today, which includes having a Virginia Avenue Tunnel with a single set of tracks. Any diminution in the ability to provide reliable, consistent, and timely freight rail service would make freight rail transport less competitive than truck transport, and the expected response of many freight customers would be to switch transport modes from rail to truck. A substantial shift in modes may result in worsening the already congested interstate and regional road networks, especially those along the I-95 and I-81 corridor, along with associated environmental and socioeconomic impacts. In addition, some portion of this diversion of freight from train to truck would not revert back to freight rail shipment after completion of the Project because a prolonged disruption in service

could force some shippers to make long term changes to industrial production and shipping routines.

2.4 Conclusion

The purpose of the proposed action is to preserve, over the long-term, the continued ability to provide efficient freight transportation services in the District of Columbia, the Washington Metropolitan Area and the eastern seaboard. These services would continue if the structural and operational deficiencies of the tunnel are addressed, capacity is added in preparation for expected increases in freight transportation demand, and commerce remain uninterrupted while the tunnel is replaced with a new facility.

Freight rail transportation, including intermodal freight movements, is increasingly becoming more important to the nation's commerce needs into the 21st century. Transporting goods by intermodal freight rail has important public benefits. Highway capacity is limited, and the wider use of freight rail transportation would contribute to the nation's energy security needs as moving freight by rail is substantially more energy efficient than moving the same amount by truck, in addition to having lower GHG emissions. Projections (2011 FAF) made by the U.S. DOT reflect the increasing importance of freight rail transportation.

Independent of whether the Virginia Avenue tunnel is reconstructed, freight demand is expected to increase both regionally, as the population of the Washington Metropolitan Area is expected to grow, and nationally with greater economic globalization. In order to meet the freight transportation needs of the 21st century, the condition of freight rail infrastructure must keep pace. Notwithstanding the aging structural condition of the Virginia Avenue Tunnel necessitating major repairs or replacement of the tunnel, the interior horizontal and vertical clearances within the tunnel do not meet the needs of modern freight rail infrastructure. Its single railroad track arrangement and the inability to accommodate double-stack intermodal container freight trains do not meet the needs of 21st century freight transportation demand. Over time, demand for freight transportation is expected to increase and taking steps now to modernize the freight rail network to accommodate intermodal containers stacked two-high would allow CSX to handle the expected increase in freight in fewer trains than would otherwise be possible.

In carrying out the Project, good construction practices would be utilized that are intended to:

- Minimize construction impacts to the adjacent communities, including traffic impacts to I-695 and the surrounding street grid, by establishing appropriate maintenance of traffic plans and other mitigation measures as deemed necessary;
- Ensure that the construction area and temporary railroad operations are protected from any unauthorized access and members of the community are kept safe;
- Continue to interact with and involve the community following the NEPA process, including monitoring the implementation of mitigation measures;
- Maintain the appropriate level of freight transport services through the District during the period of construction that would be consistent with CSX's commitment that any

interim measure would maintain commerce through the District within the local area in which the Virginia Avenue Tunnel exists; and

- Conduct construction in a manner that would:
  - Occur in as timely a manner as possible to minimize any adverse effects to the local community,
  - Include appropriate mitigation for any adverse effects to the community identified in the NEPA process and agreed to by the appropriate parties, and
  - Be coordinated and communicated with the public in advance of planned work.

Finally, CSX has committed to provide community benefits as part of the Project. At the end of construction, Virginia Avenue SE between 2nd and 9th Streets, and affected areas of Virginia Avenue Park and the Marine Corps Recreation Facility would be restored. CSX is committed to not only restoring these resources, but also working with the community to solicit input on restoration opportunities and other potential mitigation elements that could enhance the community. CSX would continue to work with the DDOT, other District agencies, the NPS, the Marine Corps, and the community on how best to incorporate community enhancements while meeting the needs of the District, the community and stakeholders.

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