

# Richmond to South Hampton Roads High-Speed Rail Feasibility Study

## EXECUTIVE SUMMARY



Prepared for:  
Virginia Department of  
Rail and Public Transportation

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April 2002

## Introduction

The findings of the Parsons Transportation Group (PTG) team's Engineering Feasibility Analysis of the Richmond to South Hampton Roads corridor are summarized in this document. The draft Report is submitted to DRPT and the Technical Advisory Committee for review and comment. Topics addressed in the draft Executive Summary include:

- Assessment of current conditions;
- Analysis of critical locations;
- Projection of future traffic and capacity requirements;
- Preliminary identification of improvements;
- Overview of environmental constraints;
- Analysis of ridership and revenue potential; and
- Capital Cost Estimates for the improvements.

The analysis of the rail infrastructure of the study area has identified a program of improvements that would be necessary to accommodate frequent passenger trains operating at speeds of up to 110 mph.

## Proposed Richmond To South Hampton Roads High-Speed Rail Service

The Virginia Department of Rail and Public Transportation (DRPT) contracted with the Parsons Transportation Group (PTG) to evaluate the potential for high-speed rail service in the Richmond-Petersburg-South Hampton Roads Corridor. The study evaluated the requirements, and developed an overall long-range track configuration, alignment plan, and operating plan that would support the requirements of all potential users of the rail line. The corridor may be considered a natural extension of the Southeast High-Speed Rail Corridor (SEHSR)<sup>1</sup> running from Petersburg to the South Hampton Roads area. The route would extend between Main Street Station in Richmond and a terminal station near the Harbor Park baseball stadium in downtown Norfolk. It would make use of a combination of CSX Transportation (CSXT) and Norfolk Southern (NS) rail lines;<sup>2</sup> CSXT between Richmond and Petersburg and in the Hampton Roads area; and NS between Petersburg and Norfolk.

The proposed Richmond - South Hampton Roads high-speed rail service would provide stations located conveniently to Norfolk, Virginia Beach, and other communities south of Hampton Roads. The current bridge-tunnel link between the Newport News Amtrak station and south side of Hampton Roads, a connecting bus, provides a somewhat circuitous and often congested route to Norfolk and Virginia Beach. New

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<sup>1</sup> The Parsons Transportation Group (PTG) has recently completed two related studies, of the Washington-Richmond corridor and the Richmond-Petersburg-Raleigh-Charlotte corridor, for the FRA. The studies were performed in coordination with DRPT, NCDOT, Amtrak, CSXT, and NS.

<sup>2</sup> The potential for utilizing trackage owned by short line railroads in the South Hampton Roads area also has been evaluated as part of the study.

stations on the south side would require much shorter and more reliable access times and make service convenient to more communities.

A variety of alternative south side station locations have been evaluated. Key Hampton Roads markets include:

- Downtown Norfolk,
- Downtown Portsmouth,
- Virginia Beach,
- Norfolk Naval Base,
- Other Norfolk destinations,
- Other Portsmouth destinations,
- Chesapeake, and
- Suffolk.

Downtown Norfolk and Portsmouth are relatively compact markets that could be served by a station located in one of these areas. The remaining markets are spread over a much larger geographic area and would be best served by a “suburban” station with good access to the highway system.

## **The Existing Services**

A varied network of surface transportation options exists in the James River Corridor, between Richmond and Hampton Roads. However, public transportation is limited. Amtrak currently operates conventional rail service providing two round trips per day between Richmond and Newport News, with Thruway bus service between the Newport News station, Norfolk and Virginia Beach. These trains also serve Williamsburg as an intermediate stop between Richmond and Newport News. In 1999, a total of about 110,000 passengers were served at Newport News (including those using the connecting bus service) and about 45,000 passengers were served at Williamsburg. Most of these passengers travel to/from Washington, New York, and other locations in the Northeast Corridor. Service on the south side of the river is extremely limited, with only one Carolina Trailways bus scheduled, and no Amtrak service. Bus service on the north side of the river ranges in travel time from 1-hour 45 minutes to 2 hours 50 minutes between Richmond and Norfolk.

To effectively and efficiently develop a market, the following critical tasks were undertaken to ensure that informed choices are made: ridership forecasts were developed; operating scenarios were analyzed; facility options were evaluated; and potential environmental constraints were analyzed.

### **Rail Passenger Service in Virginia**

The DRPT is actively pursuing significant increases in intercity rail passenger service throughout the state. All of the corridors being evaluated include Richmond’s Main Street Station as the hub for these services. Presently, Main Street Station is closed, although Amtrak service to Newport News uses the eastern-most station tracks. The City of Richmond has purchased the station from the Commonwealth and is currently renovating the facility. The city is working with DRPT and Amtrak to re-institute rail passenger service into and through the station.

Amtrak’s Staples Mill Road Station, located almost 15 minutes by rail north of Main Street Station, is the only rail passenger station presently serving Richmond.

Amtrak trains to points south of Richmond stop at Staples Mill Road Station, but utilize the CSXT A Line (the former Atlantic Coast Line route) to reach Petersburg, VA. Once Main Street Station is re-opened, all passenger trains, with the exception of Amtrak's AutoTrain, would utilize the former "S" Line to reach Petersburg, VA<sup>3</sup>.

## Fundamental Requirements of NS and CSXT - To Be Fulfilled Before New Passenger Service Begins

Both NS and CSXT submitted comments<sup>4</sup>. NS's stated position is that prior to initiation of new passenger service on their tracks, the proposed operation must:

- Improve safety of all rail operations in the area;
- Be transparent to freight operations, i.e., sufficient infrastructure must be provided to enable freight trains and passenger trains to operate without delay to either, and to allow for the growth of both;
- Furnish sufficient indemnity for liability; and
- Compensate NS for the use of its asset with a level of return similar to that of freight trains.

In addition, NS and CSXT state that they will retain control of dispatching of trains on all tracks over which their freight trains will operate after inauguration of the high-speed passenger service.

## The Corridor Today

### Location

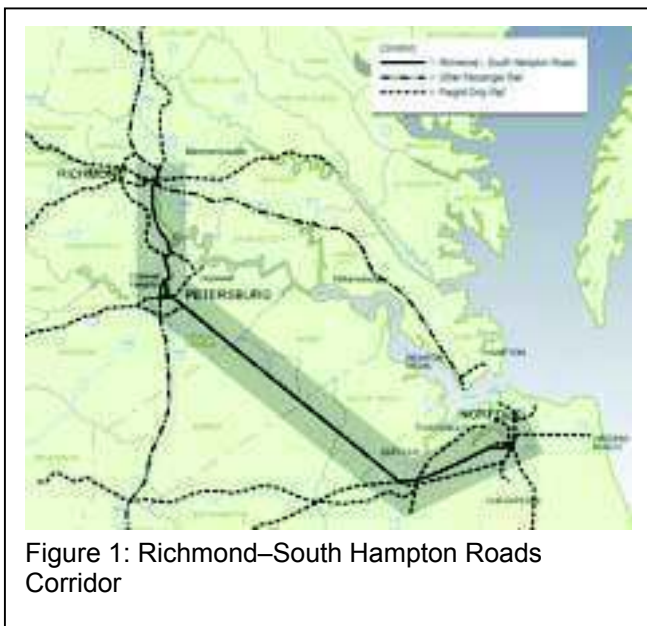


Figure 1: Richmond-South Hampton Roads Corridor

The study corridor connects Richmond and South Hampton Roads via Petersburg and Suffolk (Figure 1). In 1995 the Commonwealth requested that the United States Secretary of Transportation expand the federally designated SEHSR Corridor to include a link from Richmond to Hampton Roads. This designation is not specific to any particular rail line and will be applicable to whichever corridor is selected as the route for high-speed rail service to the Hampton Roads metropolitan area.

### Length and ownership

<sup>3</sup> PTG presently is under contract to the FRA to determine the requirements to re-institute rail passenger service on the "S" Line. Performed in cooperation with DRPT, NCDOT, Amtrak, and CSXT, the study will define an alignment that would utilize the "S" Line to a point just north of the Appomattox River in Petersburg.

<sup>4</sup> , NS comments are attached as Appendix A.

The proposed rail route of the Richmond–South Hampton Roads Corridor extends for 105 miles between Main Street Station, Richmond<sup>5</sup> and Park Avenue (Formerly Lovett Avenue) in Norfolk, Virginia. CSXT and NS are the primary owners of the existing rail infrastructure. CSXT owns the line segments between Richmond and Petersburg and between Suffolk and Algren (Bowers Hill); NS owns the segments between Petersburg and Suffolk, and between Algren and Norfolk.

## Trackage and Track Conditions

The route primarily has two tracks except for three segments of single-track, in Petersburg, between Suffolk and Algren, and between Algren and South Norfolk. The owner railroads have maintained the line in a condition satisfactory for the current designated operating speed class wherever necessary.

## Alignment

The alignment has numerous long stretches of tangent track that would not constrain passenger or freight train performance.

## Signaling

The automatic block signaling system that is installed almost the entire length of the route—although safe for existing speed levels—will not support passenger train speeds in excess of 79 mph. The existing signal system does not include continuous cab signaling and automatic train control features, similar to those of the Northeast Corridor, required by Federal regulations to exceed 79 mph. Therefore, a significant amount of upgrading would be necessary for high-speed rail service.

## Highway-Railroad Grade Crossings

Like most proposed high-speed corridors, Richmond–South Hampton Roads contains numerous public and private highway-rail at-grade crossings. Almost all the public crossings have flashing lights, gates, and warning bells. The private crossings generally have crossbucks only. Every effort should be made to upgrade or install enhanced protective devices, and/or close or grade-separate as many grade crossings as possible. As a minimum, every crossing will be protected with active warning devices over which passenger trains operate at speeds greater than 80 mph.

## Stations

In the Richmond area, Amtrak trains presently stop at Staples Mill Road Station, located north of downtown Richmond. The City of Richmond is restoring, in three phases, the centrally located Main Street Station as an intermodal passenger facility, which will become the station for intercity trains. Passenger service is currently offered at Ettrick (Petersburg area) by Amtrak intercity trains operating between New York City and North Carolina and Florida also stop at Ettrick, for the Petersburg area.

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<sup>5</sup> This is not now an operational station but will be reopened under pending plans.

## Users and Services

The proposed Richmond–South Hampton Roads passenger rail service would use what is a primarily freight corridor, over which Amtrak trains to North Carolina and Florida presently operate between Centralia and Petersburg. Amtrak provides two distinct lines of service in this corridor:

- Long-distance—trains serving intercity and leisure travel; and
- Auto Train—a specialized service carrying passengers and their motor vehicles between Northern Virginia and central Florida.

## Freight

CSXT operates freight trains between Richmond and Petersburg on both the A Line and the remaining segment of the S Line (the former Seaboard Airline Railroad, and between Suffolk and Portsmouth. NS operates trains between Petersburg and Norfolk. Both railroads also serve local shippers.

Freight operations are much more variable than passenger services, in terms of scheduling, train size, train performance, and frequency in a given period of time. Freight trains vary significantly in their performance capabilities and compatibility with passenger operations. For example, unit trains of coal and grain generally have a lower horsepower-to-tonnage ratio and poorer performance than more time-sensitive operations. Thus, a general merchandise or intermodal train ordinarily takes less time to clear a given route segment than a unit coal train.

The need to efficiently manage traffic during daylight hours will become critical in the future. Not only will rail passenger travel increase, but CSXT and NS have projected higher levels of freight traffic than currently operate over these heavily utilized routes.

## Areas of Special Complexity

Except for the CSXT A Line, the rail lines involved in the study essentially have been freight-only lines for more than 30 years. Development of a reliable high-speed route has required an analysis of numerous locations and stretches of rail line to define a network that reliably would support projected future freight and passenger operations.

The evaluation of current conditions and potential improvements to support high-speed passenger services to South Hampton Roads has been coordinated for consistency with planned improvements for the *SEHSR Corridor* (Richmond-Charlotte, NC) services, particularly in the common Richmond—Petersburg section. Both high-speed services must be planned and designed to:

- Provide cost effective improvements necessary to increase the capacity of existing rail lines;
- Provide one station in the Petersburg-Ettrick-Colonial Heights area that can serve all current and proposed passenger trains (South Hampton Roads Service, SEHSR Service, and current Amtrak Service);
- Coordinate train schedules in the “shared” corridor among the three services; and
- Minimize conflicts with freight operations.

## The S Line, from Main Street Station to Centralia

The South Hampton Roads High-Speed service would utilize the CSXT S Line between Richmond, VA, and Centralia. Previous studies for the *SEHSR Corridor* have identified improvements to the S Line necessary to operate high-speed passenger service. Combined with signal system improvements, this route would provide entry into the restored Main Street Station in downtown Richmond, VA, for all passenger trains operating from the south.

## Centralia to Petersburg

A third track, designated for passenger use, would be constructed on the east side of CSXT's A Line between Centralia and one of several proposed diverging points on the north side of Petersburg.<sup>6</sup> This added track would be the preferred track for passenger operations, both north- and southbound, and would provide passenger trains access to the S Line to Richmond without crossovers and conflicts with CSXT's primary freight operations on the A Line.

## Petersburg

Where and how passenger trains between Richmond and South Hampton Roads would pass through Petersburg is the key critical issue to be addressed. Direct passenger rail access from Richmond to South Hampton Roads has not existed for years. Recent developments and construction make re-institution of the route difficult, but not impossible. Five different route alternatives have been identified, each having different impacts on operations, and each requiring different levels of capital investment to construct. The route selection criteria were:

- Provide one station in the Petersburg-Ettrick-Colonial Heights area that can serve all current and proposed passenger trains;
- Minimize operating conflicts with freight trains;
- Avoid operating **passenger** trains through busy freight yards;
- Minimize the capital cost of bridge, structures, and additional tracks required; and
- Provide segments of track where passenger trains can run unimpeded.

The five connection alternatives, discussed below, were named:

- North Collier Connection,
- Secoast Connection,
- West Connection,
- Ettrick Connection, and
- Dunlop Connection.

The first two options would use the NS Belt Line, passing south of Petersburg. The other three would use the older NS Main Line. The Main Line appears to have an advantage in avoiding the considerable amount of freight traffic on the Belt Line. Using

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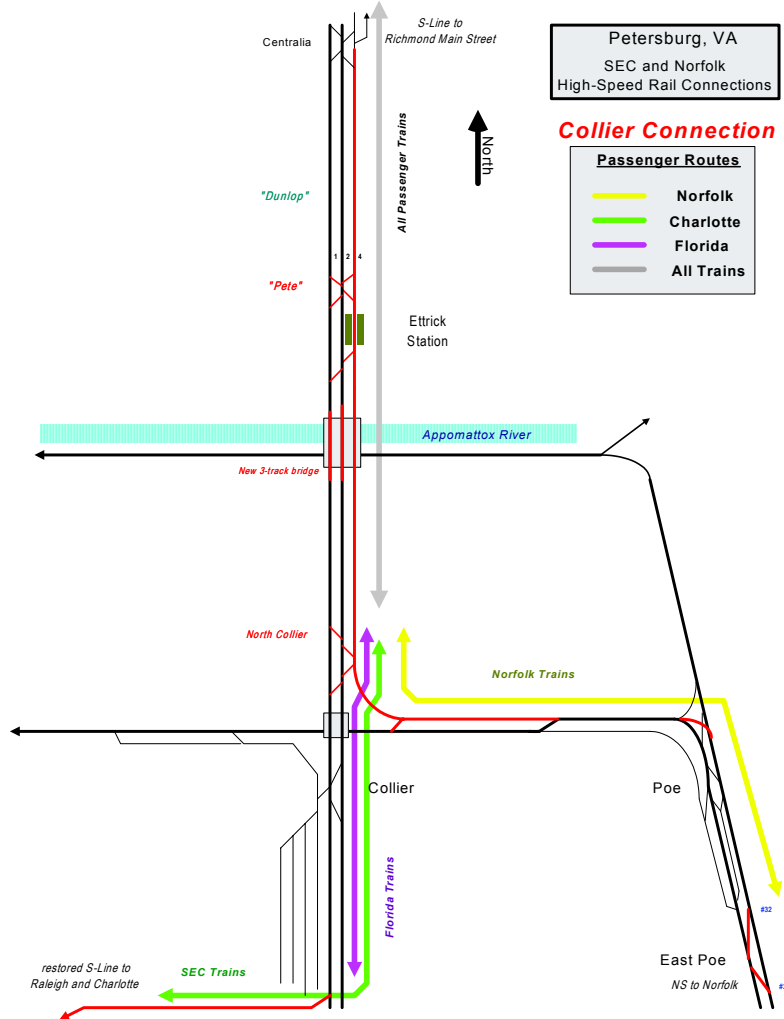
<sup>6</sup> The construction of this third track eliminates the need to rebuild the old S Line between Centralia and Petersburg (Ettrick) previously planned for the *SEHSR Corridor*. The alignment is described in the draft *Potential Improvements to the Richmond – Charlotte Railroad Corridor* Report prepared by PTG for the FRA.

the Belt Line for passenger trains would require an additional track over the segment between North Collier and Poe.

On the other hand, it might be necessary to double-track the Belt Line in order to reduce the need to run freight trains on the Main Line. This would be affected by the level of freight traffic projected, and further study of activity and capacity would be required. Preliminary investigation indicates that the cost of upgrading either line would be approximately the same if double-tracking of the Belt Line were required.

Recently, it has been recommended that the north – south route for A- and S Line trains be revised from that initially recommended in the study prepared for the FRA. Rather than restoring the S Line between Centralia and Burgess, it has been determined that intercity and SEHSR trains would operate on an upgraded A Line through Petersburg, between Centralia and South Collier. Trains for stations on the A Line would continue southward, while S Line trains would utilize a restored Burgess Connection between South Collier and Burgess to access the S Line to Raleigh. Ettrick would remain the location of the intercity passenger station.

**Figure 2: North Collier Connection**



**North Collier Connection**

The *North Collier Connection* would involve building a track connection, just north of Collier Yard, in the northeast quadrant from the CSXT A Line to the NS Petersburg Belt Line. This could be the least complicated of the five alternatives to construct, depending on the difficulty in interfacing with the Halifax Road grade separation, currently under construction. Initial investigation indicates that it could be built entirely east of the highway project, but further study is necessary. This connection would allow the continued use of the existing Petersburg passenger station at Etrick, north of the Appomattox River.

**Disadvantages**

The connection might be complicated by the interface with the new highway overpass for Halifax Road. The development of the adjacent property is a potential physical impediment. While relatively simple to build, the *North Collier Connection* would require an additional main track on the NS Belt Line between North Collier and

Poe. A new interlocking would have to be built on straight track at East Poe to avoid the need to provide turnouts on the superelevated curve at Poe.

### **The Secoast Connection**

The *Secoast Connection* is a logical outgrowth of the proposed restoration of the S Line for SEHSR service to Charlotte, NC. If the S Line is restored north of Burgess, a connection to the NS Petersburg Belt Line would be made in the northeast quadrant at Secoast, where the S Line would cross over the Belt Line. This concept would require construction of a new bridge over the Appomattox River for the S Line, upstream from the current CSXT A Line Bridge, and restoration of the S Line<sup>7</sup> southward from that point. A connection in the northeast quadrant at the intersection of the S Line and the NS Belt Line would enable South Hampton Roads trains to traverse the S Line from Ettrick to the connection, then use the NS Belt Line to go eastward.

### **Disadvantages**

The connection would take right-of-way from the Virginia State University experimental farm for the connecting track from the Ettrick Station to the bridge. Similar to the North Collier Connection, the Secoast Connection would require the South Hampton Roads passenger trains to utilize the NS's Belt Line. It would require an additional main track on the NS Belt Line between Secoast and Poe. A new interlocking would have to be built on straight track at East Poe to avoid the need to provide turnouts on the superelevated curve at Poe. Furthermore, more of the S Line would have to be restored, including the crossing of Washington Street, and a new Appomattox River bridge that would not be available to A Line trains.

### **The West Connection**

The *West Connection* would connect a restored S Line to the NS Main Line through Petersburg, instead of the Belt Line. A low-level bridge would be constructed for the S Line about one-half mile upstream from the existing A Line bridge, with a low-speed connection to the NS Main Line on an eight-degree curve from the S Line. This connection would retain the existing Ettrick station and would not require changes to CSXT freight and Amtrak long-distance operations south of Petersburg.

### **Disadvantages**

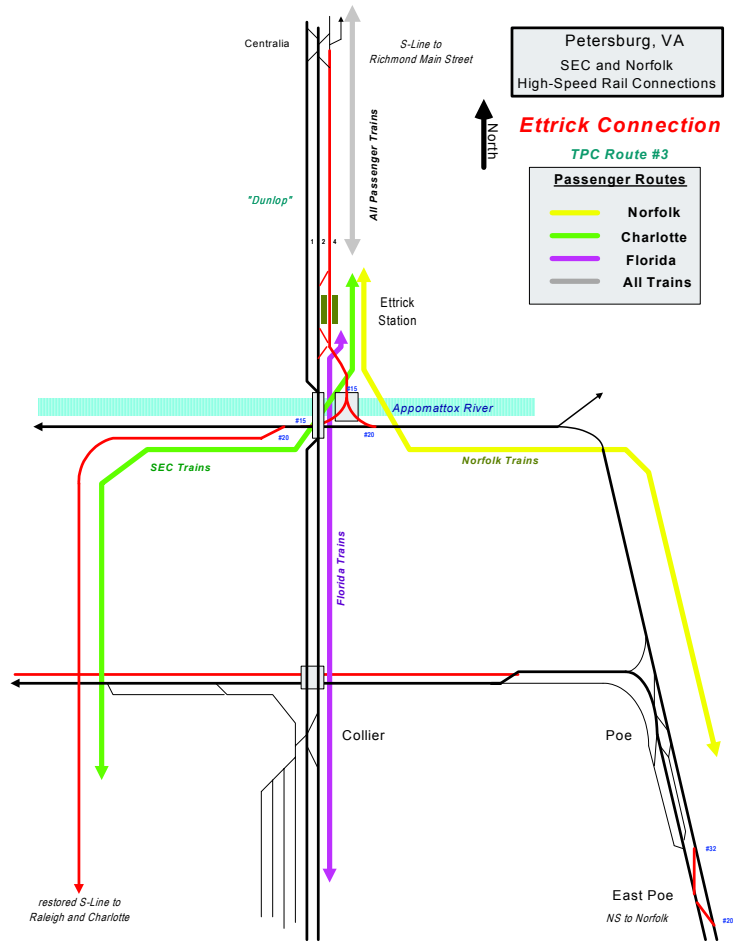
A bridge that would enable the S Line to go under both the NS Main Line and Washington Street would require a steep approach on the north bank, and a bridge deck that would almost be at the level of the river. The connection would take right-of-way from the Virginia State University experimental farm for the track from the Ettrick Station to the bridge, and would require a 30 foot deep cut through the center of the farm to descend to the level necessary to pass under the NS Main Line. Although the bridge would be lower and less expensive to build than any high level bridge for either the A line or S Line, this would be offset by the need to tunnel under the NS Main Line in order to make the connection to it, and the fact that the bridge over the river would not be available for A Line trains. The connecting track from the S Line onto the NS Main Line would require a sharp, slow speed eight-degree curve. The Bridge over the Appomattox River that would be required for this connection, is located considerably west of the existing CSXT A Line Bridge. It would add about two miles distance over any other South Hampton Roads alternative.

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<sup>7</sup> Improvements defined in the draft Richmond to Charlotte Report.

The *West Connection* would require construction of a new platform at the Ettrick Station, for the use of Charlotte and South Hampton Roads trains, as well as a third track. Because South Hampton Roads and S Line trains would use a different platform from A Line trains, underground or overhead passageways and elevators would be required for access. Finally, as with the Secoast Connection, a greater portion of the S Line would have to be restored.

**Figure 3: Ettrick Connection**



**Ettrick Connection**

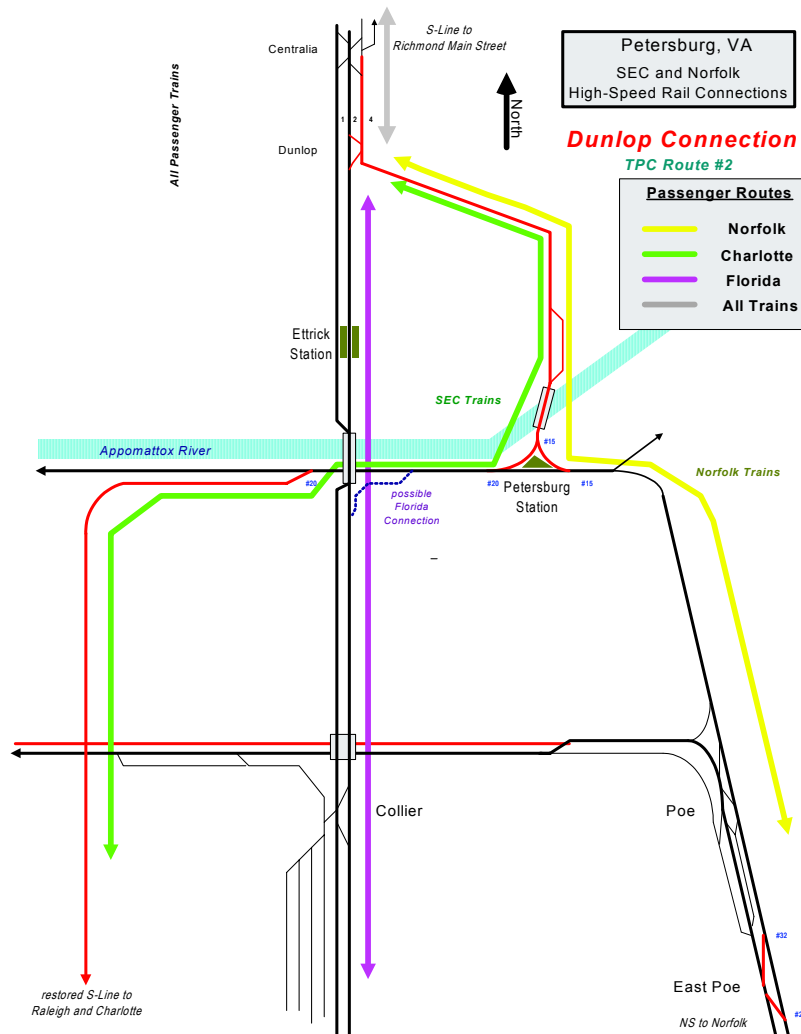
Further consideration resulted in the development of alternatives that would use the NS Main Line, rather than the Belt Line, while simplifying the construction requirements of the connection. The *Ettrick Connection* was developed to retain the operating benefits of using the A Line and the Ettrick Station and the NS Main Line. The *Ettrick Connection* consists of a track on the east side of the A Line, beginning south of Ettrick Station, that descends to the level of the NS Main Line across the Appomattox River. A low level-bridge would be constructed to connect to the NS Main Line, eastward. Optionally, the bridge could provide a Wye connection to the NS Main Line, westward, for Raleigh-bound S Line trains. The *Ettrick Connection* eliminates the need for a more-expensive high bridge, for either the S Line or a multiple track replacement

for the A Line. It retains the existing station, and provides a passenger train route eastward to South Hampton Roads that does not require use of the NS Belt Line.

### Disadvantages

The connection would take right-of-way from the Virginia State University experimental farm for the connecting track from the Ettrick Station to the bridge. The size and degree of curvature required to build the connection would require lower speed operations through the approach tracks' curves and switches connecting to the NS Main Line. Should the S Line be included, it must be restored north of Burgess, and construction of a more complex bridge with a "Wye" connection to the NS Main Line in both directions would be required, as well as a grade-separated crossing of Washington Street.

Figure 4: Dunlop Connection



## The Dunlop Connection

The last alternative, the *Dunlop Connection*, would involve restoration of the original Atlantic Coast Line Railroad route from Dunlop to Petersburg, including reconstruction of the superstructure of the old railroad bridge over the Appomattox River and restoration of the Wye connection with the NS Main Line. Should the S Line be restored north of Burgess, separate platforms for South Hampton Roads and Charlotte trains would be required along with a connection to the restored S Line from the NS Main Line. Should the A Line trains be routed to the downtown station in Petersburg, construction of The *Battersea Connection*, between the NS Main Line and the A Line, south of the Appomattox River bridge would also be required. This connection would skirt the grounds of the Battersea Mansion, for which the connection has been named, and enable all Amtrak trains to reach a single downtown Petersburg station, permitting the Ettrick station to be closed. If the Battersea Connection should prove to be infeasible, a single station that could serve all trains would have to be located north of Dunlop. The *Dunlop Connection* requires a less-expensive bridge to cross the river, and permits the use of a single passenger station for all Amtrak trains in downtown Petersburg.

### Disadvantages

The Battersea Connection would require a tight 5-degree curve and a 1.75-percent grade to connect the NS Main Line to the A Line, limiting speed to 40 mph. The connection would require a bridge over the abandoned S Line and a substantial fill to avoid the mansion.

Development and new highway construction has compromised the alignment in the vicinity of Dunlop. Portions of the old right-of-way have either been sold or have been encroached upon. Community opposition in Colonial Heights and Pocahontas would be likely. A Line and S Line trains would have to operate over a short segment of the NS Main Line, requiring cooperation between CSXT and NS dispatchers.

## NS Main Line between Petersburg and Suffolk

The NS Main Line between Petersburg (Poe) and Suffolk (Brico) is the primary location for potential operational conflicts. High-speed passenger trains would be overtaking slower freight trains and a primary goal of the study is that high-speed train operations be transparent to freight train operations. Optimizing the Richmond – South Hampton Roads trip time for passenger rail service on a consistent basis – while preserving and enhancing the dependability of the NS freight operations – would require improvements that would increase rail capacity at strategic locations. Reduced trip times and improved capacity would enable the high-speed service to operate reliably without adversely affecting, or being delayed by the large number of long freight trains.

Three strategies were pursued in designing the plant and operations to minimize the probability of schedule conflicts in this critical segment of the corridor:

1. Create track connections, modify interlockings, and make additional operational improvements that would result in segments of track where freight and passenger train conflicts would be minimized in Petersburg (west end) and at Suffolk (east end);
2. Provide a passing siding of sufficient length in the most effective location—a third track to be used by freights—where a passenger trains could overtake and pass a slower train without either train being required to stop;
3. Design passenger schedules so that trains traveling in opposite directions “meet” in terminals or “pass” at locations where freight operations would not be disrupted.

## Petersburg to Poe

Using the NS's Main Line through downtown Petersburg (the West, Dunlop, and Etrick Connections), permits the high-speed South Hampton Roads trains to avoid the yard operations at Poe, where the Belt Line joins the Main Line. Offsetting this advantage might be the need to construct a second track on the Belt Line, by connecting the existing sidings, to allow NS to avoid using the Main Line. This would create a passenger route through Petersburg having minimal interface with freight operations. The Belt Line would continue to be the primary NS freight line, bypassing downtown Petersburg.

Connecting the A Line to the Belt Line (the North Collier and Secoast Connections) would route high-speed passenger trains through an area of heavy freight activity. It appears that the following would be required:

- an additional main track on the NS Belt Line between North Collier and Poe, and
- a new interlocking built on straight track at East Poe, to avoid the curve at Poe.

Given their higher speeds, passenger trains would occupy the shared, 48.3 mile Poe-Brico main line segment for as little as: 27 minutes at 110 mph; 33 minutes at 90 mph; and 37 minutes at 79 mph. A 45 mph freight train would take 65 minutes to cover this distance.

The high rate of passenger train speed also would mean that any delay to freight trains held up from entering the Poe-Brico segment would be minimal, since the passenger trains would reach the line segment at speed and accelerate away from the freight trains.

## Poe Interlocking and Yard

NS has a small yard and a busy automobile unloading facility at Poe, both of which require freight trains to stop and work for substantial time intervals. These freight trains occupy the siding at Poe, and often occupy the eastbound main track. The NS's heavy use of the Belt line, the congestion that arises from trains stopping and working at the CSXT interchange or at Poe Yard, and the possible need to add track capacity to the Belt Line to maintain quality freight service, indicate that an additional track would be needed on the Belt Line, between North Collier and Poe, on which to move passenger trains.

If the passenger trains were operated on the Main Line, a second track on the Belt Line, consisting of the existing sidings connected by additional track, might be required.

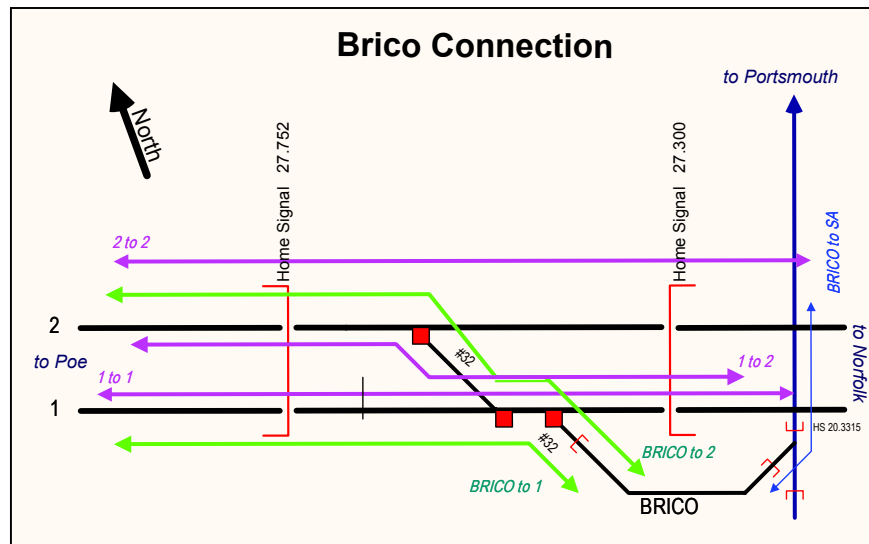
Further study will be necessary to make either of these determinations.

## Suffolk to South Norfolk – The Brico Connection

The possibility of establishing high speed passenger service on the CSXT line from Brico to Algren, thence on the former Virginian Railroad (VGN) from Algren to South Norfolk, has been examined as an alternative to avoid the heavily used NS main line wherever possible. This diversion would require a new high-speed connection at Brico, just west of Kilby, VA, west of Suffolk, to connect the NS Main Line with the CSXT Portsmouth Subdivision. This connection would remove the passenger trains from the NS Main Line at this location, enabling them to bypass the terminals and yards at Suffolk and Portlock (South Norfolk).

Located 3 miles west of downtown Suffolk, Kilby is where the double track NS main line crosses over top of the former VGN right of way, as well as the CSXT Portsmouth Subdivision. U.S. Highway 58 crosses over all three railroads on two overhead bridges, at a 90-degree angle to the NS main line. A connection between the CSXT and NS lines exists in the southwest quadrant, but it is of no benefit for passenger train movements between South Hampton Roads and Petersburg. The large earthen fill of approaches to the U.S. 58 highway bridges precludes a potential connection in the preferred northeast quadrant. The recommended alternative is a loop (jug handle) connection in the southwest quadrant from the NS Main Line, from Petersburg, to the CSXT Portsmouth Subdivision, to Portsmouth.

**Figure 5: Brico Connection**



**Access to Norfolk Terminal**

The recommended route for the high-speed passenger service into the Norfolk Terminal minimizes conflicts with freight operations inside the busy terminal area by avoiding the NS Main Line in favor of the less traveled CSXT Portsmouth Subdivision and the former VGN line.

The CSXT Portsmouth Subdivision offers a tangent track, with a few easy curves and few grade crossings. The Portsmouth Subdivision intersects the NS’s VGN line at Algen.

**Bowers Hill Station**

The Hampton Roads markets outside of Norfolk and Portsmouth cover a large geographic area and would be best served by a “beltway (suburban)” station with good access to/from the highway system, particularly I-264 and the Hampton Roads Beltway (I-64/664). The benefit to both modes of the interface of rail passenger service and major regional highways has been successfully demonstrated at the New Carrollton, MD station, located north of Washington, DC. The present New Carrollton rail station, constructed in the early 1980s, has proven to be an effective traffic generator.

An analysis of the rail-highway interface has led the study team to conclude that a station located just east of the Algren track connection, at the crossing of Homestead Road, near the Bowers Hill post office, would best serve the projected travel market.

### **Access to Downtown Norfolk**

Operation over the NS's "V-Line" (former Virginian main line) between Algren and South Norfolk separates the passenger operation from the bulk of NS's freight movements on their main line into Norfolk. The single track VGN line between Algren (V15.5) and South Norfolk would require rehabilitation, but is a straight, well-engineered right of way. It includes a draw-span bridge over the Southern Branch of the Elizabeth River, on the Inland Waterway. This is an unavoidable crossing, as the NS Main Line has its own drawbridge over this navigable waterway a few miles further south. At South Norfolk (V2.3), the passenger route would re-enter the NS main track. It is recommended that the passenger route be restricted to the westbound Number 2 main track over Bridge 5 into Norfolk.

### **South Hampton Roads Passenger Terminal**

#### ***Alternative Terminal Locations***

Downtown Norfolk and Portsmouth are relatively compact markets that could be served by a station located in either one of these areas. The historic N&W Norfolk Terminal station was located in downtown Norfolk, on Water Street near the Eastern Branch of the Elizabeth River. The historic SAL Station building in downtown Portsmouth still exists, however, rail access to the station location is restricted by recent development and passenger access to downtown Norfolk would require a transfer to another mode. Considering that neither site is currently available, it appears that a downtown Norfolk station site near the Harbor Park baseball stadium would be desirable. The proposed location is at the east (compass north) end of Bridge 5, immediately adjacent to the parking lot for the stadium. The site is the closest available location to downtown Norfolk.

The station tracks need to be accommodated in the 1500 feet of space between Bridge 5 and the grade crossing for Park (formerly Lovitt) Avenue. The station could share parking with the stadium, and enjoys good highway access, and public transit services, being served by the downtown bus network and, ultimately, the planned light rail line. The site's singular drawback is its relatively small size, and the inability to provide either a maintenance/servicing facility for Amtrak at the location or a convenient Wye track or turning loop where trains can be "turned" to return to Richmond.

As of this time a location to store and service trains in Norfolk has not been identified. An efficient storage yard and maintenance facility in the vicinity of the proposed Norfolk Passenger Terminal would be necessary to properly clean and inspect trains. Further evaluation of train operations through the area, and potential locations, would be required to finalize the location.

## **Service Goals**

All operators and sponsors—intercity passenger, commuter, and freight operators—intend the services on the Richmond-South Hampton Roads Corridor in the target planning year, 2025, to be operated at higher levels of traffic, and be more reliable than those operating on the Corridor at present. The envisioned mix of services is presented in Table 1 and described below.

**Table 1: Railroad Services Envisioned for 2025 on the Richmond–South Hampton Roads Corridor**

Service	Route	Number of Daily Train Movements			
		Richmond to Petersburg	Petersburg to Suffolk	Suffolk to Bowers Hill	Portlock to South Hampton Roads
<b>PASSENGER</b>					
Corridor	North Carolina—Northeast Corridor	8	0	0	0
Corridor	South Hampton Roads-Richmond/Washington/Northeast Corridor	12	12	12	12
Long-distance	Florida—Northeast Corridor	8	0	0	0
Auto Train	Lorton, Virginia—Sanford, Florida	2	0	0	0
<b>Total Amtrak</b>		<b>30</b>	<b>12</b>	<b>12</b>	<b>12</b>
<b>FREIGHT</b>					
Intermodal Trains		14	14	0	0
Coal trains + Empties		12	10	4	10
General Merchandise Trains		16	10	0	0
Local Trains		4	2	0	0
Light Power		0	0	0	20
Orange Juice		2	0	0	0
Trash		6	0	0	0
<b>Total CSXT/NS Freight</b>		<b>54</b>	<b>36</b>	<b>4</b>	<b>30</b>
<b>GRAND TOTAL Richmond—South Hampton Roads Corridor</b>		<b>84</b>	<b>48</b>	<b>16</b>	<b>42</b>

A corridor-type of high-speed intercity passenger train service would be the most appropriate to operate between Richmond and South Hampton Roads. **Train service** reliably linking Richmond (Main Street Station) and South Hampton Roads **in less than 90 minutes** by 2025, with two intermediate stops would satisfy this demand.

The 2025 service would include six daily round trips, including:

- South Hampton Roads - New York trains (four round trips), and
- South Hampton Roads - Washington trains (two round trips).

Hampton Roads service would also include two Newport News – Northeast Corridor trains.

## Methodologies

Sources included reports prepared by the FRA, data provided by the Virginia Department of Rail and Public Transportation, filings before the Surface Transportation Board, track diagrams, maps, equipment specifications, and other engineering and ownership documentation. Limited field investigations took place to verify existing conditions. Also, the study team met with appropriate State, local, CSXT, NS, and VRE officials to assess the status of their respective plans, and to assemble a consensus list of possible projects that would assist all operators to meet their service goals.

The analysis compared the services as presently envisioned by the operators for 2025, with the fixed plant as configured today and as upgraded with various carefully ordered combinations of improvements. The analysis focused on two questions:

- Can individual trains meet their trip-time goals, irrespective of other traffic?
- Can all the services operate in combination at intended speeds and schedules over the Corridor, while still meeting their reliability imperatives?

To answer the first question, the study team used a computer model known as a train performance calculator (TPC) to model the operation of a single train, with defined performance characteristics, over a traffic-free railroad with profile, alignment, and maximum speeds as specified for each segment. The train performance calculator was applied to prototypical freight, intercity passenger, and commuter trains, to assess their optimal performance over the Corridor under different sets of conditions. However, it must be remembered that the mere physical possibility of operating a given train over a given right-of-way at a given trip time offers no assurance that a combination of services can reliably operate on the Corridor.

To answer the second question, the study team applied detailed simulations— modeling sophisticated, random variations in operating conditions and performance—to the full spectrum of freight, intercity passenger, and commuter services on the Richmond–South Hampton Roads Corridor. These simulations assessed the impacts of changes in both schedules and fixed plant capabilities on all services operating simultaneously over a hypothetical seven-day test period.

Taken together, the TPC runs and the detailed operating simulations permitted the analysts to compare intended schedules, optimal running times, and expected performance for all services. The effects of alternative schedules and fixed plant capabilities were evaluated through numerous model runs. By these means the study team developed a preliminary list of potential projects and priorities that would meet the trip time and reliability goals of the study. This report synthesizes the results of investigations to date and defines a plan that can serve as a basis for further design, environmental work, and partnership and financial development for the Washington—Richmond Corridor.

## Investment Requirements

The analysis yielded a preliminary list of projects that would provide the proposed level of service to South Hampton Roads. This list of projects assumes that the freight railroads, as owners of the fixed plant, will continue to maintain the proposed corridor tracks in the state of good repair that characterizes the main line portions from Richmond to Suffolk to Algren. For that segment, therefore, the investment requirements contained in this report **do not** include replacement in kind of key existing track components (ties, rail, and the like)—in railroad parlance, “program maintenance.”

On the other hand, for the segment between Algren and South Norfolk, this report provides for a significant upgrade, with replacement of rails, ties, and other track components to assure safe, expeditious passenger and freight service. Signal investment requirements are subsequently addressed.

This study has emphasized train operations and related facilities, and therefore has confined itself to identifying only a few of the many issues related to stations; cost estimates for all station improvements have not been developed. The corridor partners will, however, need to devote significant resources to this topic if rail service in the corridor is to be optimized. The provision of marketable (and potentially profitable) station facilities, parking, and amenities will merit careful attention and focused investment in the preparation of a development plan for the South Hampton Roads Corridor.

## Description Of Improvements

Table 2 provides a preliminary list of projects, and their costs, that would fulfill the service goals of the recommended high-speed rail service. Improvements include the construction of segments of additional track, and the reconfiguration of switching locations (interlockings) to optimize operating flexibility and provide the capability of making simultaneous train crossover movements (parallel moves). This expanded capacity reduces the impact of the projected intercity and commuter passenger service increases, and maintains the quality of freight service on the line, thereby making the increased passenger service attractive to NS and CSXT, the owner/operators.

**Table 2: Description of Improvements**

<b>Project</b>	<b>Description</b>	<b>Estimated Cost at 79mph<sup>8</sup></b>	<b>Estimated Cost &gt; than 79 mph<sup>9</sup></b>
Centralia to Dunlop Third Track	Construct third track east of the present CSXT A Line between Centralia and Dunlop.	<b>\$24.09</b>	<b>\$24.09</b>
Dunlop through Petersburg to Poe: Costs of three potential options	Ettrick Connection	<b>\$37.57</b>	<b>\$37.57</b>
	Dunlop Connection	<b>\$40.38</b>	<b>\$40.38</b>
	Collier Connection	<b>\$82.03</b>	<b>\$82.03</b>
NS Petersburg Belt Line, Poe to Jack	Construct second track on Belt Line.	<b>\$21.65</b>	<b>\$21.65</b>
NS Main Line: Poe to Brico	Create additional flexibility by the installation of three new, or reconfigured, universal interlockings and a 12.6-mile center siding in this segment of extended tangent track. Interlockings would be located in this track segment at: <i>East Poe</i> (N76.1); <i>Disputanta</i> (N69.2); <i>Waverly</i> (N59.7); <i>47 Crossover</i> (N46.8); and <i>Wight</i> (N37.3).	<b>\$22.25</b>	<b>\$49.65</b>
Brico Connection: NS Main Line to CSXT Portsmouth Sub	Construct a 1.8-mile connection between the NS Main Line and the CSXT Portsmouth Subdivision at Brico (N27.3). Brico Interlocking, at the north end of the connection would enable northbound trains to access both Main Line tracks. A new interlocking on the Portsmouth Subdivision at the east end of the connecting track would enable passenger trains to move from the connecting track to the CSXT Portsmouth Subdivision would be the straight, high-speed route, while a 45 mph route would be provided for CSXT trains.	<b>\$6.09</b>	<b>\$6.09</b>

<sup>8</sup> Fully loaded constant 2000 dollars, in millions.

<sup>9</sup> Fully loaded constant 2000 dollars, in millions.

<b>Project</b>	<b>Description</b>	<b>Estimated Cost at 79mph<sup>8</sup></b>	<b>Estimated Cost &gt; than 79 mph<sup>9</sup></b>
CSXT Portsmouth Sub and NS Virginian Main: Brico Connection to Bowers Hill Station to South Norfolk	Upgrade the CSXT Portsmouth Subdivision to support high-speed rail service. The 14.6-mile segment would remain single tracked with a 2.3-mile siding at the east end. At Algren the route to the former Virginian Main would be the straight route and the route to Portsmouth would be 45 mph. Upgrade the former Virginian Main to support the proposed high-speed rail service. A 2.3-mile siding would be located west of the proposed Bowers Hill station. The siding was placed to support the meets that occur with the proposed schedules on the single-track in the vicinity of Bowers Hill Station.	<b>\$35.39</b>	<b>\$35.39</b>
NS Main Line: South Norfolk to Norfolk	Upgrade the connection from the Virginian to the Main Line – South Norfolk. Revise NS Junction. Construct station tracks in the 1500 feet of space between Bridge 5 and the Park (Lovitt) Avenue grade crossing. Two station tracks would be located adjacent to the Line to the Lamberts Point.	<b>\$5.70</b>	<b>\$5.70</b>
Norfolk Passenger Terminal	Station platforms would be located on the west or downtown Norfolk-side of the double-track NS Lamberts Point Line. The platforms would be located adjacent to the station tracks.	<b>\$10.00</b>	<b>\$10.00</b>
Ettrick Station	Revise Ettrick Station to accommodate third track and revised operation	<b>\$4.37</b>	<b>\$4.37</b>
Bowers Hill Station	A single-track beltway station would be located at Bowers Hill, about two miles east of Algren.	<b>\$4.3</b>	<b>\$4.3</b>

<b>Project</b>	<b>Description</b>	<b>Estimated Cost at 79mph<sup>8</sup></b>	<b>Estimated Cost &gt; than 79 mph<sup>9</sup></b>
Maintenance Facility: Norfolk	Construct an efficient storage yard and maintenance facility in the vicinity of the Norfolk Passenger Terminal to ensure that passengers are provided safe, reliable, and clean trains. Provide sufficient yard storage capacity to handle overnight layovers for trains scheduled to depart Norfolk the next day, and to store equipment to be maintained. Further evaluation of train operations through the area and potential locations would be required to finalize the location.	<b>\$0.0</b>	<b>\$0.0</b>
Signal System Upgrade	Upgrade the signal system to efficiently handle increased train traffic on the Corridor and to permit improved intercity passenger service with greater safety. These improvements also would enable freight service to safely and efficiently operate on the same tracks. A cab signal system (necessary to operate passenger trains at speeds greater than 79 mph), a new block layout, and new signal aspects would be incrementally installed to accommodate speeds up to 110 miles per hour <sup>10</sup> . Block spacing would anticipate increased train speeds. Reverse signaling would be installed throughout the corridor.	<b>\$16.98</b>	<b>\$16.98</b>
Diesel Locomotive Upgrade	The installation of cab signals would require that all NS and CSXT locomotives operating on the South Hampton Roads corridor be equipped with Automatic Train Control (ATC).	<b>\$0.0</b>	<b>\$20.00<sup>11</sup></b>
Intercity Rail Fleet	The passenger equipment to be utilized would be compatible with SEC operations as well as NEC electrified operations north of Washington – a locomotive change would be required at Washington.		
<b>TOTAL</b>	<b>Total corridor improvements using the Ettrick Connection in Petersburg. Does not include storage facility or passenger equipment requirements.</b>	<b>\$188.39</b>	<b>\$235.79</b>

<sup>10</sup> The braking distance for a 110 mph passenger train is essentially equal to that of a 60 mph freight train.

<sup>11</sup> Assumes 250 locomotives, actual number not available.

## Ridership And Revenue Forecasts

The ridership and revenue forecasts for rail service from Richmond to South Hampton Roads were developed using information originally assembled for the Southeast High Speed Rail Study in 1996 and recently updated by AECOM for the North Carolina DOT and Amtrak. In addition, data from the 1996 Hampton Roads Crossing Study were obtained from VDOT to supplement the Southeast HSR study travel base.

The model used for this analysis is an adaptation of a spreadsheet model that has been used in many applications for Amtrak and Georgia and North Carolina DOT's to evaluate intercity rail alternatives. The spreadsheet models were developed based market research and physical data such as highway networks, socio-economic variables, and service characteristics of public modes.

The study team examined nine service alternatives for passenger rail service to Norfolk along the existing CSXT lines from the existing Richmond- Staples Mill station through Richmond's Main Street station to Petersburg, then along the Norfolk Southern line from Petersburg to Norfolk. The alternatives vary with speed (79 mph to 110 mph) and frequency (one to six daily round trips). The exhibit below provides a summary of the alternatives operating characteristics between Newport News / Norfolk and the Richmond Main Street Station.

**Table 3: Alternative Specification Summary**

Alternative	Maximum Allowed Speed*	Frequency		Travel Time	
		Newport News – Richmond	Norfolk-Richmond	Newport News – Richmond	Norfolk-Richmond
BASE	79 mph	2	0	1:30	
1	79 mph	2	1	1:30	1:43
2	90 mph	2	1	1:30	1:35
3	79 mph	2	2	1:30	1:43
4	90 mph	2	2	1:30	1:35
5	79 mph	2	4	1:30	1:43
5A	79 mph	4	4	1:30	1:43
6	90 mph	2	4	1:30	1:35
7	110 mph	2	4	1:30	1:26
8	110 mph	2	6	1:30	1:26

\* between Richmond and Norfolk only; speeds between Richmond and Newport News remain at a 79 mph maximum allowed speed in all alternatives

Ridership and revenue forecasts were prepared for each of the nine alternatives for forecast years of 2010 and 2025. A summary of forecast results for 2025 are included in the table below. The trips reported in the table correspond to trips between Hampton Roads, Petersburg, Richmond, Washington DC, and the Northeast Corridor.

The forecast results show a consistent increase in performance measures as the speed and frequency of service increases. The low frequency alternatives have low incremental ridership gains because the new service does not provide a significant improvement over the existing Newport News service. As the speed and frequency of the South Hampton Roads service increases the incremental ridership and revenue increase significantly.

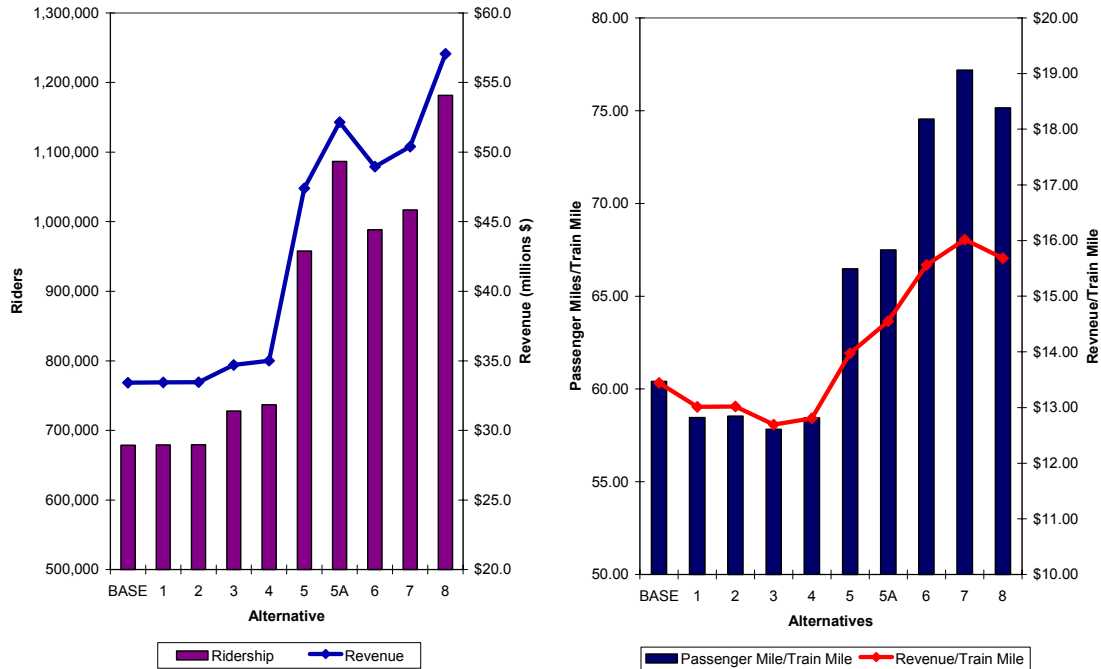
**Table 4: Summary of Forecast Results for 2025**

Alt	Total Riders	Total Revenue (millions \$)	Passenger Miles (millions)	Train Miles (millions)	Revenue/ Train Mile	Pass Mi/ Train Mile
Base	678,700	\$33.430	150.200	2.486	\$13.45	60.4
1	679,100	\$33.450	150.260	2.570	\$13.01	58.5
2	679,500	\$33.460	150.450	2.570	\$13.02	58.5
3	728,000	\$34.700	158.110	2.734	\$12.69	57.8
4	737,000	\$35.010	159.800	2.734	\$12.81	58.5
5	957,800	\$47.390	225.420	3.391	\$13.98	66.5
5A	1,086,600	\$52.150	241.940	3.584	\$14.55	67.5
6	988,400	\$48.960	234.530	3.146	\$15.56	74.5
7	1,017,000	\$50.400	242.860	3.146	\$16.02	77.2
8	1,181,500	\$57.060	273.420	3.638	\$15.68	75.2

It is important to note that the ridership and revenue increase at a faster rate than train miles for most of the higher frequency and speed alternatives. The following charts display forecasted riders and revenue and passenger miles and revenue per train mile. These charts illustrate the benefit of faster and more frequent service. Revenue per train mile increases from the base in all alternatives except for alternatives with low frequency. Passenger miles per train mile also generally increase after falling slightly in the low frequency alternatives.

The slightly lower performance of Alternatives 3 and 4, relative to Alternatives 1 and 2 as well as Alternative 8, relative to Alternative 7, reflects the diminishing return of additional frequencies as the timetable of trains expands. Because of the more than seven (7) hour running time between Norfolk and New York, it is not practical for all of the new Norfolk train frequencies operate north of Washington – they would depart or arrive at the end point station at a poor time of day and/or conflict with other Northeast Corridor operations. This is the case with the additional frequency provided in Alternatives 3 and 4 and one of the two additional frequencies provided in Alternative 8.

**Table 5: Forecast Results and Performance Measures for 2025**

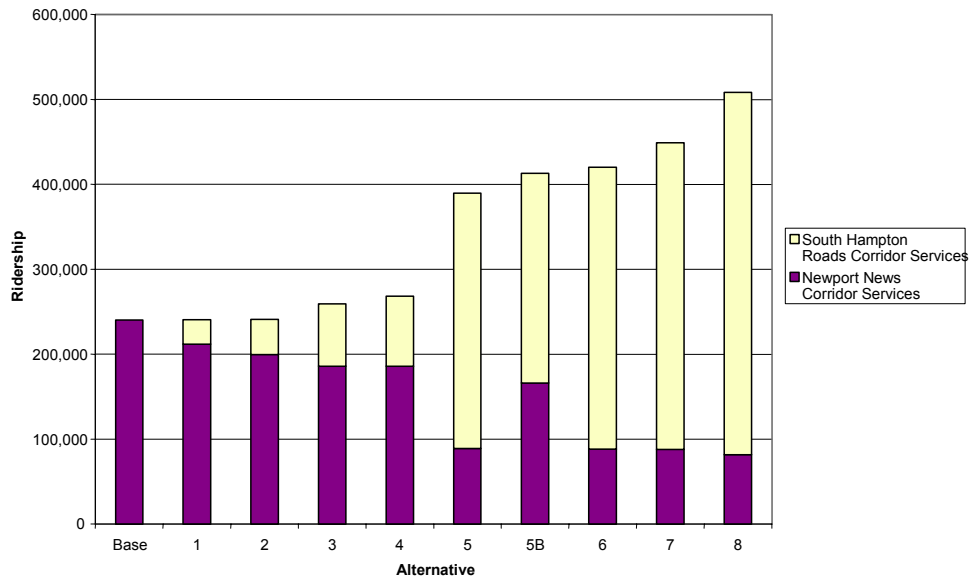


The next exhibits show ridership and revenue to/from the Hampton Roads area, served by the existing Newport News/Williamsburg corridor services and the new South Hampton Roads corridor service. As these exhibits show, there is an overall increase in ridership and revenue to/from the Hampton Roads area as the combined service frequencies and travel times improve across the service alternatives. Similarly, the exhibit shows the increasing diversion of ridership/revenue from the Newport News/Williamsburg corridor services, as passengers shift to the improved frequencies and travel times along the South Hampton Roads corridor service to/from Richmond and point north.

**Table 6: Hampton Roads Rail Ridership and Revenue for 2025**

Alt	Newport News / Williamsburg Corridor Services		South Hampton Roads Corridor Services		Hampton Roads Total	
	Riders	Revenue (millions\$)	Riders	Revenue (millions\$)	Riders	Revenue (millions\$)
Base	240,200	\$13.460			240,200	\$13.460
1	211,800	\$12.460	28,800	\$1.020	240,600	\$13.480
2	199,500	\$11.970	41,500	\$1.510	241,000	\$13.480
3	185,900	\$11.380	73,300	\$2.650	259,200	\$14.030
4	185,900	\$11.380	82,300	\$2.960	268,200	\$14.340
5	89,000	\$4.870	300,800	\$16.780	389,800	\$21.650
5A	166,100	\$9.190	247,100	\$13.150	413,200	\$22.340
6	88,200	\$4.840	332,200	\$18.380	420,400	\$23.220
7	88,000	\$4.830	361,000	\$19.830	449,000	\$24.660
8	81,800	\$4.590	426,300	\$22.660	508,100	\$27.250

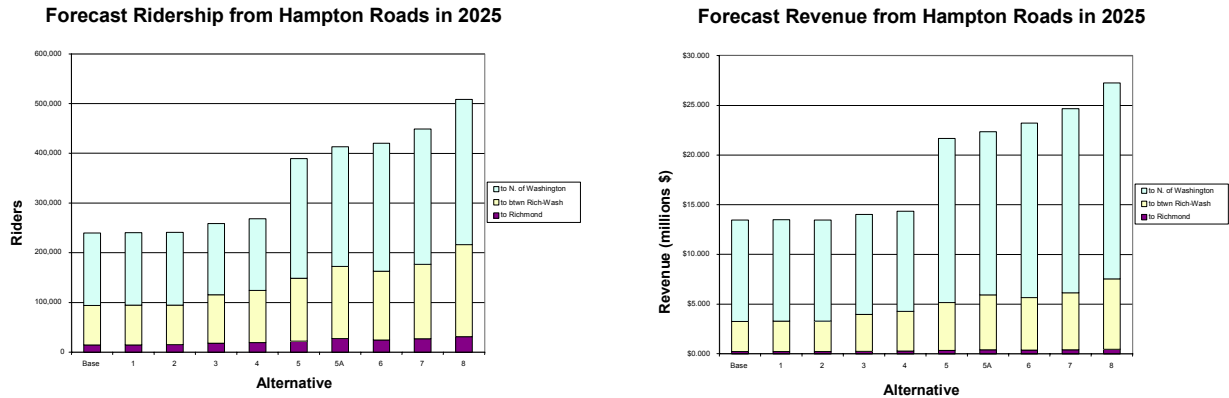
**Forecast Ridership for Hampton Roads Corridors 2025**



Another important characteristic of the Hampton Roads area ridership and revenue forecasts is their north-end origin-destination. The exhibit below provides a graphical

illustration of the relative significance of Hampton Roads ridership and revenue to/from Richmond, points north of Richmond to as far as Washington, and points north of Washington. As the exhibits show, very little Hampton Roads ridership and revenue is associated with travel to/from Richmond and, as in the base, most ridership and, in particular, revenue is associated with trips to/from points beyond Washington.

**Table 7: Relative significance of Hampton Roads ridership and revenue to/from Richmond, points north of Richmond**



The next exhibit summarizes the total ridership and revenue forecasts for each of the alternatives including the above figures for the Hampton Roads area as well as impacts between Petersburg/Richmond and points north. As the exhibit shows, ridership and revenue also increase as new frequencies are introduced at Petersburg and, in some alternatives, Richmond.

**Table 8: Hampton Roads, Richmond, and Other Markets Rail Ridership and Revenue for 2025**

Alt	Hampton Roads		Richmond/Petersburg & markets to the north		Total	
	Riders	Revenue (millions\$)	Riders	Revenue (millions\$)	Riders	Revenue (millions\$)
Base	240,200	\$13.460	438,500	\$19.970	678,700	\$33.430
1	240,600	\$13.480	438,500	\$19.970	679,100	\$33.450
2	241,000	\$13.480	438,500	\$19.970	679,500	\$33.460
3	259,200	\$14.030	468,800	\$20.670	728,000	\$34.700
4	268,200	\$14.340	468,800	\$20.670	737,000	\$35.010
5	389,800	\$21.650	568,000	\$25.740	957,800	\$47.390
5A	413,200	\$22.340	673,400	\$29.810	1,086,600	\$52.150
6	420,400	\$23.220	568,000	\$25.740	988,400	\$48.960
7	449,000	\$24.660	568,000	\$25.740	1,017,000	\$50.400
8	508,100	\$27.250	673,400	\$29.810	1,181,500	\$57.060

## Initial Overview Of Environmental Constraints

Because the alternatives under consideration are located almost entirely within existing or abandoned rail rights of way, environmental impacts are anticipated to be minimal. Limited environmental documentation should be required for most of the corridor. Categorical Exclusions should be sufficient in areas that are free of environmental constraints and where only operating changes or minor capital improvements within existing rights-of-way are proposed. In many segments of the corridor, environmental constraints may be present within the buffer analyzed, but the use of only existing tracks would also limit the need for extensive environmental documentation. More detailed environmental analyses would have to be completed to determine the full level of documentation required.

A summary of the environmental resources and potential constraints within the 300-foot buffer of the proposed HSR right of way is provided in Table 9. The resources included in this summary table would not necessarily be affected by the construction and implementation of HSR between Richmond and South Hampton Roads.

Several geographic areas of environmental concern where more detailed environmental documentation is expected to be necessary have been identified. The areas of environmental complexity where there is a potential for environmental impacts or difficulty in obtaining permits include:

- Crossing of the Appomattox River at Petersburg – New bridges would be required for all connections. The construction of the new bridges could permanently alter floodplains and historic districts and temporarily impact aquatic habitats in the Appomattox River. Further investigation would be necessary to determine the nature and degree of these effects. The Dunlop Connection would also require construction of a connection within the boundaries of the Battersea Historic District for Florida-bound trains.
- Brico Connection – New construction would be required for the connection of the existing Norfolk Southern (NS) line, which runs northwest-southeast, to the CSXT line, which runs west-east at its junction with the NS line. This connection may displace wetlands and residences near Kilby.
- Waverly – provisions of service and potential for noise and vibration impacts to residential areas adjacent to the railroad and low-income or minority populations that may be disproportionately affected.
- Station Construction at Bowers Hill – Although construction would avoid most environmental resources, there are potential impacts on traffic, public safety, and the nearby Great Dismal Swamp National Wildlife Refuge and the Hampton Roads Wetland Mitigation Bank.
- Crossing of the Great Dismal Swamp National Wildlife Refuge– the potential for noise or vibration impacts in close proximity to a significant natural resource, 4(f) property, and sensitive habitats that support rare, threatened, and endangered species.
- Noise Impacts in Chesapeake and South Norfolk – as the corridor approaches the cities of Chesapeake and Norfolk, several neighborhoods and residential areas are in close proximity to the tracks. Noise studies would be necessary to determine any effects.

Table 9: Summary Matrix of Environmental Resources and Constraints Assessed Within 300 Feet of the HSR Right of Way

<b>Number of Existing Resources and Potential Constraints</b>	<b>HSR Corridor with Dunlop Connection</b>	<b>HSR Corridor with Ettrick Connection</b>
Noise-Sensitive Receptors <sup>1</sup>	8	8
Stream Crossings	29	29
Wetlands (ac)	576.6	584.4
Floodplain Crossings	27	27
Threatened and Endangered Species	34	34
Wildlife Refuges	1	1
Traffic (total number of road crossings)	129	133
Above-Grade Crossings	25	24
At-Grade Crossings	98	101
Below-Grade Crossings	6	8
Community Facilities and Services (Total Resources)	19	19
Schools	2	3
Religious Institutions	6	5
Cemeteries	5	5
Airports	1	1
Landmarks	4	4
Parks and Recreational Areas	1	1
Transportation (bus) terminals	0	0
Government/Municipal Buildings <sup>2</sup>	0	0
Historic & Archaeological Resources <sup>3</sup>	4	5
Hazardous Waste Sites <sup>4</sup>	16	16

<sup>1</sup> Number of Category 3 receptors within 150 feet of existing lines.

<sup>2</sup> Including Town Capital Buildings, Town Halls, Courthouses, Libraries, Police, Auditoriums, Police Stations, Fire/Rescue Stations, Hospitals.

<sup>3</sup> Listed on or eligible for listing on the National Register of Historic Places.

<sup>4</sup> Located within 2 miles.

Additional environmental analysis would be needed to determine the interactions of the proposed corridors and these environmental constraints. Limited environmental documentation may be required if changes to existing railroad rights-of-way to implement the proposed rail service are minimal. However, from an overview perspective, the locations listed above could have the most complex environmental

issues within the corridor. Once more detailed design information is available, further environmental information would be prepared to determine the significance of impacts. None of these concerns, however, represents a "fatal flaw" for the Richmond to South Hampton Roads HSR.

## Conclusions

This analysis of current and projected railroad operations and facilities on the Richmond–South Hampton Roads Corridor has led to the following conclusions:

- **Feasibility of high-speed service:** Reliable high-speed passenger train service between Richmond and South Hampton Roads is a feasible goal **provided** that requisite infrastructure improvements are constructed.
- **Travel Times - Richmond to South Hampton Roads:** Scheduled trip times, Main Street Station to Norfolk terminal, decreases as the maximum authorized speed increases, ranging from 1-hour 43 minutes at 79 mph, to 1-hour 35 minutes at 90 mph, to 1-hour 31 minutes at 110 mph. Travel times between Richmond and Newport News, at 79 mph, is 1-hour 30 minutes.
- **Total Trips – South Hampton Roads to Richmond to Washington to Northeast Corridor:** Total trips increase significantly as the maximum speed and frequency of South Hampton Roads service increase. By the year 2025 Newport News-only service, without speed or frequency increases, would total 213,500 passengers annually. The addition of the South Hampton Roads service would increase the annual ridership to 492,100.
- **Protection of all freight and passenger services:** Computerized simulations of the operations of all users of this Corridor (freight and Amtrak) have identified a number of specific infrastructure changes that would provide the capacity to reliably handle all existing and projected services. Even with these changes, close scheduling and dispatching coordination among operators—extending to the Washington - Richmond and Richmond - Raleigh Corridors and other contiguous routes—would be necessary to optimize the use of the improved facility and preserve the dependability and marketability of all passenger and freight operations.
- **Need for further analysis:** Between Newport News and Richmond, on the existing CSXT line, the affect on ridership of altering service frequency, increasing maximum authorized speeds, and providing sufficient capacity to reliably operate the enhanced service, should be evaluated to assist in the prioritization of passenger rail funding in the Richmond to Hampton Roads corridor.
- **Need for further engineering:** Further detailed engineering would be needed to verify the constructibility of the various improvements, particularly for three challenging areas: the changes required through Petersburg, the track connection at Brico, and the station and track changes required between Algren and the proposed South Hampton Roads terminal station in Norfolk.
  - **Preferred Route Through Petersburg – Florida and SEHSR Raleigh and Charlotte trains:** Recently, it has been recommended that the north – south route for these intercity and high-speed trains be revised from that initially recommended in a study prepared for the FRA. Rather than restoring the S Line between Centralia and Burgess, it has been determined that intercity and SEHSR trains would operate on an upgraded A Line between Centralia

and South Collier. Trains destined for points on the A Line would continue southward, while S Line trains would utilize a restored Burgess Connection between South Collier and Burgess to access the S Line to Raleigh. Ettrick would remain the location of the intercity passenger station.

- **Preferred Route Through Petersburg – South Hampton Roads trains:**

There are three options that appear to justify further study:

1. Dunlop connection
2. Ettrick connection
3. North Collier connection

Each of these options possess positive attributes, but each raises concerns in terms of cost, circuitry, and station location. If there is to be one station, the more direct the route to South Hampton Roads, the more circuitous the routes to the south, and vice versa. For example, a downtown Station would require A and S Line trains to use connections from the NS Main Line to continue south.

If a new high bridge, and a direct route to Collier is selected for SEHSR, The South Hampton Roads alternatives might require either:

1. Dunlop connection - a separate station,
2. Ettrick connection - a separate bridge, or
3. North Collier connection - avoiding the Halifax Road overpass at North Collier, an additional main track on the NS Belt Line between North Collier and Poe, and a new interlocking East Poe to avoid the need to provide turnouts on the superelevated curve at Poe.

The *Dunlop Connection* and the *Ettrick Connection* fulfill the planning requirements to reduce passenger train conflicts with NS freight operations in Petersburg, but each requires an additional Appomattox River Bridge. Although the Dunlop Connection requires a less-expensive bridge, it requires a restored right of way (that raises substantial neighborhood issues), and a second station (if the other trains continue to use a station on the A Line. The *North Collier Connection* can overcome conflicts with freight operations only at greater expense to provide some additional trackage and interlocking improvements. Further study is required to determine the extent of these tradeoffs.

- **Necessary commitments of the involved parties:** Implementation of the development concept, described in this report, for the Richmond–South Hampton Roads Corridor will require:

- The commitment of the Commonwealth of Virginia, and other affected parties to obtain funding for the recommended improvements, to progress the necessary engineering work on a timely basis, and to arrange for any needed environmental/historic documentation; and
- Officials of the Commonwealth of Virginia, the freight railroads, and local governments to close or upgrade as many highway-rail grade crossings as possible on this route.

Cooperation of all parties is essential if the benefits of high-speed rail service are to be achieved.

## Appendix A

### COMMENTS AND LETTERS



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Mr. Alan Tobias  
Rail Passenger Project Manager  
Virginia Department of Rail and Public Transportation  
1313 East Main Street, Suite 300  
Richmond, VA 23218-0590

Dear Alan:

This letter follows the January 24, 2002 meeting of the Technical Advisory Committee for the South Hampton Roads High Speed Rail Study, which was held at the Virginia Diner in Wakefield. At that meeting, Norfolk Southern raised a number of questions concerning the Study's omissions and understatements. As you requested, we are sending our concerns to you in this letter.

This Study, as with all studies of emerging high-speed corridors, is conceptual. By this we mean that no funding exists for implementation. Until serious money develops to construct infrastructure, we at Norfolk Southern will continue to regard this and all similar studies as hypothetical exercises.

Even so, the Study should attempt to put a realistic cost on implementing high-speed rail passenger service between Petersburg and Norfolk. Understating the cost misleads our decision makers and it places Norfolk Southern in the unfair position of appearing to hype the cost of a project.

We are not hyping the cost of the project. We are asking the Virginia Department of Rail and Public Transportation (VDRPT) and its consultant, Parsons Transportation Group (PTG), to include costs and factors that so far have been understated or omitted.

Alan Tobias  
Bill Schafer  
February 20, 2002  
Page 2

Any further studies will certainly need to include these costs, so it's better to acknowledge them now than to surprise everyone unpleasantly in the future.

Specifically, the cost estimates (which were distributed at the January 24 meeting) for preparing Norfolk Southern's line for 110 mph operation between Petersburg and Norfolk do not appear to consider key items, including the following:

Cab signals - under federal law, our freight locomotives must be outfitted with this equipment if passenger trains operate in excess of 79 mph. The cost of equipping our locomotives will be borne by the high-speed rail (HSR) project. The draft Study did not include a cost for this equipment.

Grade crossing improvements - in previous comments to VDRPT and to PTG, we have stated our requirement that all grade crossings over which passenger trains operate in excess of 79 mph must have active warning devices or must be closed. We do not believe that these extra costs are included in the draft Study.

Additional mainline track - in the past, we have stated unequivocally that NS requires any passenger train operating above 90 mph to do so on separate, dedicated tracks. The cost of constructing and equipping such a track is not included in draft Study.

Compensation for use of private property - the draft Study makes no acknowledgement that NS must be compensated for the use of its asset. This compensation includes use fees, additional maintenance costs, and purchase or lease of right-of-way, among other considerations.

Dispatching - NS will continue to dispatch all tracks over which its freight trains operate after inauguration of passenger service.

Alan Tobias  
Bill Schafer  
February 20, 2002  
Page 3

Transparency - while this word is mentioned in the draft Study, it is not defined. Norfolk Southern will consider passenger train operation only if it is "transparent" to freight operations. We define transparency as the provision of sufficient infrastructure for passenger trains and freight trains to operate without delay to either, and to allow for the growth of both.

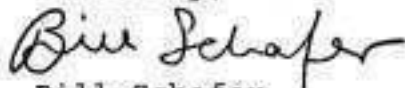
Delay to freight trains - the draft Study acknowledges that delay to freight trains would be "minimal". We have maintained all along that delay to freight trains is not acceptable, however minimal.

Liability - no one has begun to address this issue. Indemnifying Norfolk Southern for 110 mph passenger operation will open a whole new universe for our respective attorneys to explore. Based on our experience with commuter authorities, the cost to the passenger carrier of indemnifying NS will be substantial.

Railroading is expensive. 110 mph railroading is very expensive. As the ridership analysis presented in the draft Study indicates, huge growth occurs with increases in frequency, not speed. The implication is that four round trips a day at 79 mph are more cost-effective than four round trips a day at 110 mph.

As always, Norfolk Southern continues to be receptive to discussions of passenger service -- including projects such as South Hampton Roads HSR -- as long as the discussions remain realistic and include our concerns.

Sincerely,



Bill Schafer  
Director - Corporate Affairs

Cc: Mike Holowaty, Parsons & Transportation Group



Norfolk Southern Corporation  
Corporate Affairs  
2001 Market Street, Suite 29  
Philadelphia, PA 19103

**Bill Schafer**  
Director – Corporate Affairs  
215-209-4287 – Direct Ring  
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April 18, 2002

Mr. Alan C. Tobias  
Rail Passenger Project Manager  
Virginia Department of Rail and Public Transportation  
1313 East Main Street  
Suite 300  
Richmond, VA 23218-0590

Dear Alan:

We have reviewed the April 2002 draft executive summary of the Richmond to South Hampton Roads High-Speed Rail Feasibility Study. As with the previous drafts of this Study, we continue to be dismayed that many of our suggested changes have not been acknowledged or incorporated.

As a starting point, the Study should incorporate all of the principles outlined in our April 17, 2002 open letter to "Planners of Passenger Train Projects" (attached). Most of these principles have been communicated to you a number of times in the past.

Norfolk Southern is the owner of much of the right-of-way over which the proposed passenger trains will operate, and we do not agree with some of the findings and recommendations in the Study. We suggest the following changes:

- Page 6 -- the section pertaining to "Highway-Railroad Grade Crossings" should state that any corridor over which passenger trains operate in excess of 79 mph will be "sealed", as is being done between Charlotte and Greensboro, North Carolina. For further information on "sealed corridors", please contact Paul Worley at North Carolina's Department of Transportation.
- Page 7 ("Freight") -- we prefer the following wording in the second paragraph (changes shown in italics): "For example, unit trains of coal and grain generally have a lower horsepower-to-tonnage ratio and *slower acceleration/deceleration characteristics* than more time-sensitive operations. Thus, a general merchandise or intermodal train ordinarily takes less time to *travel* a given route segment than a unit train."

- Page 16 ("Petersburg to Poe") -- we suggest changing the wording in the fourth paragraph to indicate that passenger trains operating in excess of 90 mph will require their own dedicated tracks, and in the fifth paragraph to indicate that "sufficient capacity must be provided to avoid delay to freight trains entering the Poe-Brico segment."
- Page 18 ("Access to Downtown Norfolk") -- we request that you indicate that a third mainline be provided from South Norfolk to east (geographic north) of Bridge 5 to retain the present two-track mainline capacity for exclusive freight use.
- Pages 21-22 ("Investment Requirements") -- it is okay to assume that Norfolk Southern will maintain its existing mainline tracks to FRA Class 4 standards. Additional costs, such as upgrading and adding tracks and signals for passenger operations and maintaining them to higher passenger standards, will be borne entirely by the passenger operators.
- Page 22 ("Description of Improvements") -- please change the wording in the last sentence to read: ". . . thereby making the increased passenger service *acceptable* to NS and CSXT, the owner/operators".
- Page 23 (Table 2: Description of Improvements) -- under "NS Main Line: Poe to Brico", sufficient funds should be shown here for separate mainline tracks that will be needed if passenger train speeds exceed 90 mph. Additional costs that are not part of the total but should be mentioned include:
  - Reconnecting and restoring to service Bridge 5A in Norfolk
  - Service tracks and turning facilities for the passenger trains
- Page 25 (Table 2) -- under "Signal System Upgrade", this item is greatly understated because it does not acknowledge the additional passenger tracks that Norfolk Southern will require if passenger train speeds exceed 90 mph. No signal system permitting passenger trains and freight trains to operate on the same track where passenger train speeds exceed 90 mph is acceptable to Norfolk Southern. This has consistently been our position in our previous comments to you on this issue. Under "Total", the following wording should be added: "Does not include storage facility or passenger equipment requirements *or upgrades necessary for 110 mph operation or use fees paid to right-of-way owners.*"

Alan Tobias  
Bill Schafer  
April 18, 2002  
Page 3

- Page 33 (Conclusions - Protection of all freight and passenger services) -- this section should state that the right-of-way owners are the final arbiters of the capacity needed to accommodate the proposed passenger services, irrespective of the findings of consultant's computer simulations.

Please contact me if you wish to discuss any of these issues further.

Sincerely,

Bill Schafer

CC: Jim McClellan  
Bruce Wingo  
Gordon Mott - CSXT



Norfolk Southern Corporation  
Corporate Affairs  
2001 Market Street, Suite 29  
Philadelphia, PA 19103

**Bill Schafer**  
Director – Corporate Affairs  
215-209-4287 – Direct Ring  
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April 17, 2002

To Planners of Passenger Train Projects:

Norfolk Southern welcomes the opportunity to work with state departments of transportation, high-speed rail advocates, and transit and commuter authorities to develop new or additional passenger rail services. We look forward to moving your projects forward as long as they remain realistic and include our concerns.

Because of the popularity of passenger train proposals, we believe that you should be aware of some of the principles that will underlie any discussions we hold with planners. These principles are intended to protect our “factory”, which is the track and right-of-way needed to produce our product – the present and future transport of freight – and to protect the interests of our owners and employees. We foresee major segments of our business – particularly the movement of truck trailers and containers – growing significantly in the coming years as highways become more congested.

These principles refer only to conventional intercity or commuter passenger services and high-speed rail projects. Additional conditions will apply to light rail and other public transit ventures. To discuss any of the following issues further, please call me at the number above.

#### CONVENTIONAL AND HIGH SPEED PASSENGER

Passenger studies of emerging corridors by definition are conceptual. By this we mean that no funding exists for their implementation. Until serious money is available to construct infrastructure, we at Norfolk Southern will continue to regard passenger studies as hypothetical exercises.

Studies should put realistic costs on implementing rail passenger service. Understating costs misleads decision-makers and it places Norfolk Southern in the unfair position of appearing to inflate the costs of a project. Far from overstating costs, we ask public agencies and their consultants to include costs and factors that will be required, but are frequently understated or overlooked. Let’s include items we know will be necessary to passenger rail now to avoid surprising everyone unpleasantly in the future.

Studies must acknowledge that NS owns its corridors and is entitled to fair compensation for their use. We maintain them and we pay taxes on them. Please don't assume that the use of our capacity and our asset is "free". Instead, please acknowledge in your studies and reports that we are entitled to a fair return if you want to use the corridor for passenger trains.

We will require new passenger train service to pay higher use fees than Amtrak pays today. Please do not use "Amtrak incremental cost" factors in estimating the operating costs of new passenger services. Amtrak was entitled to special rights in return for relieving the freight railroads of intercity passenger train operation over thirty years ago. There is no relationship between the Amtrak rates and a fair, commercial return for use of private assets.

Passenger train operation must be "transparent" to our freight operations. We define transparency as the provision of sufficient infrastructure for passenger trains and freight trains to operate without delay to either, and to allow for the growth of both.

Delay to freight trains by passenger trains, however minimal, is unacceptable. Sufficient infrastructure must be furnished so that each type of train can operate without getting in the other's way. The common assumption that a proposed passenger train will impose "minimal interference with freight operations" is a non-starter.

Liability will be a major issue. Based on our experience with commuter authorities, the cost to the passenger carrier for indemnifying NS is substantial. We will accept no new or expanded passenger operations without adequate liability protection.

Cab signals for freight locomotives will be required if the top speed for passenger trains is above 79 mph. Be prepared to equip the NS freight locomotive fleet with additional cab signal and other safety apparatus, and to pay for and maintain any additional signal infrastructure required by speeds in excess of 79 mph.

Dispatching will remain with NS for all trains operating over NS tracks after inauguration of passenger service.

## HIGH SPEED CORRIDORS

High-speed corridors require careful planning. If the federal government designates a corridor as "high speed", NS will automatically assume that mainline tracks dedicated solely to high speed trains will someday be built in the same corridor as our existing mainline tracks. Provisions must be made for the separate high-speed tracks throughout the corridor, especially in urban areas. Highway or railroad overpasses/underpasses, when built with public funds, must allow space for the additional tracks.

NS will require dedicated tracks for passenger trains operating in excess of 90 mph. No heavy-duty rail freight line has 110-mph passenger trains operating over it today. Where

freight trains do operate over 110-mph track (Northeast and Empire Corridors, for example), the penalties imposed on freight trains are substantial. In a heavy-duty freight environment (Cleveland-Chicago is one example), high-speed passenger trains must operate over tracks dedicated to their use.

Railroading is expensive. 110 mph railroading is very expensive. As most ridership analyses indicate, the greatest growth occurs with increases in frequency, not speed, which would seem to imply that four round trips a day at 79 mph are much more cost-effective than four round trips a day at 110 mph.



Tel (757) 926-8611

# City of Newport News

Department of Engineering  
2400 Washington Avenue  
Newport News, Virginia 23607



Engineering the Future  
Fax (757) 926-8300

## OFFICE OF THE DIRECTOR

February 12, 2002

Virginia Department of Rail and Public Transportation

Attn: Alan Tobias

113 E. Main Street, Suite 300

P.O. Box 590

Richmond, VA 23218-0590

Re: Richmond – South Hampton Roads High Speed Rail Study

Dear Mr. Tobias:

The following will represent the City's comments to the Draft Ridership and Revenue Forecasting Report, Environmental Overview Draft Report and the Draft Executive Summary. Our primary issue focuses on the attempted comparison of this high-speed rail corridor with the Newport News-Richmond high-speed rail corridor. It was our understanding that this study was to focus on the feasibility of putting high-speed rail in the Route 460 corridor and to determine if there was a fatal flaw to the concept. If a comparison between the two rail corridors were needed, it would be scheduled in the future. This should continue to be the focus of the study with mention, for informational purposes only, of a high-speed rail corridor between Newport News and Richmond, which is presently served by twice daily Amtrak service at a maximum speed of 79 miles per hour that would compete for the Hampton Roads ridership.

If more historical information is needed about the Newport-News to Richmond corridor, please reference the I-64 Major Investment Study completed in June 1999. The rail component of the Locally Preferred Alternative consisted of a service frequency of eight trains per day per direction, a maximum operating speed of 110 miles per hour resulting in 66 minutes of travel time with stops at 6 stations or express service, stops at only 3 stations, of 53 minutes.

### **Draft Ridership and Revenue Forecasting Report**

Page 4 – I assume Silver Star, Silver Meteor and Palmetto are the names of trains or train routes. I am not sure if there is some significance in naming the trains if you do not know anything about these trains or their routes versus just saying rail passenger surveys.

Page 5 – Income, is this per person, per household, median family, business income, or industrial income?

Page 7 - Highway Cost (full/incr) - What is full versus incr?

Page 10 Exhibit 8 - I would take out the comparison to Newport News-Richmond.

Page 11 Exhibit 9 - I would take out the Newport News-New York Trains and focus on the Norfolk trains. I assume the Base is existing and all the Alternatives are future.

Page 12 Exhibit 10 - Again I would focus on the Norfolk trains and take out the Newport News trains.

Page 13 Exhibit 11 - Again I would focus on the Norfolk trains and take out the Newport News trains. The only thing this table tells me is that maximum speed really is not a factor in travel time in the market so why even consider the significant expense of upgrading to 90 mph or 110 mph if there is no significant travel time saving? Focus on frequency versus speed.

Page 15 Exhibit 12 - Again I would focus on the Norfolk and Sunray station versus the Newport News and Williamsburg stations.

Page 17 Exhibit 13 - Define Passenger Miles, Train Miles, Ridership/Train Mile and Passenger Miles/Train Mile.

Page 18 Exhibit 14 - What does "incremental" mean in this table?

Page 23 Exhibit 19 - Again focus on the Norfolk station not Newport News.

Page 24 Exhibit 20 - Leave out the Newport News Corridor. Page 8 of the meeting handout seems to be a table of the same information but the information in the table is different. Which is correct?

A stronger point might be made of the desire for Hampton Roads passengers to reach a destination north of Richmond, the Northeast Corridor, and not Richmond itself. It must also be more strongly pointed out that there are limited slots of time available for rail passenger service from Richmond to the Northeast Corridor, thus limiting the number of direct trains from Hampton Roads to the Northeast Corridor, the desired destination.

#### **Environmental Overview Draft Report**

No comments.

#### **Draft Executive Summary**

Page 5 - Signaling. Additional discussion is needed here to give the reader an order of magnitude of the expense to upgrade the corridor and the equipment to be used on the corridor for high-speed service.

For this level of study I have no problem not making some decision over the routing through Petersburg. Suffice it to say as the study does that there is a viable route through Petersburg.

Page 12 - NS Main Line Between Petersburg and Suffolk. The study states, "...a primary goal of the study is that high-speed train operations be transparent to freight train operations." This cannot just mean adjusting passenger train travel around freight but adjusting freight around passenger travel such that both can function within the corridor. In the highway environment the mix between trucks and cars can be deadly so there has been some discussion to forcing trucks to make deliveries at night when car travel is at its minimum. So to, rail freight could move at night if passenger rail service was heavy during the day.

Page 15 - Alternative Terminal Locations. I strongly support the Downtown Norfolk station near Harbor Park. Sharing parking with the stadium, being near Downtown, access to the bus facilities and future light rail make this a great site if it can all be worked out.

Page 22 - The first paragraph states, "In all the scenarios, the service provided between Richmond and Newport News remains constant at current levels with two round trips per day and a maximum allowed speed of 79 mph. All scenarios assume that the proposed Hampton roads Crossing bridge/tunnel is not in place." The comparison with Newport News-Richmond should be eliminated, focusing just on the Norfolk-Richmond corridor, as the purpose of the study was not to perform a comparison between the two corridors but to see if the Route 460 corridor was feasible.

Page 27 - Need for further analysis. Presently the State prioritization of passenger rail service to Hampton Roads from Richmond is via Newport News. Further study is needed if this prioritization is to be changed or whether there is justification for both services.

Page 28 - I take exception to the second half of the last sentence. Parsons seems to be speaking for the Commonwealth, which it should not do.

For there to be any chance of political success or financial funding, the project will of course have to begin with 79 miles per hour service and limited frequency. Frequency should then be increased before attempting to increase speeds. In order to avoid spending money for capital improvements that have to be ripped out for higher speed service in the future, consideration should be given to implementing capital improvements for the 110 miles per hour service whenever financially feasible.

Dick Beadles, Virginia High Speed Development Committee, in his letter to you dated January 23, 2002, has a number of valid rail related comments and because of his vast rail experience, has stated them much better than I so I will not attempt to repeat them. I, however, am not ready to support getting a new consulting team, just making continuing modifications to the study and reports should be adequate.

February 12, 2002

Based on the comments from Bill Schafer, Norfolk Southern, the Route 460 rail corridor may have two fatal flaws. While the first is not fatal to rail passenger service, the extreme cost of 90 and 110 mile per hour service may be fatal to passenger service at speeds higher than 79 miles per hour. The second is only fatal if there is no way to run rail passenger service at any speed, at times and frequencies demanded by riders, in the corridor without impacting on freight rail service. It is critical that the two, freight and passenger rail, co-exist; both modes have to be flexible with the other.

Sincerely,

A handwritten signature in black ink, appearing to read 'Mostafa A. Sabbah', written in a cursive style.

Mostafa A. Sabbah, Ph.D., P.E.  
Director of Engineering

MAS:TMS:psb

pc: Special Projects Engineer, T. Slaughter

Virginia High Speed Rail Development Committee  
5101 Monument Avenue  
Richmond, Virginia 23230

April 17, 2002

Mr. Alan Tobias  
VA Dept. of Rail & Public Transportation  
1313 East Main Street, Suite 300  
P. O. Box 590  
Richmond, VA 23218-0590

Re: April, 2002 Version of Executive Summary,  
RIC-SHR Rail Corridor Study by Parson Transp. Group, et. al.

Dear Alan:

Once again, and regrettably on my part, I have a schedule conflict and will not be able to attend the April 25 meeting of the Technical Advisory Committee relative to the Richmond - South Hampton Roads rail corridor study.

Although I do have some technical comments, which I will endeavor to get to you in advance of the meeting, I also have some "non-technical" comments and suggestions, which I believe to be of even greater importance.

Listed below are my summary conclusions and observations, based upon the above-referenced work product:

1. While I personally would not chose to use your "fatal flaws" characterization of this study and its findings, it is both remarkable -- and fortuitous -- that despite having to absorb unrealistically *high* (and probably unsupportable) freight train projections, ultra-conservative *low* passenger demand projections, and seemingly very generous preliminary engineering estimates, rail passenger service to South Hampton Roads turns out to be operationally feasible and quite cost-effective.
2. While further study and refinement will obviously be necessary in the future, such work is not, in my view, our highest priority as a next step.
3. Our most pressing need is to agree, as a region (Hampton Roads), that both sides of Hampton Roads warrant modern, direct, inter-city rail passenger service at the earliest possible date. We -- speaking of VHSRDC -- would hope that a consensus would emerge for achieving the foregoing, with the following stipulations: (i) that the Peninsula should be given first priority, and (ii) that the need to serve South Hampton Roads is more important to the Commonwealth than service to North Carolina, without prejudice to the latter.
4. This study, with all of its limitations and imperfections, makes it quite clear that the most prudent and cost-effective approach to achieving future high-speed rail development, regardless of how high, high-speed service is to ultimately be in the future,

and regardless of the desirability of having HSR-restricted rail trackage, is to start with 79-mph maximum ("conventional") rail passenger service. What is most important, in the beginning, is to have frequent departures, modern equipment, and user-friendly service that is highway competitive both as to convenience and travel time.

Note: I suspect that few non-technical readers of the report will automatically grasp that the projected 2025 condition (as to projected train traffic volumes) and > 79-mph speeds are the controlling "drivers" of cost estimates and "critical" freight rail interface hurdles.

5. Even without laying claim to natural disaster and Homeland Defense evacuation capabilities to be derived from implementation of the "5A" service levels, the estimated price tag for the projected service is a transportation bargain for Hampton Roads.

It is time we placed these issues squarely in the hands of the region's elected leaders, and other public-policy makers at both the State and Federal levels.

In my judgement, the very worst thing we could do would be to get bogged down in another premature technical study prior to making some fundamental policy decisions.

Bold leadership is needed.

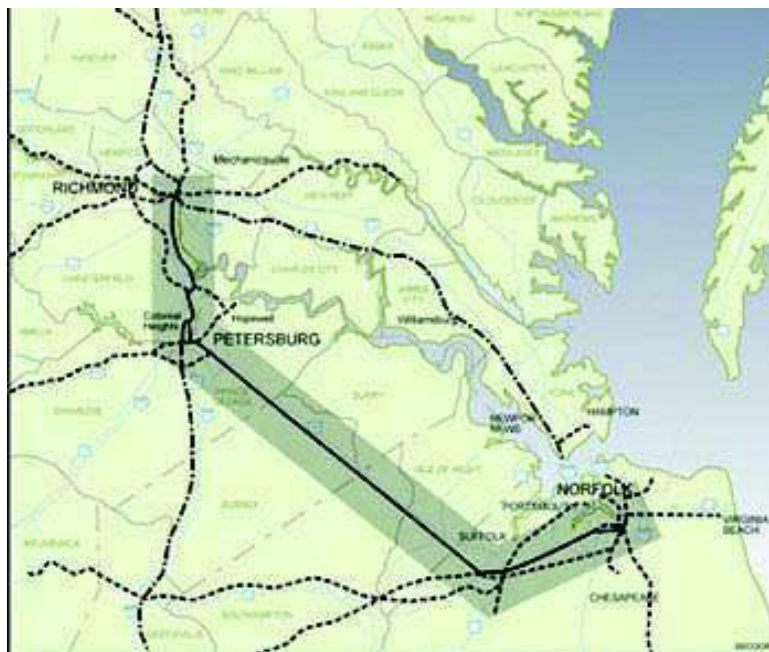
Sincerely,

Richard L. Beadles, Vice President  
VA High Speed Rail Development  
Committee.

cc: Technical Committee e-mail list.

# Richmond to South Hampton Roads High-Speed Rail Feasibility Study

## FINDINGS AND RECOMMENDATIONS



Virginia Department of  
Rail and Public Transportation

April 2002

In 2000 The General Assembly of Virginia directed the Department of Rail and Public Transportation (DRPT) to conduct a study to determine the feasibility of implementing high speed rail service between Richmond and South Hampton Roads using the existing railroad tracks that parallel U.S. Route 460. Item 525, Section N (Page 402) of the FY 2001 Appropriations Act states that:

“Any funding provided to Route 460 Improvements from Suffolk to Petersburg shall include the necessary feasibility, environmental and demand analyses for consideration of high speed rail.”

The purpose of this study is to determine the feasibility of providing direct high speed rail service from Richmond to South Hampton Roads via Petersburg and Suffolk using existing rail lines. The study is a “Fatal Flaws” analysis which is directed to determine if there are conditions which would make high speed rail service extremely difficult or impractical to implement. The main objectives of the proposed service are to minimize the end-to-end rail travel time and maximize capacity in order to provide fast, frequent, reliable and comfortable passenger service, and to maintain and enhance the ability of the host railroads to move freight in the same corridor.

The study includes three major tasks:

- An analysis of the engineering feasibility of operating high speed rail to South Hampton Roads along the existing Norfolk Southern and CSX rail lines. This task includes the selection of a preferred route and the identification of station locations.
- A projection of the potential ridership demand and revenue for the proposed service. This task includes the analysis of several different service scenarios with varying levels of frequency and speed.
- An survey of environmental conditions along the selected alternative route to determine the potential for major environmental issues. Issues addressed include: water and wetland resources, cultural resources, threatened and endangered species and wildlife, superfund sites, air, noise, public parks, recreation areas, wildlife refuges and historical properties.

## Conclusions

The analysis of current and projected railroad operations and facilities on the Richmond–South Hampton Roads Corridor has led to the following conclusions:

- **Feasibility of high-speed service:** Reliable high-speed passenger train service between Richmond and South Hampton Roads is a feasible goal **provided** that requisite infrastructure improvements are constructed.
- **Travel Times - Richmond to South Hampton Roads:** Scheduled trip times, Main Street Station to Norfolk terminal, decreases as the maximum authorized speed increases, ranging from 1-hour 43 minutes at 79 mph, to 1-hour 35 minutes at 90 mph, to 1-hour 31 minutes at 110 mph. Travel times between Richmond and Newport News, at 79 mph, is 1-hour 30 minutes.
- **Cost of Improvements:** This study estimates the cost of the recommended improvements to be \$235.8 million. This price includes only those improvements between the connection to the Southeast High Speed Rail corridor in Petersburg and Norfolk. It is assumed for the purposes of this study that improvements between Richmond and Petersburg will be completed as part of the Southeast High Speed Rail initiative. The majority of the recommended improvements provide the connections, capacity and station facilities necessary to operate passenger trains at any speeds. There are some savings, however, if the maximum passenger train speed is limited to 79 mph. The estimate for the cost of improvements for 79 mph operations is \$188.4 million.
- **Total Trips – South Hampton Roads to Richmond to Washington to Northeast Corridor:** Total trips increase significantly as the maximum speed and frequency of South Hampton Roads service increase. By the year 2025 Newport News-only service, without speed or frequency increases, would total 240,200 passengers annually. The addition of the South Hampton Roads service would increase the annual ridership to 508,100.
- **Protection of all freight and passenger services:** Computerized simulations of the operations of all users of this Corridor (freight and Amtrak) have identified a number of specific infrastructure changes that would provide the capacity to reliably handle all existing and projected services. Even with these changes, close scheduling and dispatching coordination among operators—extending to the Washington - Richmond and Richmond - Raleigh Corridors and other contiguous routes—would be necessary to optimize the use of the improved facility and preserve the dependability and marketability of all passenger and freight operations.
- **Need for further analysis:** Between Newport News and Richmond, on the existing CSXT line, the affect on ridership of altering service frequency, increasing maximum authorized speeds, and providing sufficient capacity to reliably operate the enhanced service, should be evaluated to assist in the prioritization of passenger rail funding in the Richmond to Hampton Roads corridor.
- **Need for further engineering:** Further detailed engineering would be needed to verify the constructibility of the various improvements, particularly for three challenging areas: the changes required through Petersburg, the track connection at Brico, and the station and track changes required between Algren and the proposed South Hampton Roads terminal station in Norfolk.
  - **Preferred Route Through Petersburg – Florida and SEHSR Raleigh and Charlotte trains:** Recently, it has been recommended that the north – south

route for these intercity and high-speed trains be revised from that initially recommended in a study prepared for the FRA. Rather than restoring the S Line between Centralia and Burgess, it has been determined that intercity and SEHSR trains would operate on an upgraded A Line between Centralia and South Collier. Trains destined for points on the A Line would continue southward, while S Line trains would utilize a restored Burgess Connection between South Collier and Burgess to access the S Line to Raleigh.

- **Preferred Route Through Petersburg – South Hampton Roads trains:** There are three options that appear to justify further study:
  1. Dunlop connection
  2. Ettrick connection
  3. North Collier connection

Each of these options possess positive attributes, but each raises concerns in terms of cost, circuitry, and station location. If there is to be one station, the more direct the route to South Hampton Roads, the more circuitous the routes to the south, and vice versa. For example, a downtown Station would require A and S Line trains to use connections from the NS Main Line to continue south.

If a new high bridge, and a direct route to Collier is selected for SEHSR, The South Hampton Roads alternatives might require either:

1. Dunlop connection - a separate station,
2. Ettrick connection - a separate bridge, or
3. North Collier connection - avoiding the Halifax Road overpass at North Collier, an additional main track on the NS Belt Line between North Collier and Poe, and a new interlocking East Poe to avoid the need to provide turnouts on the superelevated curve at Poe.

The *Dunlop Connection* and the *Ettrick Connection* fulfill the planning requirements to reduce passenger train conflicts with NS freight operations in Petersburg, but each requires an additional Appomattox River Bridge. Although the Dunlop Connection requires a less-expensive bridge, it requires a restored right of way (that raises substantial neighborhood issues), and a second station (if the other trains continue to use a station on the A Line. The *North Collier Connection* can overcome conflicts with freight operations only at greater expense to provide some additional trackage and interlocking improvements. Further study is required to determine the extent of these tradeoffs.

- **Necessary commitments of the involved parties:** Implementation of the development concept, described in this report, for the Richmond–South Hampton Roads Corridor will require:
  - The commitment of the Commonwealth of Virginia, and other affected parties to obtain funding for the recommended improvements, to progress the necessary engineering work on a timely basis, and to arrange for any needed environmental/historic documentation; and
  - Officials of the Commonwealth of Virginia, the freight railroads, and local governments to close or upgrade as many highway-rail grade crossings as possible on this route.

Cooperation of all parties is essential if the benefits of high-speed rail service are to be achieved.

## Recommendations

The Richmond to South Hampton Roads High Speed Rail Feasibility study demonstrates that modern, fast passenger service is feasible in the study corridor. There are no “fatal flaws” that will prevent implementation of the service, but a substantial capital investment will be needed.

- **Improvements should be incremental.** A significant capital investment will be needed to make the necessary connections, upgrade the track and construct station facilities in order to allow trains to run at conventional speeds (maximum speed of 79 mph). A staged implementation plan should prioritize projects and lay out a reasonable schedule for implementing service at conventional speeds, then continuing to make improvements to allow higher speed operations.
- **Frequency matters.** This study clearly demonstrates that frequency of service is at least as important as speed in attracting riders to the service. Efforts should be made build capacity in order to maximize the frequencies as early in the implementation process as possible.
- **Cost is a direct function of speed.** The capital costs required to implement passenger service will increase significantly as the speed of the service is increased. As Norfolk Southern states in their policy on passenger service (See the Appendix to the Executive Summary) “Railroading is expensive. 110 mph railroading is very expensive.” This study does not analyze operating costs, but it is clear that the cost of maintaining facilities and operating trains at higher speeds is substantially more expensive than conventional speed operations.

## Next Steps

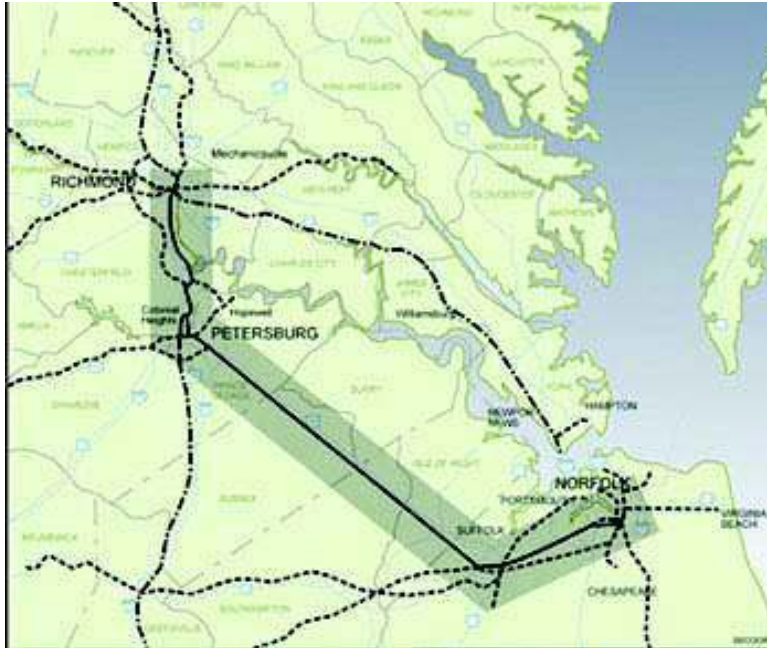
Extensive additional study and engineering will be needed to precisely define the scope of the proposed service improvements. In order to move this service proposal forward, the following actions should be taken:

1. **Additional study is needed to determine a preferred routing through Petersburg.** This study identifies three possible alignments through Petersburg. The Ettrick Connection is the alternative most favored by the localities. All three alternatives will involve significant capital investment in new rail infrastructure, including a new or rebuilt bridge across the Appomattox River. Further study is necessary to determine which of these alternatives will best serve South Hampton Roads trains and provide the best connections with the existing Amtrak service and the proposed Southeast High Speed Rail service.
2. **Additional marketing analysis is needed.** This study does not compare high speed rail service in the Route 460 corridor with the adopted proposal for service improvements on the Peninsula. In order to determine the relative benefits of improved service on the Peninsula and the proposed service to South Hampton Roads, a comprehensive marketing study of the entire Hampton Roads region should be conducted. Additional analysis of ridership in the Petersburg area is also needed to assist in developing routing and station alternatives. This study should include a comprehensive analysis of intercity travel patterns for the whole region and look at a variety of service scenarios that test high speed rail service on both sides of Hampton Roads. The study must also include an analysis of potential service to South Hampton Roads utilizing the proposed rail tube in the new Third Crossing tunnel.

3. **A phasing plan must be developed.** This feasibility study provides cost estimates only for the full proposed rail network. Costs were not estimated for the incremental service levels tested in the ridership analysis. A substantial portion of the estimated improvements will be necessary to implement the service at any speed: the Petersburg connection must be constructed and track expansions must be built to provide the necessary capacity for additional passenger trains. However some of the identified improvements, such as signal upgrades, will not be necessary for lower speed services. A phasing plan will identify the specific projects that are needed in order to accomplish the proposed intermediate levels of service.
4. **An estimate of operating costs must to be developed.** The scope of work for this feasibility study did not include an analysis of operating expenses. A detailed analysis of the operating costs of the various service scenarios should be included in any future study. This analysis is necessary to determine the full cost implications of proposed rail service and to help determine the most efficient service alternative.
5. **Further negotiations with the railroads are needed.** CSX and Norfolk Southern have vital concerns about the impact of proposed passenger service on their freight business in the corridor. The railroads want to ensure that enough capacity is provided to allow for them to maintain and grow their freight traffic without any impediment from the passenger trains. The railroads all also concerned about liability and safety issues. Both CSX and Norfolk Southern have developed passenger rail policies which state that passenger trains operating in excess of 90 mph must have a dedicated track. The Virginia Department of Rail and Public Transportation acknowledges this policy. We recognize that this issue has a major effect on high speed rail proposals throughout the country and will it will be addressed on a national level. The Department will work with the railroads to reach an agreement for service that is acceptable to all parties.

# Richmond to South Hampton Roads High-Speed Rail Feasibility Study

## TASK 1 - ENGINEERING



Prepared for:  
Virginia Department of  
Rail and Public Transportation

Prepared by:  
**PARSONS**

May 2002

## Richmond to South Hampton Roads High-Speed Rail Feasibility Study

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### Introduction

The findings of the Parsons Transportation Group (PTG) team’s Engineering Feasibility Analysis of the Richmond to South Hampton Roads corridor are summarized in this report. Topics addressed in the Engineering Feasibility Analysis Task Report include:

- assessment of current conditions;
- analysis of critical locations;
- projection of future traffic and capacity requirements; and
- preliminary identification of improvements.

Capital Cost Estimates for the improvements were developed in a subsequent task.

The purpose of this task was to perform an analysis of the rail infrastructure of the study area and determine the improvements that would be necessary to accommodate frequent passenger trains operating at speeds of up to 110 mph.

### Proposed Richmond - South Hampton Roads High-Speed Rail Service

The Virginia Department of Rail and Public Transportation (DRPT) contracted The Parsons Transportation Group (PTG) to evaluate the Richmond-Petersburg-South Hampton Roads corridor. The study developed an overall long-range track configuration, alignment plan, and operating plan that would support the proposed expanded requirements of all users of the rail line. The corridor may be considered a natural extension of the Washington-Charlotte Southeast High-Speed Rail (SEHSR) Corridor,<sup>1</sup> extending from Petersburg, to the South Hampton Roads area. The route studied would extend between Richmond’s Main Street Station and a terminal station in the South Hampton Roads area. The route would require a combination of CSX Transportation (CSXT) and



<sup>1</sup> The Parsons Transportation Group (PTG) has recently completed two related studies of the Washington-Richmond corridor and the Richmond-Petersburg-Raleigh-Charlotte corridor for the FRA. The studies were performed in coordination with DRPT, NCDOT, Amtrak, CSXT, and NS.

## Task 1 Report – Engineering Feasibility Study

Norfolk Southern (NS) rail lines<sup>2</sup>. CSXT operates the rail lines between Richmond and Petersburg and a segment in the Hampton Roads area. NS operates a rail line between Petersburg and Norfolk.

The proposed Richmond - South Hampton Roads high-speed rail service would provide stations located conveniently to Norfolk, Virginia Beach, and other communities south of Hampton Roads. The current bridge-tunnel link between the Newport News Amtrak station and south side of Hampton Roads, a connecting bus, provides a somewhat circuitous and often congested route to Norfolk and Virginia Beach. New stations on the south side would require much shorter and more reliable access times and make service convenient to more communities.

A variety of alternative south side station locations have been evaluated. Key Hampton Roads markets include:

- Downtown Norfolk,
- Downtown Portsmouth,
- Virginia Beach,
- Norfolk Naval Base,
- Other Norfolk destinations,
- Other Portsmouth destinations,
- Chesapeake, and
- Suffolk.

Downtown Norfolk and Portsmouth are relatively compact markets that could be served by a station located in one of these areas. The remaining markets are spread over a much larger geographic area and would be best served by a “suburban” station with good access to the highway system.

## Background

### The Existing Services

A varied network of surface transportation options exists in the James River Corridor between Richmond and Hampton Roads; however, public transportation is limited. Amtrak currently operates conventional rail service providing two round trips per day between Richmond and Newport News, with Thruway bus service between the Newport News station, Norfolk and Virginia Beach. These trains also serve Williamsburg as an intermediate stop between Richmond and Newport News. In 1999, a total of about 110,000 passengers were served at Newport News (including those using the connecting bus service) and about 45,000 passengers were served at Williamsburg. Most of these passengers travel to/from Washington, New York, and other locations in the Northeast Corridor. Greyhound and Carolina Trailways Lines collectively operate nine round trips in the corridor. Service on the south side of the river is extremely limited, with only one Carolina Trailways bus schedule, and no Amtrak service. Bus service on the north side of the river ranges in travel time from 1 hour 45 minutes to 2 hours 50 minutes between Richmond and Norfolk. Passengers from Petersburg to South Hampton Roads are routed via Richmond and Newport News, with an average travel time of over four hours. In

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<sup>2</sup> The potential for utilizing trackage owned by Short Line railroads in the South Hampton Roads area also has been evaluated as part of the study.

## Task 1 Report – Engineering Feasibility Study

part, this is due to the fact that the highway, US 460 is inferior to I-64, on the north side. It has numerous at-grade highway intersections and substantial cross traffic, making travel time significantly longer, for both buses and cars. A substantial amount of truck traffic intensifies this problem.

To effectively and efficiently develop a market, a number of critical tasks must be undertaken to ensure that informed choices are made. This report is an important beginning. The following tasks were undertaken:

- Ridership forecasts were developed,
- Operating scenarios were analyzed, and
- Facility options were evaluated.

### **Rail Passenger Service in Virginia**

The DRPT is actively pursuing significant increases in intercity rail passenger service throughout the state. All corridors evaluated include Richmond's Main Street Station as the hub for these services. Presently, Main Street Station is closed, although Amtrak service to Newport News uses the eastern-most station tracks. The City of Richmond has purchased the station from the Commonwealth and has developed an extensive program of improvements to upgrade it, and restore it to service. Working with DRPT and Amtrak, the city of Richmond intends to re-institute rail passenger service into and through the station.

Amtrak's Staples Mill Road Station, located almost 15 minutes by rail north of Main Street Station, is the only rail passenger station presently serving Richmond. Amtrak trains to points south of Richmond stop at Staples Mill Road Station, but bypass downtown on the CSXT A Line (the former Atlantic Coast Line route) to reach Petersburg, VA. Once Main Street Station is re-opened, all trains, with the exception of Amtrak's AutoTrain, would utilize the S Line (the former Seaboard Air Line route) to reach Petersburg, VA<sup>3</sup>.

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<sup>3</sup> PTG presently is under contract to the FRA to determine the requirements to re-institute rail passenger service on the S Line. Performed in cooperation with DRPT, NCDOT, Amtrak, and CSXT, the study is defining an alignment that would utilize the S Line from the south to a point in the vicinity of the Appomattox River in Petersburg.

## Task 1 Report – Engineering Feasibility Study

<b>Rail Services That Will Utilize Main Street Station</b>		
<b>Corridor</b>	<b>Existing Station Stop</b>	<b>Proposed Station Stops</b>
Washington – Richmond	Staples Mill Road	Staples Mill Road Main Street
Richmond-Newport News	Staples Mill Road Station (passes through Main Street)	Staples Mill Road Main Street
Amtrak Florida Service	Staples Mill Road	Staples Mill Road Main Street
North Carolina Service	Staples Mill Road	Staples Mill Road Main Street
Proposed Bristol Service	Does not presently operate	Main Street Station
Proposed South Hampton Roads Service	Does not presently operate	Staples Mill Road Main Street

When Main Street Station is first opened only the Newport News trains will stop. The second phase will allow for two Richmond round trips to be extended to terminate there, after new storage, maintenance and turning facilities are constructed. The final phase will have all trains, including the Florida and North Carolina (SEHSR) services, stop at the station. Improvements on the tracks between Main Street Station and Centralia will be needed before this phase can be implemented.

### **NS and CSXT Fundamental Requirements To Be Fulfilled Before New Passenger Service Begins**

NS's stated position is that prior to initiation of new passenger service on their tracks, the proposed operation must:

- Improve safety of all rail operations in the area;
- Be transparent to freight operations, i.e., sufficient infrastructure must be provided to enable freight trains and passenger trains to operate without delay to either, and to allow for the growth of both;
- Furnish sufficient indemnity for liability; and
- Compensate NS for the use of its asset with a level of return similar to that of freight trains.

In addition, NS and CSXT state that they will retain control of dispatching of trains on all tracks over which their freight trains will operate after inauguration of the high-speed passenger service.

### **Prior Richmond to South Hampton Roads Rail Service**

The Norfolk and Western (N&W), now NS, the Seaboard Air Line (SAL) and the Atlantic Coast Line (ACL), both now CSXT, previously operated passenger rail service to the south side of Hampton Roads from points in Southside Virginia and North Carolina. The Virginian Railway (VGN) and an earlier Norfolk Southern Railway, both now part of NS, also operated local passenger service.

The N&W, Virginian and the earlier Norfolk Southern Railway utilized the N&W Terminal Station in Norfolk, which was located at 1200 East Main Street. The SAL

## Task 1 Report – Engineering Feasibility Study

operated trains from Raleigh, NC to a terminal in Portsmouth, located at High and Water Streets. The ACL ran trains from Rocky Mount, NC to a terminal in north Portsmouth (a portion of this line is now owned by the Commonwealth Railway).

Amtrak intermittently offered services from Norfolk and Washington to the west via the N&W to Petersburg. The Norfolk train utilized the final N&W passenger station, located at the Lamberts Point Yard.

### **The N&W Service Between Richmond and Norfolk**

Historically, the ACL and N&W operated a service like that envisioned. For most passengers, connections were made at Petersburg between trains of the two railroads, although some through cars were handled from New York. ACL cooperated with N&W on service to Norfolk from Richmond's Broad Street Station running the trains as far as Petersburg, where either coaches were added to NS trains, or passengers transferred to NS trains to/from Cincinnati. Norfolk & Western did operate one through train a day, called The Cannonball, using trackage rights on the ACL from Broad Street Station, in Richmond to Petersburg. The Cannonball lasted until 1967, but by then, it had become a night train that carried a through New York-Norfolk sleeper.

### **Assessment of Current Conditions**

Because of the schedule requirements necessary to process the study, initial emphasis would be given to documenting the **condition assessment**. Consultations have been held with the freight railroads. On-site inspections have been made. Maps and documents available from State and local agencies, and rail operators have been collected and reviewed. Current information on use of the lines and any current plans for upgrading the rail corridor facilities has been obtained and reviewed.

The PTG team has reviewed the current condition of the rail lines included in the Study Area. Their suitability to safely and efficiently accommodate high-speed passenger trains and the levels of freight rail service was evaluated. The review has included, but not been limited to, track conditions and configurations, roadbed (both existing and abandoned) conditions, signal and traffic control systems, grade crossings, curves and grades, etc. The Richmond - South Hampton Roads rail plant and systems are summarized below.

Initiation of high-speed rail service between Richmond and South Hampton Roads would require a connection between the north south, Richmond to Charlotte route and the east west, Petersburg to Norfolk route. This presents a number of difficulties due to the disparity of alignment orientations and elevations. Avoiding freight traffic is also of critical importance. Several alternatives have been identified and are discussed in the Critical Areas subsection. The five connection alternatives were named:

- North Collier Connection (A line to NS Belt Line),
- Secoast Connection (S Line to NS Belt Line),
- West Connection (S Line to NS Main Line),
- Ettrick Connection (A Line to NS Main Line via Ettrick Station), and
- Dunlop Connection (A Line to NS Main Line via original ACL main line through Colonial Heights).

### Original Atlantic Coast Line Main Line Alignment

Historically, the connection between the A Line and the NS line to South Hampton Roads was the original main line of the Atlantic Coast Line Railroad (ACL) between Richmond and Petersburg. This line ran through the city of Colonial Heights and crossed the Appomattox River at Pocahontas Island, between the present day US-1 (Martin Luther King, Jr.) and Interstate 95 bridges. The railroad then climbed a steep grade out of the river valley as it ran along Washington Street before turning south toward Emporia. This steep grade and street trackage was bypassed in 1895 with the construction of a six-mile long "belt line" to the west of the city, crossing the Appomattox River valley on a single-track bridge more than two miles to the southwest of the original ACL bridge. When built, the belt line was primarily intended for freight trains, but passenger trains were gradually transferred to it. The bridge was built some sixty feet above the river to minimize the gradient on the approaches. The difference in elevations between the A Line (belt Line) and the NS Main Line would make a new connection using this bridge difficult and expensive.

The original main line of the ACL was eventually severed to eliminate rail traffic on Washington Street, with the two disconnected leads remaining in service. The north lead (later referred to as the Appomattox Lead), was still used as late as 1989, but was removed sometime in the early 1990s. PTG and staff from R. L. Banks examined the potential use of this line as a connector from the A Line to the NS Main Line during a field investigation on March 13, 2001.

The connection between the original main line and the present A Line, at Dunlop, has been removed and a self-storage complex has been constructed on the old railroad right of way, south of the former junction. Just to the south of this point, Ellerslie Avenue crosses the existing A Line on a new bridge. Ellerslie Avenue also crosses over the old main line nearby. However, the recent construction project that rebuilt the bridge over the nearby A Line removed the bridge over the old main line, as well as most of the earth fill that served as approaches. The roadway is still elevated above the railroad alignment because it ascends to the level of the bridge over the A Line, but is not high enough to provide clearance over the old ACL right of way.

One mile south of Ellerslie Avenue, Temple Avenue crosses the old main line right of way on two separate bridges. These bridges appear to be in fair-to-good shape. Conduit Road, three-fourths of a mile south of Temple Avenue, once crossed the track on a bridge, but the bridge was removed and the railroad cut has been filled in. Highway ramps for the Roslyn Road interchange of Interstate 95 have encroached on the right of way 0.7 mile south of Conduit Road, but there appears to remain enough room to restore the track in this area. Just south of the Roslyn Road interchange, the track begins a curve toward the west of approximately 2 degrees. At the end of this curve the track crossed the Appomattox River on a five-span bridge. The superstructure of this bridge has been removed but the piers are still intact. At the southwest end of the bridge, the roadbed turns back to the south, and eventually east, on a compound curve that in some sections is as sharp as 9 degrees. This was formerly the east leg of the wye track between the ACL and the NS Main Lines. A new road connecting the Pocahontas community to downtown Petersburg has been built on this alignment. The N&W Appomattox Street station is located south of the east-west NS right of way between the two legs of the wye. The

## Task 1 Report – Engineering Feasibility Study

present NS Main Line continues eastward, and meets the Petersburg Belt Line at Poe, four miles east of the station.

**The general assessment of this line is that it would be possible to restore and use it for high-speed rail service.**

### **NS Main Line - Petersburg to Suffolk**

The NS Main Line between Petersburg (Poe), milepost N 77.7, and Brico (Kilby), at milepost N 26.4 (where the NS crosses the CSXT Portsmouth Subdivision), is a double track line, 51 miles long, with not one single curve. An Automatic Block System (ABS) controls train traffic, with each track signaled in one direction between Kilby and Disputanta (42 miles), and bi-directional signals between Disputanta and Poe (9 miles). The average block length (distance between signals) is four miles. Current freight train speed on the line is 60 mph for intermodal trains and 50 miles per hour for other freight trains. Rail is a mixture of main line quality 132RE and 136RE<sup>4</sup> laid on large tie plates, main line ties, and a deep ballast section. Rail, ties, surface and alignment are all in very good condition. This track presently is maintained to FRA Class 4<sup>5</sup> standards that would allow passenger train operating speeds of 79 miles per hour.

Federal Railroad Administration (FRA) regulations require that, where any train operates at a speed of 80 or more miles per hour, there must be in place an automatic cab signal, automatic train stop or automatic train control system. The current ABS system on the NS Main Line has none of these additional systems, and therefore it is limited to a top speed of only 79 miles per hour. The four-mile long blocks presently in place are long enough to provide adequate stopping distances for 110 miles per hour passenger train speeds, but the installation of either an automatic cab signal, an automatic train stop, or automatic train control system would be necessary in order to allow the higher speeds contemplated for the Richmond to South Hampton Roads High-Speed service<sup>6</sup>.

There is currently only one passing siding on the line between Poe and Kilby. The "Ivor Middle Track", located at Milepost 44 (one third of the way from Kilby to Poe) is only slightly more than one-half mile long. Minimum siding length for meeting or passing today's freight trains is six to eight times this length. Segments of third track between the two main tracks, connected at both ends, existed at one time in a number of locations.

Siding locations and lengths in 1979 were as follows:

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<sup>4</sup> Rails are described in terms of their weight in pounds per yard and the cross section of the rail, e.g. RE. 132RE and 136 RE rail sections generally are installed on high-density heavily traveled freight lines.

<sup>5</sup> Following a series of major derailments in the 1970s, the Federal Railroad Administration was given statutory authority to define track safety standards for all U.S. railroads. These standards defined nine track classes, with Class 1 being the lowest and Class 9 the highest. Specific geometry and condition standards were established for each class of track, and speed limits (defined separately for freight and passenger traffic) also were defined. Specific signal and train control standards also were developed for higher-speed track.

<sup>6</sup> NS is not convinced that, considering the present state of signal and train control development, 110 mph trains can coexist with freight trains on the same track without cumbersome and inefficient limitations being placed on freight train operation. Therefore, it is NS's position that any tracks over which passenger trains operate at above 90 mph must be completely separate from (but may be parallel to) tracks where freight trains operate.

## Task 1 Report – Engineering Feasibility Study

Location	Milepost	Length (Feet)
Myrtle	N 30.2	8282
Ivor	N 47.7	9504
Wakefield	N 54.5	8511

These "middle tracks" provided for faster trains to overtake slower ones (e.g., passenger trains overtaking freight trains) as well as locations for staging coal trains for the coal export facility at Norfolk. The introduction of high-speed passenger trains with a potential speed differential greater than 50 miles per hour would require an increase in capacity, and some of these middle tracks could be restored.

Traffic levels on this line segment have declined in recent years due to the decrease in demand for export coal. The following table illustrates this decline:

Year	U.S. Coal Exports (Thousand Short Tons)
1989	100,815
1994	71,359
1995	88,547
1996	90,473
1997	83,545
1998	78,048
1999	58,476
2000 (est.)	58,368

*Source: U.S. Department of Energy*

The U.S. Department of Energy projects that the level of coal exports will stabilize, with the volume settling at 56 million tons by 2020. This is slightly more than half of the 1989 volume. NS reports that its export coal volume in 2000 was 19.8 million tons (down from 40 million tons ten years ago) and that volume at Lambert's Point in Norfolk dropped by 500,000 tons from 1999 to 2000. This reduction in coal exports results in reduced numbers of coal train volumes on the NS main line between Petersburg and Norfolk, making implementation of passenger service somewhat easier than it would have been ten years ago.

### **Suffolk to South Norfolk**

High-speed rail service could utilize either the Norfolk Southern main line or the combination CSXT/VGN route between Kilby and South Norfolk. The two have significant similarities. The primary difference is the high level of traffic on the NS line, when compared to the CSXT line. The following table provides a comparison of the two routes:

## Task 1 Report – Engineering Feasibility Study

Characteristic	NS	CSXT/VGN
Length (miles)	21.9	21.55
Maximum Curvature (degrees)	2	1.7
Curved Trackage (feet)	13,500	12,300
Public Highway Grade Crossings	13	15
Railroad Grade Crossings	2	1
Current Maximum Speed	50	49/10
Drawbridges	1	1
Daily Trains	21.5	6.6/<1

The CSXT line also has the advantage of a better suburban station site, at Bowers Hill. Preliminary study indicates that it is superior to any potential site on the NS Main Line.

### **The Brico Connection**

The possibility of establishing high-speed passenger service on the CSXT line from Kilby to Algren, thence on the former Virginian Railway from Algren to South Norfolk, has been examined as an alternative to avoid the heavily used NS main line. This diversion would require a new connection at Brico, just west of Kilby.

Located 3 miles west of downtown Suffolk, Kilby is where the double track NS main line crosses over top of the former VGN right of way as well as the CSXT Portsmouth Subdivision at a 43-degree angle. U.S. Highway 58 crosses over all three railroads on two overhead bridges at a 90-degree angle to the NS main line. A connection between the CSXT and NS lines exists in the southwest quadrant of the intersection, but it is not in the proper quadrant for passenger train movements. A potential connection in the preferred northeast quadrant is blocked by the large earthen fill approaches to the U.S. 58 highway bridges. The recommended alternative is a “jug handle” connection in the southwest quadrant that would connect the NS Main Line from Petersburg to the CSX Portsmouth Subdivision to Portsmouth.

### **CSXT Portsmouth Subdivision - Kilby to Algren**

The CSXT Portsmouth Subdivision is a single-track line running between the A Line at Weldon, NC and Portsmouth. It passes under the NS Main Line at Kilby (MP 20.1) and crosses the VGN at grade at Algren (MP 9.5), a distance of 10.6 miles. The track was in fair condition at the time of PTG’s field inspection, but CSXT was performing tie installation, track surfacing and road crossing rebuilding on this entire stretch of line. The line is tangent for its entire distance except for three curves in Suffolk, none of which exceed 1 degree 15 minutes, and the maximum grade is .55 percent. The current track speed is 49 miles per hour except for a two-mile speed restriction in Suffolk of 25 miles per hour. Maximum speed is limited by the lack of a signal system on the line. The rail is welded, and in good condition.

The line’s favorable geometry makes it a good candidate for high-speed rail service; however, the numerous grade crossings present potential problems that would need to be addressed.

### **Former VGN Jarratt Subdivision - Kilby to Algren**

The right-of-way of the abandoned VGN Jarratt District parallels the CSXT Portsmouth Subdivision between Kilby and Algren, and could serve as an alternative to the CSXT alignment. The two lines are from 25 to 300 feet apart. The VGN right of way is mostly intact, but the following problem areas would need to be addressed:

## Task 1 Report – Engineering Feasibility Study

- The Broad Street bridge over the railroad in Suffolk has been recently rebuilt, and the profile of the span over the VGN may have been changed;
- The railroad station on Main Street in Suffolk has been restored as a museum and a parking lot has been built on the VGN right of way;
- A tourist line has been proposed that would use the right of way for a short distance to the east before turning northward on the former NF&D right of way;
- The superstructure of the single span bridge over Shingle creek, east of Suffolk, has been removed, although the abutments remain; and
- The line is close enough to CSXT in most locations that grade crossing signal systems would have to be integrated with the existing CSXT systems.

It may not be necessary to use the former VGN line because the parallel CSXT line is so lightly used, however, it is considered to be a candidate for restoration and use as a high-speed rail route, pending further study. The entire line could be utilized if negotiations to use the CSXT line are unsuccessful, or parts of the line could be used to expand capacity on the single track CSXT line.

### **Former VGN Jarratt Subdivision - Algren to South Norfolk**

The VGN alignment crosses from the north side of the CSXT Portsmouth Subdivision to the south side at Algren, (CSXT MP SA 7.5, NS MP V 15.4). Presently, the track begins a short distance to the east of that crossing. The first two miles of the track are out of service and overgrown. The in-service portion of the line begins at milepost 13, just west of the Military Highway overhead bridge. The track extends eastward to milepost 6.9, where it crosses the South Branch of the Elizabeth River on a vertical lift bridge. The line then turns to the north to connect with the NS main line at South Norfolk (milepost V 5.2) where the VGN crossed the N&W on its way to the Sewells Point Terminal. This equates to MP N 3.3 on the NS Main Line to Lamberts Point. The proposed route continues on the NS main line to Bridge 5, a moveable bridge, located 2.03 miles north of this connection. Downtown Norfolk is to the west, and the proposed passenger terminal location is located immediately north of Bridge 5.

Although once a main line track, the Jarratt Subdivision is now a switching lead. It has a mixture of 100 and 131-pound rail, none of which is welded. Train speed is currently limited to 10 miles per hour. Movements on this line were once governed by a traffic control system, but this system is no longer in service.

The line is tangent from Algren to the west approach for the South Branch Drawbridge (milepost V 7.2). It curves to the south to cross the bridge, then curves to the north after crossing the bridge. In this curve the line crosses the Norfolk & Portsmouth Belt Line (NPBL) at grade at Belt Junction (milepost V 6.5). The line is tangent for the last mile to South Norfolk, where it crosses the NS main line.

This line, when upgraded, could be used for passenger service. The tangent track between Algren and the South Branch drawbridge could be operated over at high speeds, but the residential neighborhoods adjacent to the line, and the (currently) seven public highway grade crossings, must be addressed. The segment between the South Branch drawbridge and South Norfolk includes speed limitations at the drawbridge, the NPBL crossing, the two curves, and the South Norfolk interlocking.

### South Hampton Roads Terminal

Discussions with DRPT and local officials reveal a strong state and local preference for bringing the Richmond to South Hampton Roads High Speed Rail service as close as possible to downtown Norfolk. The most direct rail route into downtown Norfolk is via the NS main line over Bridge 5. The most advantageous available location for the Norfolk passenger terminal is adjacent to the Harbor Park baseball stadium, just north of Bridge 5.

Bridge 5 is a double track, bascule-type moveable bridge spanning the Eastern Branch of the Elizabeth River. A parallel and adjacent span, Bridge 5A, is a single-track bridge similar to Bridge 5. Bridge 5A is kept in operating condition, but is not currently in use, and is not connected to operating tracks at either end. A reconnected Bridge 5A potentially could be utilized for freight train movements and would free one of the existing tracks on Bridge 5 for passenger train movements.

There is approximately 1000 feet of track between the north end of Bridge 5 and the Park Avenue (referred to as *Lovitt Avenue*, its former name, in Norfolk Southern records) grade crossing, and there is adequate space to the west of the current tracks to install additional tracks. With adjacent parking at the stadium and convenient access to I-264, this location is well suited for the location of a passenger terminal.

### Analysis of Critical Locations

Except for the CSXT A Line, the rail lines involved in the study essentially have been freight lines for more than 30 years. Development of a reliable high-speed route has required an analysis of numerous locations and stretches of rail line to define a rail network that reliably would support projected future freight and passenger operations. The evaluation of current conditions and potential improvements to support high-speed passenger services to South Hampton Roads has been coordinated for consistency with planned improvements for the *SEHSR Corridor* (Richmond-Charlotte, NC) services, particularly in the common Richmond—Petersburg section. Both high-speed services must be planned and designed to:

- Provide cost-effective improvements necessary to increase capacity on existing rail lines;
- Provide one station in the Petersburg-Ettrick-Colonial Heights area that can serve all current and proposed passenger trains (South Hampton Roads Service to Norfolk, SEHSR Service to Charlotte, and current Amtrak Service to Florida);
- Coordinate train schedules in the “shared” corridor among South Hampton Roads, Charlotte, and existing Amtrak (long-distance) trains; and
- Minimize conflicts with freight operations.

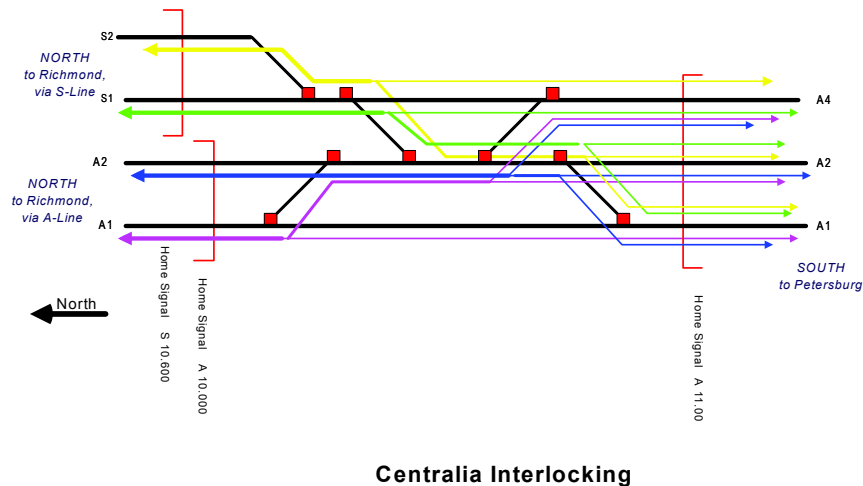
### The S Line from Main Street Station to Centralia

The South Hampton Roads High-Speed service would utilize the CSXT S Line between Richmond, VA, and Centralia. Previous studies for the *SEHSR Corridor* have identified improvements to the S Line necessary to operate high-speed passenger service over the line, including restoration of a second main track between Rocketts (MP S 0.7) and Centralia (MP S 11.0), and installation of universal interlockings at “Dale” (S 4.7) and “Falling Creek” (S 7.0). Combined with signal system improvements, this route would

## Task 1 Report – Engineering Feasibility Study

provide entry into the restored Main Street Station in downtown Richmond, VA, for all passenger trains operating from the south.

The S Line between MP S 10 and Burgess has been abandoned since the late 1960s. A connection between the S Line and the A Line was constructed at Centralia Interlocking when the S Line trackage was removed. Subsequent development and highway construction prevent this portion of the S Line from being restored. Therefore, the connecting track would be retained and Centralia Interlocking upgraded, as shown in the diagram, to improve the connectivity of the two lines.



**Notes: Yellow indicates routes to/from Track S2; Green indicates routes to/from Track S1;**

**Blue indicates routes to/from Track A2; and Purple indicates routes to/from Track A1.**

The new interlocking at Centralia would provide universal route access, while providing route separation for passenger trains, operating primarily between the S Line and track A4, from freight trains operating mainly on tracks A1 and A2.

### Centralia to Petersburg

A third track, designated for passenger use, would be constructed on the east side of CSXT's "A Line" between Centralia (MP A 10.6) and one of several proposed diverging points on the north side of Petersburg. The construction of this third track eliminates the need to restore the old S Line between Centralia and Petersburg (Ettrick) previously planned for the *SEHSR Corridor*<sup>7</sup>. This added track (A4 main track) would be the preferred track for passenger operations, both north- and southbound, and would provide

<sup>7</sup> The alignment described in the draft *Potential Improvements to the Richmond – Charlotte Railroad Corridor* Report prepared by PTG for the FRA.

## Task 1 Report – Engineering Feasibility Study

passenger trains access to the S Line, to Richmond, without crossover movements and conflicts with CSXT’s freight operations on the A Line.

### Petersburg

Where and how passenger trains between Richmond and South Hampton Roads would pass through Petersburg is the key critical issue to be addressed. A direct rail connection at Petersburg from Richmond to South Hampton Roads has not existed for years. Recent developments and construction make re-institution difficult, but not impossible. Five different route alternatives have been identified, each having different impacts on operations, and each requiring different levels of capital investment to construct. The route selection criteria are:

- Provide one station in the Petersburg-Ettrick-Colonial Heights area that can serve all current and proposed passenger trains;
- Minimize operating conflicts with freight trains by minimizing the need for “crossing” moves (when a freight or passenger train must move across other tracks to use a connection);
- Avoid operating *passenger* trains through busy freight yards;
- Minimize the capital cost of bridges, structures, and additional tracks required; and
- Provide segments of track where passenger trains can run or stop at stations, clear of freight trains.

The five connection alternatives, discussed in detail below are the:

- North Collier Connection (A line to NS Belt Line),
- Secoast Connection (S Line to NS Belt Line),
- West Connection (S Line to NS Main Line),
- Ettrick Connection (A Line to NS Main Line via Ettrick Station), and
- Dunlop Connection (A Line to NS Main Line via original ACL main line through Colonial Heights).

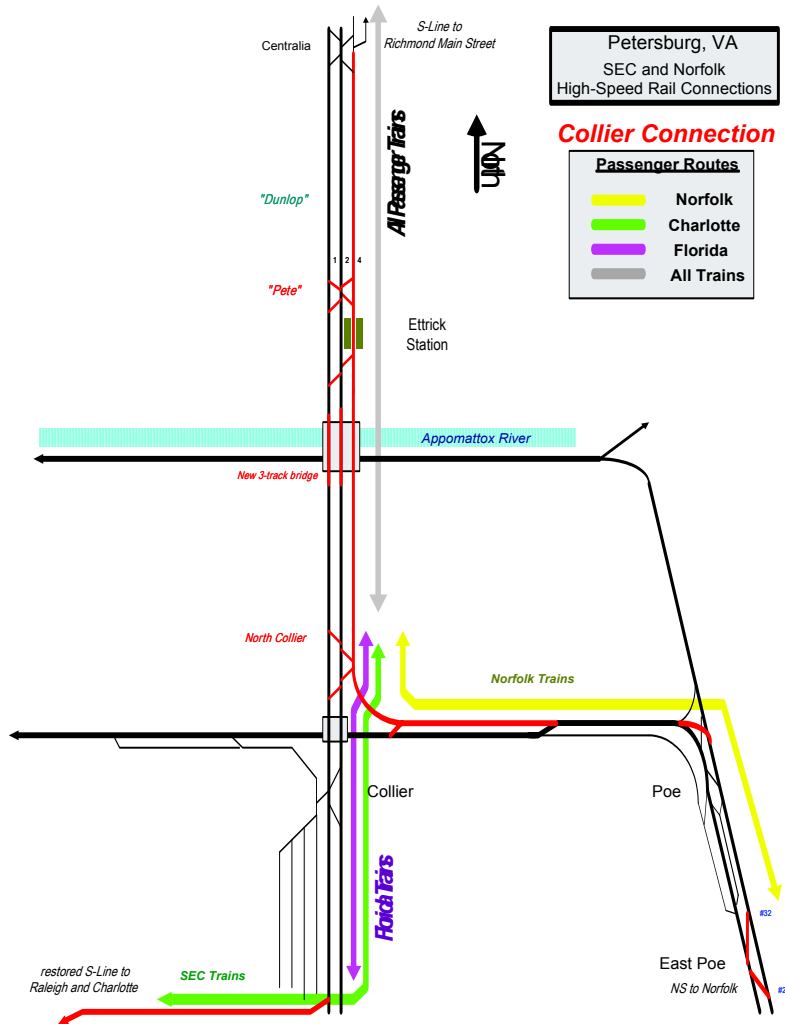
The first two options would use the NS Belt Line, passing south of Petersburg. The other three would use the older NS Main Line. The Main Line appears to have an advantage in avoiding the considerable amount of freight traffic on the Belt Line. Using the Belt Line for passenger trains would require an additional track over the segment between North Collier and Poe.

On the other hand, it might be necessary to double-track the Belt Line in order to reduce the need to run freight trains on the Main Line. The level of freight traffic projected would affect this, and further study of activity and capacity would be required.

Preliminary investigation indicates that the cost of upgrading either line would be approximately the same if double tracking of the Belt Line were required.

Recently, it has been recommended that the north – south route for A- and S Line trains be revised from that initially recommended in the study prepared for the FRA. Rather than restoring the S Line between Centralia and Burgess, it has been determined that intercity and SEHSR trains would operate on an upgraded A Line through Petersburg, between Centralia and South Collier. Trains for stations on the A Line would continue southward, while S Line trains would utilize a restored Burgess Connection between South Collier and Burgess to access the S Line to Raleigh. Ettrick would remain the location of the intercity passenger station.

# Task 1 Report – Engineering Feasibility Study



## Collier Connection

The *Collier Connection* would involve building a track connection in the northeast quadrant from the CSXT A Line, just north of Collier Yard, to the NS Petersburg Belt Line. This could be the least complicated of the five alternatives to construct, depending on the difficulty in interfacing with the Halifax Road grade separation, currently under construction, but it requires a new high bridge, with three tracks over the Appomattox River. Initial investigation indicates that it could be built entirely east of the Halifax Road highway project, but further study is necessary. This connection would allow the continued use of the existing Petersburg passenger station at Ettrick, north of the Appomattox River. Use of this alternative would require:

- Operation of all passenger trains, including Florida and SEHSR Corridor trains, on the A Line between Centralia and Collier;
- Construction of a third main track, at least to the connection at North Collier;

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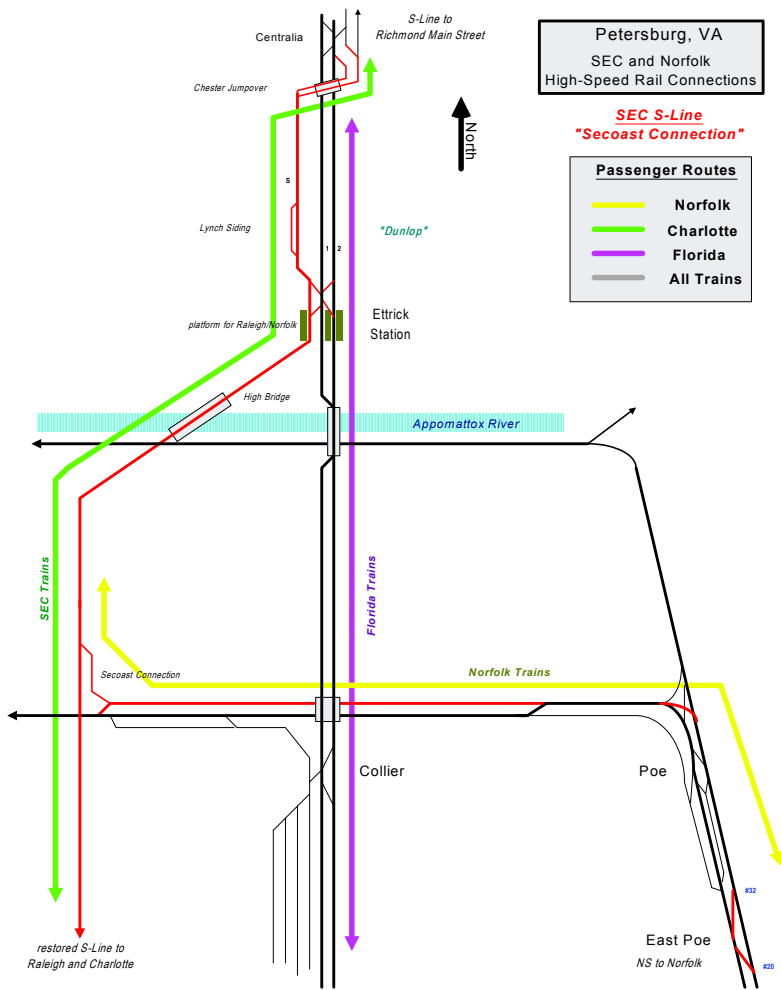
- Replacement of CSXT’s existing single-track bridge over the Appomattox River with a new three-track structure (This would eliminate the need to construct planned new bridge for the restored S Line over the Appomattox River).
- Restoration of CSXT’s connection from South Collier (Rheems) to the restored S Line at Burgess.
- A second main track might also need to be installed on the NS Belt Line between Poe and Collier. Bridges and grading already are in place to accommodate the second-track.

### Disadvantages

The connection might be complicated by the interface with the new highway overpass for Halifax Road. The development of the adjacent property is a potential physical impediment. While relatively simple to build, the *North Collier Connection* would require an additional main track on the NS Belt Line between North Collier and Poe. A new interlocking would have to be built on straight track at East Poe to avoid the need to provide turnouts on the superelevated curve at Poe. Additionally, the replacement bridge over the Appomattox River will be expensive to build.

While relatively simple to build, the *Collier Connection* would be an adjunct to a SEHSR route via South Collier that would present substantial operating issues unless a significant expenditure was included to separate southbound passenger trains from freight trains, including a jumpover at South Collier.

# Task 1 Report – Engineering Feasibility Study



## The Seacoast Connection

The *Seacoast Connection* takes its name from the interchange between CSXT (former Seaboard Coast Line) and NS Belt Line, west of Collier. The connection is a logical outgrowth of the planned restoration of the S Line for SEHSR Corridor high-speed service to Charlotte, N.C., if the S Line were restored north of Burgess. This concept would require construction of a new bridge over the Appomattox River for the S Line, upstream from the current CSXT A Line Bridge, and restoration of the S Line<sup>8</sup> southward from that point. South Hampton Roads trains would traverse the S Line from the station at Ettrick to connection in the northeast quadrant at the intersection of the S Line and the NS Belt Line, and then use the NS Belt Line to go eastward.

This option would require:

- Reconstruction of the S Line between Centralia and Petersburg, including

<sup>8</sup> Improvements defined in the draft Richmond to Charlotte Report.

## Task 1 Report – Engineering Feasibility Study

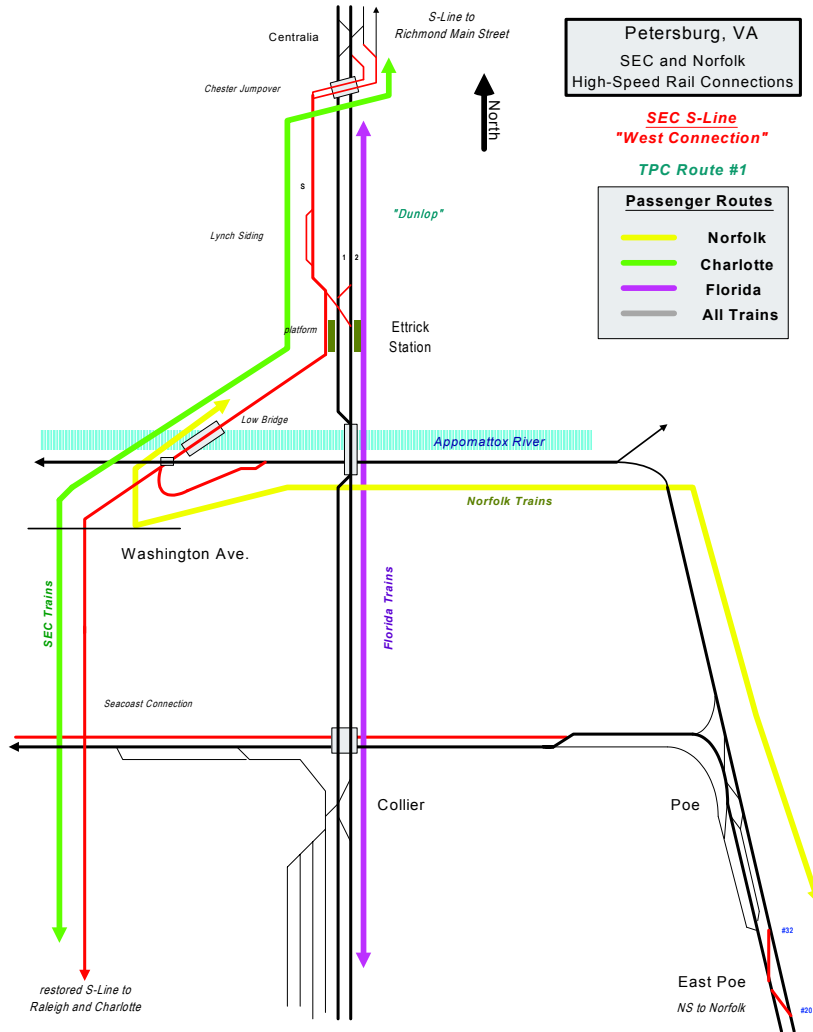
- - Construction of the Chester Jumpover to enable the S Line to crossover the A Line,
- - Revision of Ettrick Station to include a third track through the station and a second platform,
- Construction of a “high” bridge over the Appomattox River for the S Line;
- Reconstruction of the S Line between the Appomattox River and Burgess,
- Construction of the Secoast Connection between the S Line and the NS Belt Line, and
- Double tracking the NS Belt Line between Secoast and Poe.

Similar to the Collier Connection, the Secoast Connection would require the South Hampton Roads passenger trains to utilize the NS’s Belt Line, thereby, necessitating the undesirable commingling with their freight operations at Collier and Poe.

### **Disadvantages**

The connection would take right-of-way from the Virginia State University experimental farm for the connecting track from the Ettrick Station to the bridge. Similar to the North Collier Connection, the Secoast Connection would require the South Hampton Roads passenger trains to utilize the NS’s Belt Line. It would require an additional main track on the NS Belt Line between Secoast and Poe. A new interlocking would have to be built on straight track at East Poe to avoid the need to provide turnouts on the superelevated curve at Poe. Furthermore, more of the S Line would have to be restored, including the crossing of Washington Street, and a new Appomattox River bridge that would not be available to A Line trains.

# Task 1 Report – Engineering Feasibility Study



## The West Connection

The *West Connection* would connect a restored S Line to the NS Main Line through Petersburg, instead of the Belt Line. A low-level bridge would be constructed for the S Line about one-half mile upstream from the existing A Line bridge, with a low-speed connection to the NS Main Line on an eight-degree curve from the S Line. This connection would retain the existing Ettrick station and would not require changes to CSXT freight and Amtrak long-distance operations south of Petersburg.

The *West Connection* addresses the desire to minimize the commingling of passenger and freight trains through Petersburg by using NS's Main Line through Petersburg instead of the Belt Line. The concept includes a low-speed eight-degree connection from the restored S Line onto the NS Main Line by means of a proposed S Line bridge over the Appomattox River, which would be located west of (upstream from) the existing CSXT A Line bridge. It would be lower and less expensive to build than the high structure required for the Seacoast Connection, but there are trade-offs involved, as noted below. All passenger trains would continue to use the existing Ettrick station, and like the

## Task 1 Report – Engineering Feasibility Study

*Secoast Connection*, the planned restoration of the separate S Line from Centralia to Petersburg, the “jumpover” of the A Line at Centralia, and the use of new and separate passenger platforms on the west side at Ettrick station would be required.

### **Advantages**

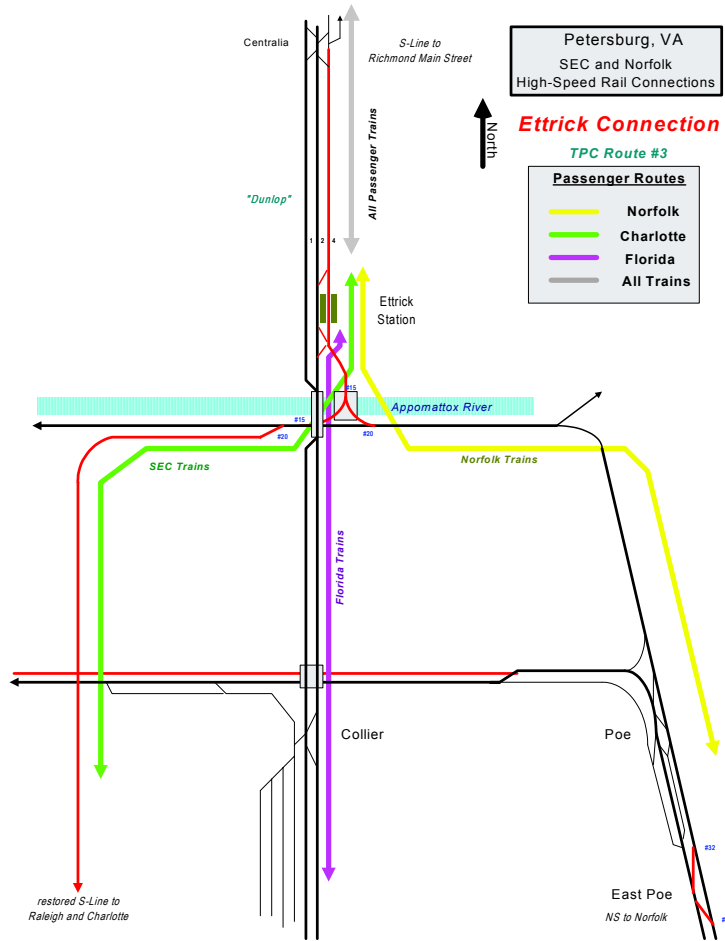
The *West Connection* would retain the features of the proposed SEHSR Corridor plan and permit South Hampton Roads trains to use the NS Main Line through Petersburg, avoiding freight conflicts at Poe, on the NS, and at CSXT’s Collier Yard. This connection would retain the existing Ettrick station and would require no changes to CSXT freight and Amtrak long-distance operations south of Petersburg.

### **Disadvantages**

A bridge that would enable the S Line to go under both the NS Main Line and Washington Street would require a steep approach on the north bank, and a bridge deck that would almost be at the level of the river. The connection would take right-of-way from the Virginia State University experimental farm for the track from the Ettrick Station to the bridge, and would require a 30-foot deep cut through the center of the farm to descend to the level necessary to pass under the NS Main Line. Although the bridge would be lower and less expensive to build than any high level bridge for either the A line or S Line, this would be offset by the need to tunnel under the NS Main Line in order to make the connection to it, and the fact that the bridge over the river would not be available for A Line trains. The connecting track from the S Line onto the NS Main Line would require a sharp, slow speed eight-degree curve. The Bridge over the Appomattox River that would be required for this connection is located considerably west of the existing CSXT A Line Bridge. It would add about two miles distance over any other South Hampton Roads alternative.

The *West Connection* would require construction of a new platform at the Ettrick Station, for the use of Charlotte and South Hampton Roads trains, as well as a third track. Because South Hampton Roads and S Line trains would use a different platform from A Line trains, underground or overhead passageways and elevators would be required for access. Finally, as with the Secoast Connection, a greater portion of the S Line would have to be restored.

# Task 1 Report – Engineering Feasibility Study



## Etrick Connection

Further consideration resulted in the development of alternatives that would use the NS Main Line, rather than the Belt Line, while simplifying the construction requirements of the connection. The *Etrick Connection* was developed to retain the operating benefits of using the A Line and the Etrick Station and the NS Main Line. The *Etrick Connection*, which begins south of Etrick Station, consists of a track on the east side of the A Line that descends to the level of the NS Main Line across the Appomattox River. A low level-bridge would be constructed to connect to the NS Main Line, eastward. Optionally, the bridge could provide a Wye connection to the NS Main Line, westward, for Raleigh-bound S Line trains.

### Advantages

The Etrick Connection:

- Substitutes a low-level bridge for the more expensive high-level S Line bridge upstream, west, of the A Line bridge;
- Retains the existing station, and
- Provides a passenger train route to South Hampton Roads that does not require use of the NS Belt Line.
- SEHSR Corridor trains would:
- Operate on the existing A Line alignment to the Etrick Station,

## Task 1 Report – Engineering Feasibility Study

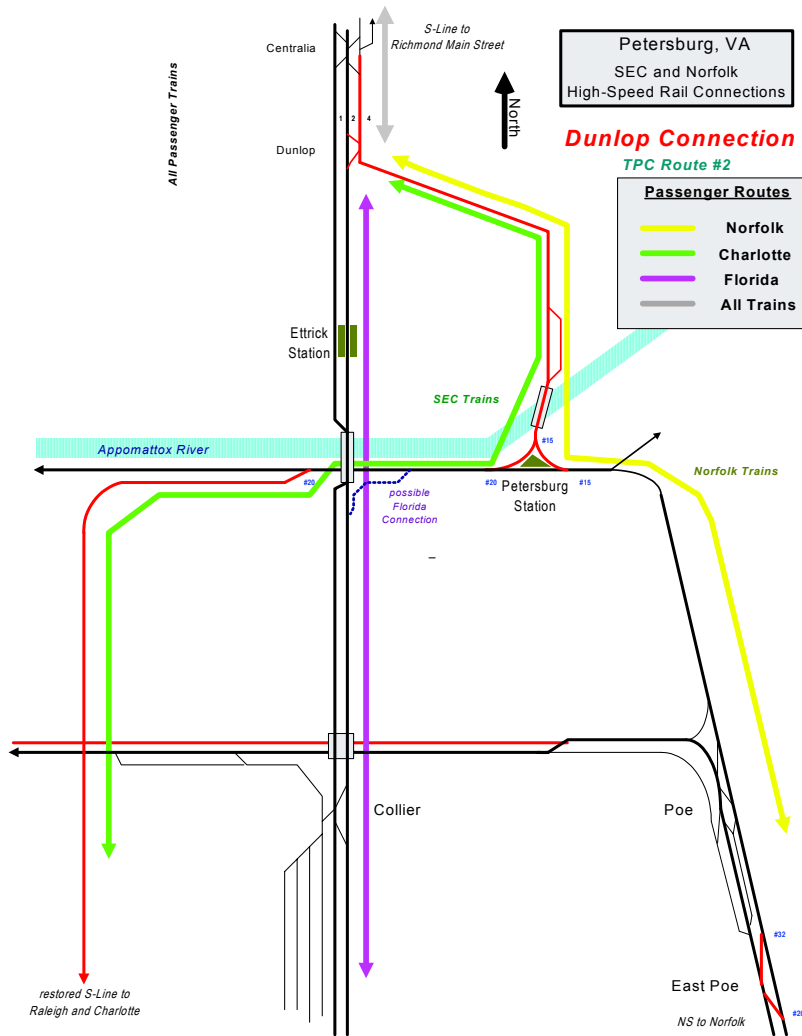
- Use the west Wye Track of the low-level bridge, then
- Connect onto the NS Main Line immediately west of the A Line bridge (the NS Main Line and the S Line are at the same elevation), and
- Connect to the proposed restored S Line alignment.

### Disadvantages

The Ettrick Connection would:

- Require construction of a new bridge over the Appomattox River with a slow-speed connection at its south end to the NS Main Line;
- Take right-of-way from the Virginia State University experimental farm property for the connecting track from the Ettrick Station to the bridge;
- Require lower speed operations through the approach tracks' curves and switches because of the geographical constraints existing at the connection site; and
- Require high-speed trains to operate over a short-segment of the NS Main Line, creating the need for cooperation between CSXT and NS dispatchers.
- Should the S Line be included, it must be restored north of Burgess, and construction of a more complex bridge with a “Wye” connection to the NS Main Line in both directions, a complex and unusual bridge design, would be required, as well as a connection from the NS Main Line to the S Line (to Raleigh) with grade-separated crossing of Washington Street.

# Task 1 Report – Engineering Feasibility Study



## The Dunlop Connection

The last alternative, the *Dunlop Connection*, would involve restoration of the original Atlantic Coast Line Railroad route from Dunlop to Petersburg, including reconstruction of the superstructure of the old railroad bridge over the Appomattox River and restoration of the Wye connection with the NS Main Line. Should the S Line be restored north of Burgess, separate platforms for South Hampton Roads and Charlotte trains would be required along with a connection to the restored S Line from the NS Main Line. Should the A Line trains be routed to the downtown station in Petersburg, construction of *The Battersea Connection*, between the NS Main Line and the A Line, south of the Appomattox River bridge would also be required. This connection would skirt the grounds of the Battersea Mansion, for which the connection has been named, and enable all Amtrak trains to reach a single downtown Petersburg station, permitting the Ettrick station to be closed. If the Battersea Connection should prove to be infeasible, a single station that could serve all trains would have to be located north of Dunlop. The *Dunlop*

## Task 1 Report – Engineering Feasibility Study

*Connection* requires a less-expensive bridge to cross the river, and permits the use of a single passenger station for all Amtrak trains in downtown Petersburg.

### **The Battersea Connection**

An important element of the consolidation all train service at a downtown Petersburg station is the Battersea Connection, a “south side” connection for A Line trains. The proposed 40 mph connection would extend 3,000 feet, from the NS Main Line to the A Line, immediately east of the CSXT A Line bridge, at a point north of the Washington Street Bridge. It would skirt the grounds of the Battersea Mansion, for which it has been named, on a sweeping 5-degree curve and a 1.75-percent grade. The connection would require a substantial length of fill to avoid the mansion. Number 20 turnouts, permitting 40 mph are proposed at each end of the connection.

### **Alternative station location**

If the Dunlop Connection is preferred and the Battersea Connection should prove to be infeasible, a station that could serve all trains would have to be located north of Dunlop. This is necessary to include A Line trains at a single station.

### **Operations**

All trains would operate over the existing A Line, expanded to three tracks, between Centralia and Dunlop, and then use the old ACL line to the Petersburg Station. South Hampton Roads trains would:

- Use the east Wye Track at the station,
- Continue on the NS Main Line to Poe.
- SEHSR Corridor and Florida trains would:
- Use the west Wye Track at the station,
- Continue onto the NS Main Line immediately west of the station, and
- Continue onto either the proposed restored S Line alignment west of the existing A Line bridge, or the Battersea Connection to the A Line.

The Petersburg station would be rehabilitated and used by all trains, but two separate platforms would be required. There would be one on the east leg for south Hampton Roads trains, and another on the west leg for A- and S Line trains.

### **Advantages**

The Dunlop Connection:

- Eliminates the need for any new S Line bridge upstream;
- Provides the opportunity for a single passenger station for all Amtrak trains in downtown Petersburg;
- Provides a passenger train route eastward to South Hampton Roads that does not require use of the densely trafficked NS Belt Line; and
- Provides the easiest crossing of the Appomattox River, at its narrowest point, and at the lowest elevation.

### **Disadvantages**

- Buildings and new highway construction compromise the proposed alignment in the vicinity of Ellerslie Road, at Dunlop.
- Portions of the old right-of-way have either been sold or have been encroached upon.
- Some bridges that provided grade separation have been replaced by fill.
- The Battersea Connection adds to the cost, and adds to travel time.

## Task 1 Report – Engineering Feasibility Study

- High-speed trains would have to operate over a short-segment of the NS Main Line, creating the need for interaction between CSXT and NS dispatchers.

### Conclusion – Preferred Route Through Petersburg

#### Preferred Route Through Petersburg – Florida and SEHSR Raleigh and Charlotte trains

Recently, it has been recommended that the north – south route for these intercity and high-speed trains be revised from that initially recommended in a study prepared for the FRA. Rather than restoring the S Line between Centralia and Burgess, it has been determined that intercity and SEHSR trains would operate on an upgraded A Line between Centralia and South Collier. Trains destined for points on the A Line would continue southward, while S Line trains would utilize a restored Burgess Connection between South Collier and Burgess to access the S Line to Raleigh. Ettrick would remain the location of the intercity passenger station.

#### Preferred Route Through Petersburg – South Hampton Roads trains:

There are three options that appear to justify further study:

1. Dunlop connection,
2. Ettrick connection, and
3. North Collier connection

Each of these options possesses positive attributes, but each raises concerns in terms of cost, circuitry, and station location. If there is to be one station, the more direct the route to South Hampton Roads, the more circuitous the routes to the south, and vice versa. For example, a downtown Station would require A and S Line trains to use connections from the NS Main Line to continue south.

If a new high bridge and a direct route to Collier are selected for SEHSR improvements, The South Hampton Roads alternatives might require either:

1. Dunlop connection - a separate station,
2. Ettrick connection - a separate bridge, or
3. North Collier connection - avoiding the Halifax Road overpass at North Collier, an additional main track on the NS Belt Line between North Collier and Poe, and a new interlocking East Poe to avoid the need to provide turnouts on the superelevated curve at Poe.

The *Dunlop Connection* and the *Ettrick Connection* fulfill the planning requirements to reduce passenger train conflicts with NS freight operations in Petersburg, but each requires an additional Appomattox River Bridge. Although the Dunlop Connection requires a less-expensive bridge, it requires a restored right of way (that raises substantial neighborhood issues), and a second station (if the other trains continue to use a station on the A Line. The *North Collier Connection* can overcome conflicts with freight operations only at greater expense to provide some additional trackage and interlocking improvements. Further study is required to determine the extent of these tradeoffs.

The final decision on station location and route at Petersburg is not required to complete the other analysis and planning requirements of the study. For rail operations simulation the ***Dunlop Connection*** has been assumed, but keeping the station at Ettrick and using the wye bridge would not compromise the project to South Hampton Roads.

The route should be planned to protect NS's ability to serve the industries of Petersburg and Hopewell, and to freely operate freight trains through the Petersburg area.

## Task 1 Report – Engineering Feasibility Study

### NS Main Line between Petersburg and Suffolk

The NS Main Line between Petersburg (Poe) and Suffolk (Brico) is the primary location for potential operational conflicts. High-speed passenger trains would be overtaking slower freight trains and a primary goal of the study is that high-speed train operations be transparent to freight train operations. Optimizing the Richmond – South Hampton Roads trip time for passenger rail service on a consistent basis – while preserving and enhancing the dependability of the NS freight operations – would require improvements that would increase rail capacity at strategic locations. Reduced trip times and improved capacity would enable the high-speed service to operate reliably without adversely affecting, or being delayed by the large number of long freight trains.

Three strategies were pursued in designing the plant and operations to minimize the probability of schedule conflicts in this critical segment of the corridor:

1. Create track connections, modify interlockings, and make additional operational improvements that would result in segments of track where freight and passenger train conflicts would be minimized in Petersburg (west end) and at Suffolk (east end);
2. Provide a passing siding of sufficient length in the most effective location—a third track to be used by freights—where a passenger trains could overtake and pass a slower train without either train being required to stop;
3. Design passenger schedules so that trains traveling in opposite directions “meet” in terminals or “pass” at locations where freight operations would not be disrupted.

Given their higher speeds, passenger trains would occupy the shared 48.3 mile Poe-Brico main line segment for as little as:

- 110 mph: 27 minutes;
- 90 mph: 33 minutes; or
- 79 mph: 37 minutes.
- 

A 45 mph freight train would take 65 minutes to cover this distance.

The high rate of passenger train speed also would mean that any delay to freight trains held up from entering the Poe-Brico section would be minimal, since the passenger trains would reach the line segment at speed and accelerate away from the freight trains.

Initially a long 12-mile third track, or center siding, is proposed between interlockings at “Waverly” (N59.5) and “47 Crossover” (N46.5). The siding would be long enough to permit freight trains to enter it at 45 mph and proceed at speed through the siding while a passenger train overtakes and passes.

Using the NS’s Main Line through downtown Petersburg (the West, Dunlop, and Ettrick Connections), permits the high-speed South Hampton Roads trains to avoid the yard operations at Poe, where the Belt Line joins the Main Line. Offsetting this advantage might be the need to construct a second track on the Belt Line, by connecting the existing sidings, to allow NS to avoid using the Main Line. This would create a passenger route through Petersburg having minimal interface with freight operations. The Belt Line would continue to be the primary NS freight line, bypassing downtown Petersburg. Passenger trains would operate in both directions on the (westbound) Number 2 track

## Task 1 Report – Engineering Feasibility Study

past Poe Yard (see Figure Poe), and avoid conflicts with freight trains working at the yard, or the automobile unloading facility located to the east.

Connecting the A Line to the Belt Line (the North Collier and Secoast Connections) would route high-speed passenger trains through an area of heavy freight activity. It appears that the following would be required:

- an additional main track on the NS Belt Line between North Collier and Poe, and
- a new interlocking built on straight track at East Poe, to avoid the curve at Poe.

### **Poe Interlocking and Yard**

Norfolk Southern's operations between Norfolk and all other parts of its freight network use the railroad's double track main line from Norfolk, through Suffolk, to Poe, VA, southeast of Petersburg. At Poe, the Main Line continues north into Petersburg, then west along the Appomattox River to Crewe, VA, Lynchburg, and Roanoke. Because of unfavorable grades in both directions on the Main Line, the railroad also operates an 8.86-mile bypass between "Poe" at N 77.81 and "Jack" at N 88.31, called the Petersburg Belt Line. This line is 1.64 miles shorter and has much more favorable grades, particularly eastbound in the heavy tonnage direction. As a result, the Belt Line is used as the railroad's primary freight route, and Main Line is used for some westbound movements and as an emergency and overflow route.

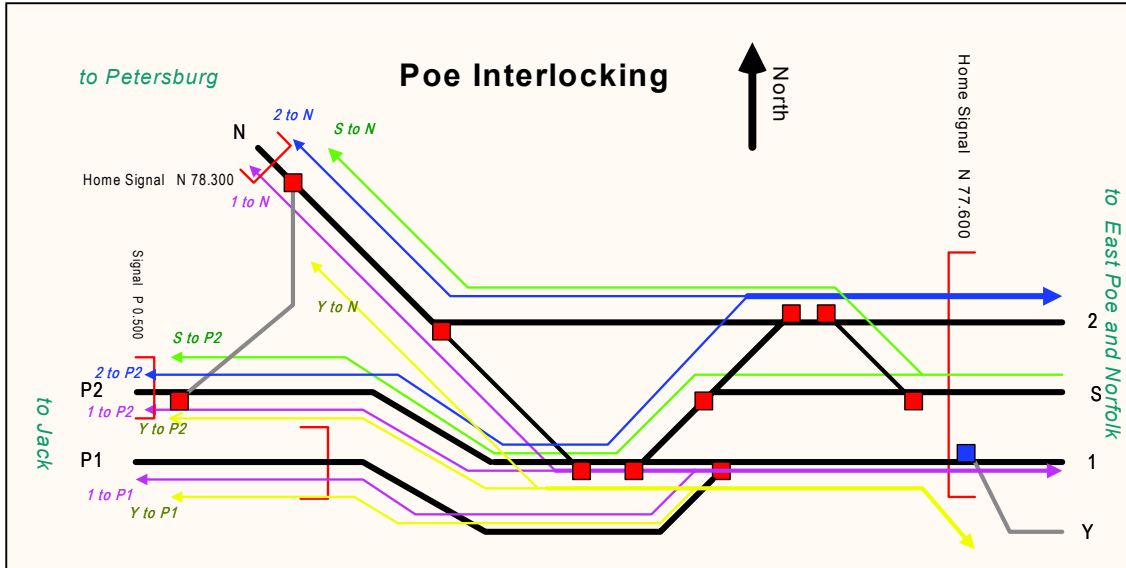
The NS has a small yard and a busy automobile unloading facility at Poe, both of which require freight trains to stop and work for substantial time intervals. These freight trains occupy the siding at Poe, and often occupy the eastbound main track. The Belt Line has a 2-mile siding extending westward from Poe, another 2-mile siding at its west end at "Jack", and a long interchange and setoff siding in its middle at Secoast where NS interchanges with CSXT. Bridges and overhead structures between Poe and Secoast are already built to accommodate a second track.

The NS's heavy use of the Belt line, the congestion that arises from trains stopping and working at the CSXT interchange or at Poe Yard, and the possible need to add track capacity to the Belt Line to maintain quality freight service, indicate that an additional track would be needed on the Belt Line, between North Collier and Poe, on which to move passenger trains.

If the passenger trains were operated on the Main Line, a second track on the Belt Line, consisting of the existing sidings connected by additional track, might be required.

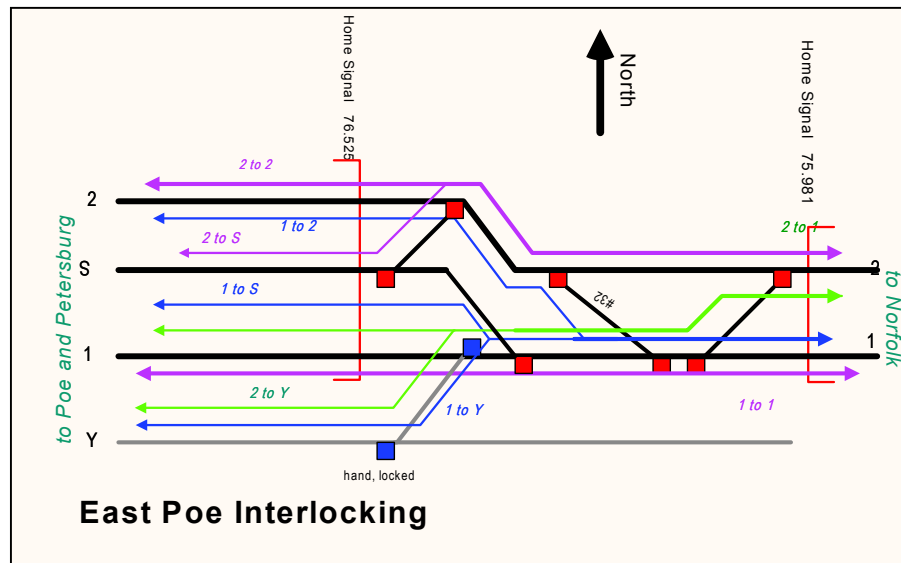
Further study will be necessary to make either of these determinations.

# Task 1 Report – Engineering Feasibility Study



Notes: Green indicates routes to/from Track S, Blue indicates routes to/from Track 2, Purple indicates eastward routes to/from Track 1, and Yellow indicates routes to/from Track Y.

The current Poe interlocking is built on a 1° curve, and presents a complex challenge to creating a passenger “bypass” from the Belt Line to the Main Line going east, particularly when one considers the number of freight trains working at Poe. By using the Main Line to Petersburg, passenger trains could be operated on Number 2 track, on the north side of the right of way, staying clear of the yard and freight operations. South Hampton Roads-bound passenger trains will cross over to the Number 1 main at East Poe, where it is recommended that a high-speed crossover be built to permit 80 mph movements. Normally, a 45 mph crossover would be specified because of the cost. However, since every southbound South Hampton Roads train would use the crossover, the collective reduction in trip time, and the increase in capacity that would result, make this specific application of an 80 mph crossover a justifiable recommendation.

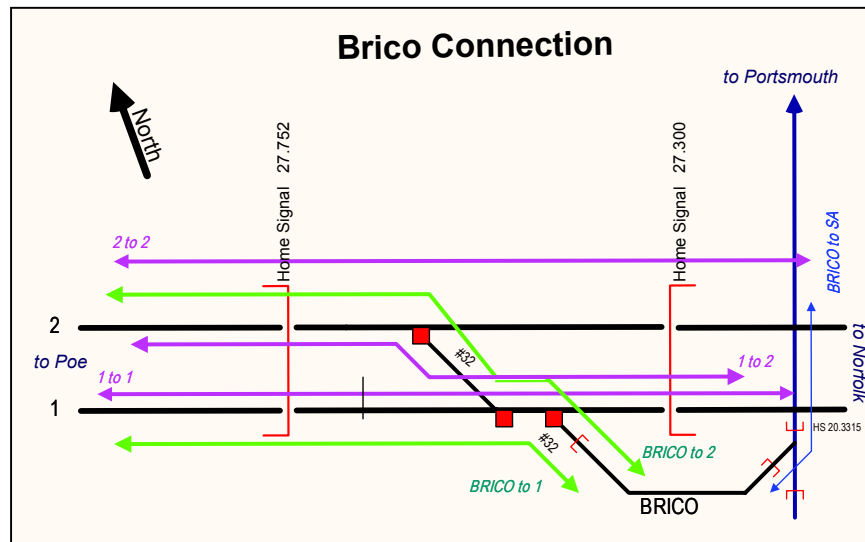


## Task 1 Report – Engineering Feasibility Study

The combination of the difficult layout of Poe Interlocking, on a curve, the presence of freight trains working from Number 1 track or the siding into the yard and the automobile facility, and NS's preference for operating freight trains on the shorter, lower-grade Belt Line, all contribute to the rationale to avoid using the Belt Line for the South Hampton Roads High-Speed passenger service. Conversely, by using a passenger connection between CSXT and NS at North Collier reached by using the NS Main Line, a distinct separation of passenger and freight activities can be maintained. After upgrading and extending the second track between Poe and Jack, NS will only need to operate its daily service to Hopewell Junction, and extra trains, when necessary, over the Main Line.

### Norfolk Terminal

The recommended route for the high-speed passenger service into the Norfolk Terminal minimizes conflicts with freight operations inside the busy terminal area. A high-speed connection is proposed at Brico (N 27.5), west of Suffolk, to connect the NS Main Line with the CSXT Portsmouth Subdivision (milepost SA 20.33). This connection would remove the passenger trains from the NS Main Line and enable them to bypass the terminals and yards at Suffolk and Portlock (South Norfolk).



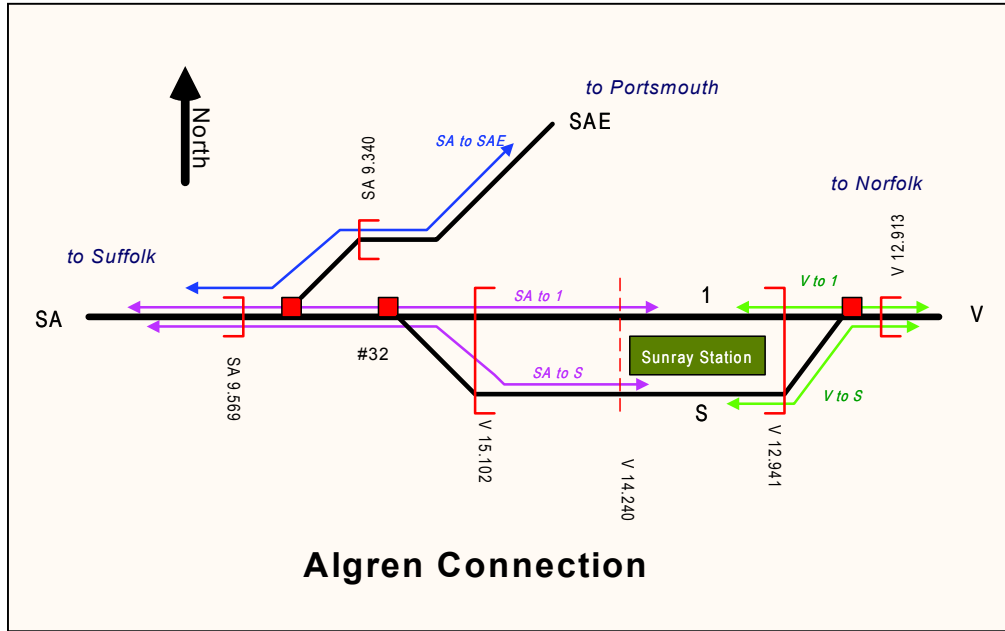
To the east of Brico, the CSXT Portsmouth Subdivision offers a tangent track, with a few easy curves and few grade crossings. The Portsmouth Subdivision intersects the NS's "Virginian" line at Algren (SA9.4).

### Bowers Hill Station

The Hampton Roads markets outside of Norfolk and Portsmouth cover a large geographical area and would be best served by a "beltway" or "suburban" station, with good access to and from the highway system, particularly I-264 and the Hampton Roads Beltway (I-64/664). The benefit to both modes of the interface of rail passenger service and major regional highways has been successfully demonstrated at the New Carrollton, MD station, located north of Washington, DC, on the Northeast Corridor. The present New Carrollton station, constructed in the early 1980s, has proven to be an effective traffic generator.

## Task 1 Report – Engineering Feasibility Study

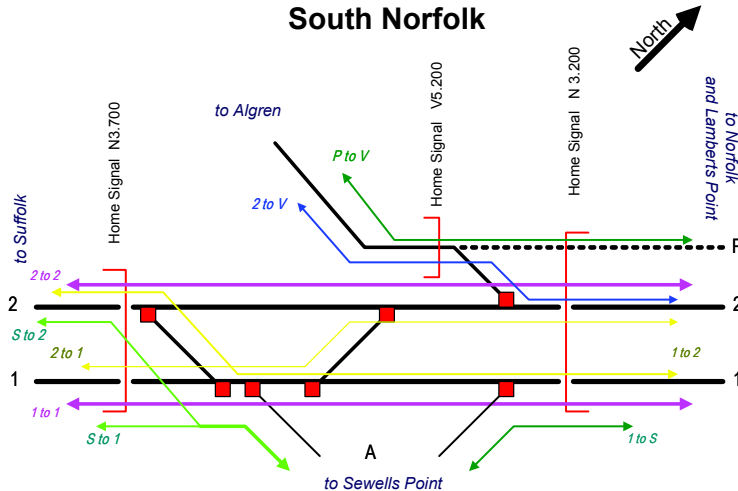
The “beltway station” also offers important market trade-offs for the proposed system. It should be in a location that has both space for parking and other facilities, and good highway access, to attract riders from the widest possible area. An analysis of the rail-highway interface has led the study team to conclude that a station located east of the Algren track connection, at the crossing of Homestead Road, would best serve the projected travel market.



### Access to Downtown Norfolk

Operation over the NS’s “V-Line” (former Virginian main line) between Algren and South Norfolk continues the separation of the passenger operation from the bulk of NS’s freight movements into Norfolk. The single track V-Line between Algren (V15.5) and South Norfolk would require rehabilitation, but is a straight, well-engineered right of way. It includes a drawbridge over the Southern Branch of the Elizabeth River, on the Inland Waterway. This is an unavoidable crossing, since the NS Main Line has its own drawbridge over this navigable waterway a few miles further south. At South Norfolk (V2.3), the passenger route would re-enter the NS main track, but could only operate on the westbound Number 2 main track over bridge 5 into the proposed Norfolk station.

## Task 1 Report – Engineering Feasibility Study



### South Hampton Roads Passenger Terminal

#### Alternative Terminal Locations

Downtown Norfolk and Portsmouth are relatively compact markets that could be served by a station located in either. It is likely that a potential Downtown Norfolk station site near the Harbor Park baseball stadium would be the most desirable location available. It is reasonably close to both downtown Norfolk, and Portsmouth. The location is on the railroad at the east (geographically north) end of Bridge 5, immediately adjacent to the baseball stadium parking lot.

The N&W Norfolk Terminal station was located in the vicinity of Water Street and the Eastern Branch of the Elizabeth River. It has been gone for a number of years, and the area has been developed such that restoring rail service is not feasible. The historic SAL Station building in downtown Portsmouth still exists, however, rail access has been eliminated by recent development around the city hall complex.

At the location proposed for the passenger station, station tracks need to be accommodated within the 1500 feet between Bridge 5 and the grade crossing for Park Avenue (formerly Lovitt Avenue). The location is the closest available to downtown Norfolk, and could share parking and highway access with the stadium. Public transit services, including the planned light rail line could be coordinated with the proposed service.

The site's singular drawback is its relatively small size, and the inability to locate either a maintenance/servicing facility or a convenient wye track or turning loop nearby.

At initial lower frequencies of passenger service, passenger trains would operate on the current Number 2 main track between Norfolk and South Norfolk. If volumes of either freight or passenger trains require it, a dedicated passenger track could be constructed between these interlockings alongside the alignment of Number 2 main track; the eastbound (to Lamberts Point) freight track could be shifted to use the "reserve" Bridge 5A to cross the Eastern Branch, leaving the current westbound track on Bridge 5 for passenger use.

## Projection of Future Traffic and Capacity Requirements

### Freight Traffic

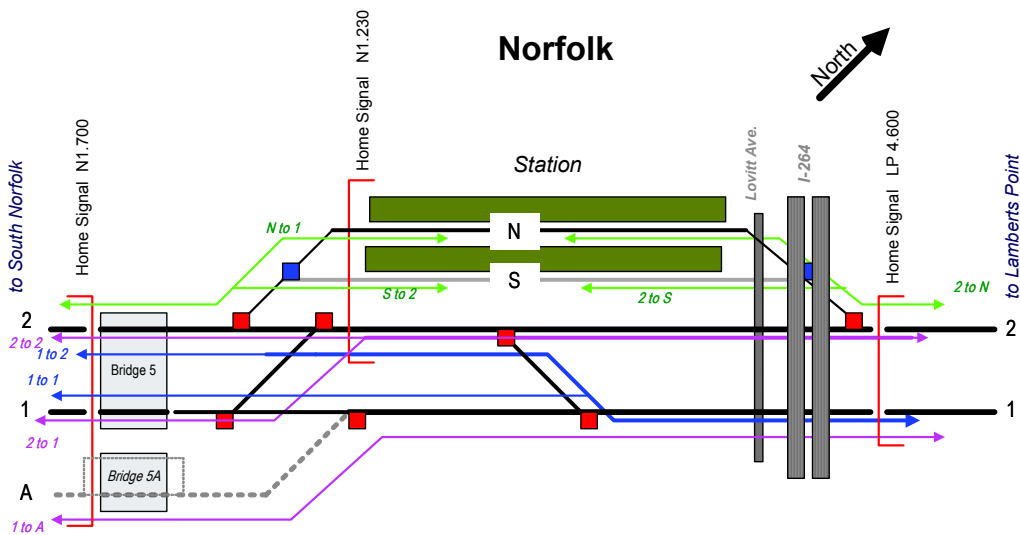
The frequency, schedules, and variability of freight trains on the CSXT and NS main lines are a critical component of the analysis of the South Hampton Roads High-Speed service. CSXT freight traffic on the S Line between Richmond and Centralia, and the A Line from Centralia to Collier, VA, is assumed to be at the same forecasted levels expected by the SEHSR Corridor planning. Current CSXT freight schedules are used, reflecting 12 southbound trains and 14 northbound trains per day between Collier and Centralia. To project future growth in CSXT freight traffic, additional train schedules were added to produce a total of 54 trains/day operating between Centralia and Collier:

- 6 daily coal trains added southbound between Centralia and Collier
- 8 daily trains of empty coal cars operated northbound from Collier to Richmond over the S Line;
- 3 daily merchandise (and municipal waste) train pairs added between Centralia and Collier;
- 4 daily pairs of intermodal trains added to operate via the restored S Line between Raleigh and Centralia.

The bulk of CSXT freight trains would continue to operate via the A Line between Acca Yard in Richmond and Collier. CSXT has indicated that, given a reconstruction of the S Line for high-speed passenger use between Raleigh and Petersburg, it would run up to 4 pairs of intermodal trains per day over that route. Depending on the route and connections used in Petersburg, these trains may have a significant effect on capacity and train delay through Petersburg. Trains of empty coal cars are also expected to operate north on the S Line to Richmond as part of CSXT’s equipment repositioning strategy, but the loaded trains would continue to run south on the A Line. Two pairs of locals are also expected on the S Line, serving Bellwood and Fanshawe Yards from Collier.

Norfolk Southern freight trains between Petersburg (Poe) and Norfolk also reflect current NS train schedules, but with the following provisions for future traffic growth:

- 6 daily *pairs* of coal trains (loaded and empty), sufficient to produce an annual



## Task 1 Report – Engineering Feasibility Study

throughput in excess of 38 million tons of coal at Lambert’s Point;

- 2 additional *pairs* of intermodal trains to Sewells Point;
- 2 *pairs* of intermodal trains to the new intermodal facility in Portsmouth;
- 1 new *pair* of “automotive” trains serving Norfolk.

In all, 16 pairs of merchandise freight, intermodal, and coal trains are planned for daily operation between “Jack” (west of Petersburg) and the Norfolk terminal. A local freight “turn” is operated daily between Suffolk and Poe to serve industries on the NS Main Line, and a pair of trains operates between “Jack” and Hopewell Junction, over the Main Line.

NS freight service in the Norfolk terminal fans out to any one of several yards, depending on commodity. Coal trains operate to Lamberts Point, crossing Bridge 5, and running past the site of the planned Norfolk passenger station. Merchandise and domestic intermodal traffic are served at Portlock Yard, while international container traffic is handled at Sewells Point; the planned new intermodal terminal on the west (Portsmouth) side of the harbor would be reached by NS off the main line at Suffolk. The Ford plant and other automotive traffic are also handled through Portlock. While the freight trains run to various locations in the Norfolk terminal, the railroad conducts all locomotive servicing at Lamberts Point, so there is a significant number of light engine movements over Bridge 5 and past the proposed passenger station location that must be taken into account.

### Passenger Schedules

#### Train Performance Calculator (TPC) Analyses

PTG has performed a series of TPC (train performance calculator) analyses to determine unimpeded running times over the route’s current configuration. Changes in the route’s basic engineering—track connections, curve realignments to obtain goal speeds (particularly lengthened spirals to ensure passenger comfort at the increased levels of *maximum authorized speed* [MAS]), elimination of speed restrictions due to track condition or municipal speed restrictions—have been evaluated using the TPC to determine the actual transit time improvements that would be achieved in the Richmond to South Hampton Roads corridor. Improved train speeds would be essential if the railroad is to establish a competitive position in the intercity passenger market.

The TPC runs indicated that all the Petersburg connections produced Richmond-South Hampton Roads running times that were within one minute of each other. The TPC running times included two-minute stations stops at Bowers Hill and Petersburg (either the existing Ettrick station or the former downtown station). The TPC results indicate, for planning purposes, that the selected connection route through Petersburg would have no effect on the scheduled running times of the South Hampton Roads High-Speed trains.

The initial TPC runs were made with a maximum passenger train speed of 110 mph.

Additional runs were made on the “Ettrick” alignment to evaluate the running times for 90 mph and 79 mph train services. The TPC results were supplied to Amtrak, who used its standard scheduling methodology to apply a schedule “pad” for schedule reliability to produce the passenger schedules used in the *Train Operations Reliability Analyses*.

## Task 1 Report – Engineering Feasibility Study

TPC Running Times Richmond - Main Street -to Norfolk			
Petersburg connection used	South	North	Speed
West	1:22	1:22	110 MAS
Dunlop	1:20	1:19	110 MAS
Etrick	1:21	1:21	110 MAS
Etrick	1:29	1:29	90 MAS
Etrick	1:36	1:36	79 MAS

Amtrak Schedule Running Times			
	South	North	Speed
via any route	1:27	1:28	110 MAS
via any route	1:36	1:35	90 MAS
via any route	1:43	1:43	79 MAS

The running times for various types of NS freight trains in the critical Poe - Brico section of the route also were evaluated using the TPC. Heavy coal trains, general merchandise, and intermodal trains were run in both directions to determine probable running times. An additional TPC run was made with a loaded coal train stopping midway between Poe and Brico, waiting 5 minutes, then accelerating up to speed again to investigate the impacts of having to stop then accelerate a heavy coal train from a dead stop.

TPC Running Times, NS Freight trains, Poe -- Brico						
	South	North	Speed	Cars	Feet	Tons
Coal Load/Empty	1:11	1:05	50 MAS	175	9000	5250 (empty)
Coal Load (5 minute stop) *	1:25		50 MAS	175	9000	22750 (loaded)
Merchandise	1:02	1:05	50 MAS	110	6000	8250
Intermodal Freight	1:02	1:03	50 MAS	75	6000	6000

\* includes a 5 minute stop on the siding

The resulting freight running times are used in the *Train Operations Reliability Analyses* to evaluate how the freight and passenger trains on the shared Poe—Brico section would interact and affect schedule performance and trip time reliability for both the freight and passenger trains. Passenger train schedules for services other than the South Hampton Roads are the same used for the *SEHSR Corridor* (Richmond-Charlotte) project. The planned 4 daily pairs of high-speed trains between Richmond and Charlotte and the current 4 pairs of Amtrak long-distance passenger trains would share the route and station stops with the South Hampton Roads service between Richmond and Petersburg.

### Passenger Service Scenarios

South Hampton Roads service frequencies and schedules were developed by Amtrak using the Train Performance Calculator (TPC) inputs of running times, combined with schedule “pad” and station dwell times. Amtrak provided schedules for 79 mph trains, 90 mph trains, and 110 mph trains, progressing from a single pair of trains running at 79 mph, to twice-daily service at 79 mph, then moving to 4 daily round-trips at 90 mph and 110 mph, and finally reaching a complete schedule of 6 daily round-trips operating at a maximum speed of 110 mph.

# Task 1 Report – Engineering Feasibility Study

## One Daily Train Pair at 79 mph

		South	North	
<b>Richmond-Main St</b>	<b>Dp</b>	<b>8:05 PM</b>	<b>8:18 AM</b>	<b>Ar</b>
Petersburg	Ar	8:26 PM	7:57 AM	Dp
Petersburg	Dp	8:28 PM	7:55 AM	Ar
Bowers Hill	Ar	9:29 PM	6:54 AM	Dp
Bowers Hill	Dp	9:31 PM	6:52 AM	Ar
<b>Norfolk</b>	<b>Ar</b>	<b>9:48 PM</b>	<b>6:35 AM</b>	<b>Dp</b>

## One Daily Train Pair at 90 mph

		South	North	
<b>Richmond-Main St</b>	<b>Dp</b>	<b>8:05 PM</b>	<b>8:20 AM</b>	<b>Ar</b>
Petersburg	Ar	8:26 PM	8:00 AM	Dp
Petersburg	Dp	8:28 PM	7:58 AM	Ar
Bowers Hill	Ar	9:23 AM	7:03 AM	Dp
Bowers Hill	Dp	9:25 AM	7:01 AM	Ar
<b>Norfolk</b>	<b>Ar</b>	<b>9:41 AM</b>	<b>6:45 AM</b>	<b>Dp</b>

## Two Daily Train Pairs at 79 mph

		South	South	North	North	
<b>Richmond-Main St</b>	<b>Dp</b>	<b>10:30 AM</b>	<b>8:05 PM</b>	<b>8:18 AM</b>	<b>5:53 PM</b>	<b>Ar</b>
Petersburg	Ar	10:51 AM	8:26 PM	7:57 AM	5:32 PM	Dp
Petersburg	Dp	10:53 AM	8:28 PM	7:55 AM	5:30 PM	Ar
Bowers Hill	Ar	11:54 AM	9:29 PM	6:54 AM	4:29 PM	Dp
Bowers Hill	Dp	11:56 AM	9:31 PM	6:52 AM	4:27 PM	Ar
<b>Norfolk</b>	<b>Ar</b>	<b>12:13 PM</b>	<b>9:48 PM</b>	<b>6:35 AM</b>	<b>4:10 PM</b>	<b>Dp</b>

## Two Daily Train Pairs at 90 mph

		South	South	South	South	
<b>Richmond-Main St</b>	<b>Dp</b>	<b>10:30 AM</b>	<b>8:05 PM</b>	<b>8:20 AM</b>	<b>5:55 PM</b>	<b>Ar</b>
Petersburg	Ar	10:51 AM	8:26 PM	8:00 AM	5:35 PM	Dp
Petersburg	Dp	10:53 AM	8:28 PM	7:58 AM	5:33 PM	Ar
Bowers Hill	Ar	11:48 AM	9:23 AM	7:03 AM	4:38 PM	Dp
Bowers Hill	Dp	11:50 AM	9:25 AM	7:01 AM	4:36 PM	Ar
<b>Norfolk</b>	<b>Ar</b>	<b>12:06 PM</b>	<b>9:41 AM</b>	<b>6:45 AM</b>	<b>4:20 PM</b>	<b>Dp</b>

# Task 1 Report – Engineering Feasibility Study

## Four Daily Train Pairs at 110 mph

		South	South	South	South	North	North	North	North	
<b>Richmond-Main St</b>	<b>Dp</b>	10:30 AM	12:25 PM	8:05 PM	10:00 PM	7:23 AM	8:18 AM	10:53 AM	5:53 PM	Ar
Petersburg	Ar	10:51 AM	12:46 PM	8:26 PM	10:21 PM	7:03 AM	7:58 AM	10:33 AM	5:33 PM	Dp
Petersburg	Dp	10:53 AM	12:48 PM	8:28 PM	10:23 PM	7:01 AM	7:56 AM	10:31 AM	5:31 PM	Ar
Bowers Hill	Ar	11:40 AM	1:35 PM	9:15 PM	11:10 PM	6:13 AM	7:08 AM	9:43 AM	4:43 PM	Dp
Bowers Hill	Dp	11:42 AM	1:37 PM	9:17 PM	11:12 PM	6:11 AM	7:06 AM	9:41 AM	4:41 PM	Ar
<b>Norfolk</b>	<b>Ar</b>	11:57 AM	1:52 PM	9:32 PM	11:27 PM	5:55 AM	6:50 AM	9:25 AM	4:25 PM	Dp

## Four Daily Train Pairs at 90 mph

		South	South	South	South	North	North	North	North	
<b>Richmond-Main St</b>	<b>Dp</b>	10:30 AM	12:25 PM	8:05 PM	10:00 PM	7:25 AM	8:20 AM	10:55 AM	5:55 PM	Ar
Petersburg	Ar	10:51 AM	12:46 PM	8:26 PM	10:21 PM	7:05 AM	8:00 AM	10:35 AM	5:35 PM	Dp
Petersburg	Dp	10:53 AM	12:48 PM	8:28 PM	10:23 PM	7:03 AM	7:58 AM	10:33 AM	5:33 PM	Ar
Bowers Hill	Ar	11:48 AM	1:43 PM	9:23 AM	11:10 PM	6:08 AM	7:03 AM	9:38 AM	4:38 PM	Dp
Bowers Hill	Dp	11:50 AM	1:45 PM	9:25 AM	11:12 PM	6:06 AM	7:01 AM	9:36 AM	4:36 PM	Ar
<b>Norfolk</b>	<b>Ar</b>	12:06 PM	2:01 PM	9:41 AM	11:27 PM	5:50 AM	6:45 AM	9:20 AM	4:20 PM	Dp

## Six Daily Train Pairs at 110 mph

southbound		South	South	South	South	South	South
<b>Richmond-Main St</b>	<b>Dp</b>	8:20 AM	10:30 AM	12:25 PM	6:05 PM	8:05 PM	10:00 PM
Petersburg	Ar	8:41 AM	10:51 AM	12:46 PM	6:26 PM	8:26 PM	10:21 PM
Petersburg	Dp	8:43 AM	10:53 AM	12:48 PM	6:28 PM	8:28 PM	10:23 PM
Sunray	Ar	9:30 AM	11:40 AM	1:35 PM	7:15 PM	9:15 PM	11:10 PM
Sunray	Dp	9:32 AM	11:42 AM	1:37 PM	7:17 PM	9:17 PM	11:12 PM
<b>Norfolk</b>	<b>Ar</b>	9:47 AM	11:57 AM	1:52 PM	7:32 PM	9:32 PM	11:27 PM

northbound		North	North	North	North	North	North
<b>Norfolk</b>	<b>Dp</b>	5:55 AM	6:50 AM	9:25 AM	11:25 AM	1:25 PM	4:25 PM
Sunray	Ar	6:11 AM	7:06 AM	9:41 AM	11:41 AM	1:41 PM	4:41 PM
Sunray	Dp	6:13 AM	7:08 AM	9:43 AM	11:43 AM	1:43 PM	4:43 PM
Petersburg	Ar	7:01 AM	7:56 AM	10:41 AM	12:31 PM	2:31 PM	5:31 PM
Petersburg	Dp	7:03 AM	7:58 AM	10:43 AM	12:33 PM	2:33 PM	5:33 PM
<b>Richmond-Main St</b>	<b>Ar</b>	7:23 AM	8:18 AM	10:53 AM	12:53 PM	2:53 PM	5:53 PM

## Maximum Authorized Speed (MAS):

In addition to affecting the trip times between Richmond and South Hampton Roads, the assumed MAS has a significant impact on capacity, particularly on the NS line(s) between Petersburg and Norfolk. As the speed differential between freight and passenger trains increases the potential for passenger trains to overtake freight trains increases. Although there are a very limited number of curves between Petersburg and Norfolk, the optimal physical characteristics of each curve may vary with the goal speed defined by the MAS. These interrelationships are analyzed as part of our systematic analysis of the improvements necessary to upgrade a corridor's rail service facilities.

## Task 1 Report – Engineering Feasibility Study

The MAS assumed will drive the level of signal system and grade crossing improvements/enhancements required. For example, with a 79 mph MAS, cab signals would not be required. This would eliminate the cost associated with equipping fleets of NS and CSXT locomotives with cab signals. With a 110 mph MAS, a larger number of grade crossings would be considered for closure or separation and the level of protection necessary for those that remain would increase.

### **Frequency of Service:**

A variety of peak and off-peak service patterns have been evaluated, both to identify Improvements and analyze demand. The Final Report's service implementation recommendations will reflect the most cost-effective blend of short- and long-term infrastructure improvements, operating scenarios, and ridership.

## **Recommended Improvements**

The improvements identified, thus far, to implement the Richmond - South Hampton Roads High-Speed Rail Service assume that:

- Main Street Station improvements are implemented by City of Richmond; and
- Main Street Station - Centralia improvements recommended in the *Potential Improvements to the Richmond to Charlotte Railroad Corridor* report are implemented.

The following additional improvements would be required.

### **Centralia to Petersburg (Dunlop – A19.2)**

An alternative routing between Centralia and Petersburg was suggested for consideration by DRPT and has been incorporated as an alternative in the Richmond – Charlotte High-Speed Corridor report. The alternative includes construction of a third track east of the present CSXT A Line. The third track would provide direct access to the proposed Dunlop Connection. Dunlop Interlocking would be constructed in place of Pete Interlocking. Dunlop Interlocking would provide universal access to all main tracks.

### **Petersburg – Dunlop Connection**

The Dunlop Connection would be double tracked for 2.8 miles, between Dunlop Interlocking and the north end of Poca Interlocking. The north end of Poca would be located north of the former five-span 313-foot long ACL Appomattox River Bridge. The south end of Poca would be the location of the Wye Track split, eastward (to Norfolk on the NS) and westward/southward, to A Line and the S Line. The piers for the bridge remain in place, but the superstructure has been removed. The former N&W Petersburg station would be restored to service. Platforms would be constructed adjacent to each leg of the Wye –on the east leg for Norfolk-bound trains and on the west leg for A and S Line-bound trains.

### **Battersea Interlocking**

The west leg of the Wye track would be extended parallel to the NS Main Line, to Battersea Interlocking, where the Wye track would merge with the NS Main Line. Connections to the A Line and the S Line, and the NS Main Line would extend westward/southward from the west end of the interlocking.

## Task 1 Report – Engineering Feasibility Study

### ***Battersea Connection***

The Battersea Connection would enable movements from the NS Main Line at Battersea to the A Line. The connection to the A Line would require that the south end of existing Appomattox Interlocking, which controls the turnout connecting the double track to the single-track Appomattox River Bridge, be modified to include the turnout to the Battersea Connection and a crossover between the two main line tracks.

### ***S Line Connection***

The S Line Connection would enable movements from the NS Main Line at Battersea to the proposed S Line south of the Appomattox River and west of the A Line Appomattox River Bridge. The connection would continue as the restored S Line, to Raleigh, NC.

### **Petersburg – NS Main Line, Petersburg Station to Poe Interlocking**

The east leg of the Wye at Petersburg Station would extend eastward to Hopewell Jct, where it would connect to the NS Main Line, at approximately MP N81. The Main Line would be a single-track to Poe Interlocking (MP N77.8), the existing connection with the Belt Line. Poe would be modified to make the route from Track 2, on the Main Line east of Poe, to the Main Line west of Poe a straight move. At present the route is through a turnout.

The route from the Belt Line to Track 1, eastward to Norfolk, would remain a straight move, while alternative 45 mph routes from Track 1 to the Belt Line would be provided.

### **Petersburg Belt Line Improvements**

Poe Interlocking would provide the capability of making simultaneous movements westward from Main Line Track 2 to the Belt Line track P1 and eastward from Belt Line Track P2 to Main Line Track 1. The Poe modifications would include a one-mile center siding that would enable eastward trains to be routed around freight trains standing on Main Line Track 1 to work the yard tracks located east of Poe. The modifications would be intended to minimize the impact of the proposed passenger train operations and the local yard operations on the heavy volume of NS trains that use the Petersburg Belt Line. The 8.8-mile Petersburg Belt Line would remain as presently configured between Poe and Jack. The line is double tracked in two segments for a total of 3.6 miles, between Poe and Walnut Creek and between Ingram and Jack, and has a 1.4-mile siding on the south side of the right-of-way, at Secoast. In exchange for NS surrendering its control and ability to operate on the NS Main Line through Petersburg, the 3.5-mile balance of the Belt Line could be double tracked so that NS would no longer need to operate through freight trains on the Main Line. The only NS freight left on the Main Line would be the trains to and from Hopewell Junction.

### **NS Main Line – Poe to Brico**

Additional flexibility would be created by the installation of three new, or reconfigured, universal interlockings and a 12.6-mile center siding in this segment of extended tangent track. Five interlockings, with No. 20 crossovers, and turnouts where necessary, would be located in this track segment at:

- ***East Poe (N76.1)***, configured as the east end of the three track segment, permitting passenger trains to bypass the yard and auto facility at Poe;
- ***Disputanta (N69.2)***, a universal interlocking where existing No. 20s will remain,
- ***Waverly (N59.7)***, to be reconfigured as the west end of the three-track segment,

## Task 1 Report – Engineering Feasibility Study

- **47 Crossover (N46.8)**, to be reconfigure as the east end of the three-track segment, and
- **Wight (N37.3)**, a new universal interlocking.

### **Brico Connection**

A 1.8-mile jug handle connection between the NS Main Line and the CSXT Portsmouth Subdivision would be constructed at Brico (N27.3). At the west end of the connection, Brico Interlocking would provide access to both Main Line tracks from the connecting track through a left hand No. 20 crossover and a left hand No. 20 turnout. A new interlocking would be constructed on the CSXT Portsmouth Subdivision at the east end of the connecting track. The passenger train moves from the connecting track to the CSXT Portsmouth Subdivision would be the straight, high-speed route, while a No. 20 turnout would provide the access route for CSXT trains.

### **Brico to Algren**

The CSXT Portsmouth Subdivision would be upgraded to support high-speed rail service. The 14.6-mile segment would remain a single track. At Algren the route to the former Virginian Main Line would be the straight route and a No. 20 turnout would provide the CSXT a route to Portsmouth. A 2.3 mile siding would be located between Algren and a new interlocking, North Algren. The siding was placed to support the meets that occur with the proposed schedules at Bowers Hill Station. A No. 32 turnout would be installed at the north end of the siding. The turnout would facilitate 80 mph, instead of 45 mph speeds for eastward passenger trains. The anticipated high percentage of passenger train meets at this location make the higher speed turnout the preferred option.

### **Algren to South Norfolk**

This segment of the former Virginian Railway main line would be upgraded to support the proposed high-speed rail service. A beltway station would be located at Bowers Hill, about two miles east of Algren.

The connection of the Virginian to the NS Main Line at South Norfolk would not be modified.

### **South Norfolk to Norfolk**

This track segment will not be improved.

### **Norfolk Passenger Terminal**

The station tracks would be located in the 1500 feet of space between Bridge 5 and the Park (formerly Lovitt) Avenue grade crossing. Station platforms would be located on the west, or downtown Norfolk side of the double-track NS Lamberts Point Line. Two station tracks would be located adjacent to the line, and the platform would be located between them. Access to the station tracks would be interlocked on both ends to provide and control movements to and from the platform in either direction. Interlocked crossovers would be installed between the two Lamberts Point Line tracks.

### **Maintenance Facilities**

Sufficient yard storage capacity should be provided to handle layovers, and to store equipment-awaiting maintenance. Yard lighting, water and power hookups, a fueling facility, crew quarter facilities, employee locker room, and supervisory office space would be included. Commissary facilities to service train sets would be furnished.

## Task 1 Report – Engineering Feasibility Study

As of this time a location to service trains that would be stored in Norfolk between runs has not been identified. An efficient storage yard and maintenance facility in the vicinity of the Norfolk Passenger Terminal would be necessary to properly clean and inspect trains. Further evaluation of train operations through the area, and potential locations, would be required to finalize the location

### Signal System Upgrade

To efficiently handle increased train traffic on the route and to permit improved intercity passenger service with greater safety, signal system upgrades should be implemented incrementally, as passenger train service levels and maximum authorized speeds are increased. These improvements also would enable freight service to safely and efficiently operate on the same tracks. A cab signal system (necessary to operate passenger trains at speeds greater than 79 mph), a new block layout<sup>9</sup>, and new signal aspects, would be installed incrementally, to accommodate speeds up to 110 miles per hour<sup>10</sup>. Block spacing would anticipate increased train speeds. The installation of cab signals would require that all NS and CSXT locomotives operating on the South Hampton Roads corridor be equipped with Automatic Train Control (ATC). Reverse signaling would be installed throughout the route.

Ultimately, a new signal system would improve the reliability of train operations for all services, contribute to reducing maintenance-related operating costs, and would be a component critical to enabling higher speed train operations.

### Identification of Improvements

The network of improvements necessary to provide adequate track structure and sufficient capacity to reliably operate freight and high-speed passenger service between Richmond and South Hampton Roads have been defined.

Ultimately, the types of improvements that would be included are projects to:

- Upgrade the track structure,
- Upgrade signal systems,
- Realign selected curves to permit higher operating speeds and reduce trip time,
- Reconfigure, relocate, eliminate, or install interlockings to improve operating flexibility,
- Install additional trackage to reliably accommodate increased freight and passenger traffic levels,
- Restore abandoned track, and
- Improve Stations.

As previously described, a series of alternative alignments and operational scenarios were evaluated to achieve the maximum integration of intercity and freight rail services. A train simulation modeling exercise, which included anticipated future freight and passenger volumes, was performed to ensure that critical operational capacity constraints have been identified and mitigated.

The list of improvements is intended to be an additive list of improvements that will :

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<sup>9</sup> The spacing between signals that represents the best compromise maximizing capacity (more signals, closer together, creating shorter blocks) and economy (fewer signals, further apart, creating longer blocks).

<sup>10</sup> The braking distance for a 110 mph passenger train is essentially equal to that of a 60 mph freight train.

## Task 1 Report – Engineering Feasibility Study

- Enable the specified running times for the Richmond - South Hampton Roads intercity passenger service to be achieved,
- Provide capacity required to accommodate future long-term growth in freight service volumes, sizes of shipments and clearances<sup>11</sup>.
- Provide safety-related improvements.

The initial list of improvements has been updated by PTG to reflect the results of our simulation modeling. The final report will include:

- A description of the project,
- Location on the route,
- Project cost, and
- The rationale for the improvement.

### Summary Track Charts

PTG prepared a summary railroad track chart locating the improvements (Appendix Track Chart). The chart enables the reader to clearly comprehend the geographical interfaces of the improvements.

### Cost Estimates

PTG cost estimating personnel developed conceptual, order of magnitude working estimates in Year 2000 dollars for each improvement identified as necessary and sufficient.

### Testing of the Improvements

The proposed schedules were incorporated into our simulation of the operations utilizing our Logsim<sup>TM</sup> simulation program. The simulation included the preliminary set of improvements defined by PTG's operations and facility analysts

PTG has used its **Corridor Operations Methodology** to evaluate the physical characteristics and capacity of the rail facilities to determine the transit time South Hampton Roads to Richmond trains could realistically achieve under various service scenarios<sup>12</sup>. The major elements that were evaluated are speed and service reliability. Other than those freight operations through the proposed passenger terminal location, freight terminal operations in South Hampton Roads were not simulated. Our staff has evaluated train operations between the various NS and CSXT facilities in the south of Hampton Roads area, and utilized our understanding of them to evaluate the impact of the commingling of passenger and freight operations. The alignment alternative selected between Suffolk and South Norfolk has eliminated the need for this study to simulate NS operations in the vicinity of Portlock Yard, while the Norfolk passenger terminal location selected has eliminated the need for this study to model NS intermodal and coal terminal operations.

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<sup>11</sup> For the simulation analysis PTG utilized train volume data provided by CSXT for previous Washington to Richmond corridor studies and growth projections supplied by NS.

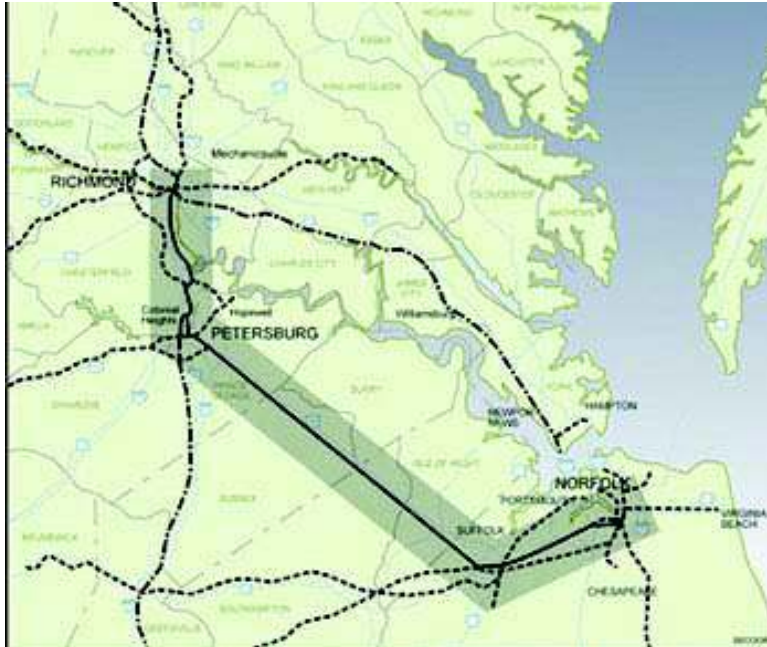
<sup>12</sup> The Corridor Operations Methodology is an integrated set of computer models, including a TPC and dispatching simulation, track geometry, construction cost estimating spreadsheets, and a tested analysis technique to evaluate corridor improvements. It has been used intensively to evaluate high speed, high-density corridor operations for Amtrak and FRA.

### **Train Operations Reliability Analyses**

The rail simulation performed by PTG enabled us to assess the number of additional trains that could transit the Richmond to South Hampton Roads corridor in a timely fashion and the range of delay that might be incurred. A combination of “string line” and simulation tools were utilized to determine the degree to which the upgraded rail lines would reach the performance levels required to support the proposed HSR service. PTG modified its Logsim™ model of the SEHSR Corridor to perform an operations simulation of the Richmond to South Hampton Roads corridor. The simulation ensured that the commingling of the new train service with the Richmond - Charlotte SEHSR Corridor was properly analyzed

# Richmond to South Hampton Roads High-Speed Rail Feasibility Study

## TASK 2 - ENVIRONMENTAL OVERVIEW



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May 2002

# SUMMARY

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## 1.1 PURPOSE OF REPORT

An initial overview of environmental constraints that should be considered as part of the development of high-speed rail (HSR) service between Richmond and South Hampton Roads is presented in this report. Information on natural resources, cultural resources, and social and community resources within a general buffer of the proposed alternatives is provided. Potential environmental constraints are reported based on a review of readily available data. A more detailed environmental analysis will be needed once a preferred alternative is selected.

The findings of the environmental constraints analysis, including a summary matrix that compares the potential environmental constraints along the corridor, are summarized in this chapter. The project background and location is briefly described in Chapter 2. The environmental resources and issues within the HSR corridor study area are characterized in Chapter 2 and their compatibility with implementation of HSR between Richmond and South Hampton Roads, utilizing rail routes south of the James River, is discussed.

## 1.2 ENVIRONMENTAL CONSTRAINTS SUMMARY

Because the alternatives under consideration are located almost entirely within existing or abandoned rail rights of way, environmental impacts are anticipated to be minimal. Limited environmental documentation should be required for most of the corridor. Categorical Exclusions should be sufficient in areas that are free of environmental constraints and where only operating changes or minor capital improvements within existing rights-of-way are proposed. In many segments of the corridor, environmental constraints may be present within the buffer analyzed, but the use of only existing tracks would also limit the need for extensive environmental documentation. More detailed environmental analyses would have to be completed to determine the full level of documentation required.

A summary of the environmental resources and potential constraints within the 300-foot buffer of the proposed HSR right of way is provided in Table 1-1. The resources included in this summary table would not necessarily be affected by the construction and implementation of HSR between Richmond and South Hampton Roads.

**Table 1-1  
Summary Matrix of Environmental Resources and Constraints Assessed Within 300 Feet of the HSR Right of way**

<b>Number of Existing Resources and Potential Constraints</b>	<b>HSR Corridor with Dunlop Connection</b>	<b>HSR Corridor with Ettrick Connection</b>
Noise-Sensitive Receptors <sup>1</sup>	8	8
Stream Crossings	29	29
Wetlands (ac)	576.6	584.4
Floodplain Crossings	27	27
Threatened and Endangered Species	34	34
Wildlife Refuges	1	1
Traffic (total number of road crossings)	129	133
Above-Grade Crossings	25	24
At-Grade Crossings	98	101
Below-Grade Crossings	6	8
Community Facilities and Services (Total Resources)	19	19
Schools	2	3
Religious Institutions	6	5
Cemeteries	5	5
Airports	1	1
Landmarks	4	4
Parks and Recreational Areas	1	1
Transportation (bus) terminals	0	0
Government/Municipal Buildings <sup>2</sup>	0	0
Historic & Archaeological Resources <sup>3</sup>	4	5
Hazardous Waste Sites <sup>4</sup>	16	16

<sup>1</sup> Number of Category 3 receptors within 150 feet of existing lines.

<sup>2</sup> Including Town Capital Buildings, Town Halls, Courthouses, Libraries, Police, Auditoriums, Police Stations, Fire/Rescue Stations, Hospitals.

<sup>3</sup> Listed on or eligible for listing on the National Register of Historic Places.

<sup>4</sup> Located within 2 miles.

**Summary**

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Several geographic areas of environmental concern where more detailed environmental documentation is expected to be necessary have been identified. The areas of environmental complexity where there is a potential for environmental impacts or difficulty in obtaining permits include:

- Crossing of the Appomattox River at Petersburg –New bridges would be required for the Ettrick Connection and the Dunlop Connection. The construction of the new bridges could permanently alter floodplains and historic districts and temporarily impact aquatic habitats in the Appomattox River. Further investigation would be necessary to determine the nature and degree of these effects. The Dunlop Connection would also require construction of a connection within the boundaries of the Battersea Historic District for Florida-bound trains.
- Kilby Connection – New construction would be required for the connection of the existing Norfolk Southern (NS) line, which runs northwest-southeast, to the CSXT line, which runs west-east at its junction with the NS line. This connection may displace wetlands and residences near Kilby.
- Waverly – provisions of service and potential for noise and vibration impacts to residential areas adjacent to the railroad and low-income or minority populations that may be disproportionately affected.
- Station Construction at Sunray – Although construction would avoid most environmental resources, there are potential impacts on traffic, public safety, and the nearby Great Dismal Swamp National Wildlife Refuge and the Hampton Roads Wetland Mitigation Bank.
- Crossing of the Great Dismal Swamp National Wildlife Refuge– the potential for noise or vibration impacts in close proximity to a significant natural resource, 4(f) property, and sensitive habitats that support rare, threatened, and endangered species.
- Noise Impacts in Chesapeake and South Norfolk – as the corridor approaches the cities of Chesapeake and Norfolk, several neighborhoods and residential areas are in close proximity to the tracks. Noise studies would be necessary to determine any effects.

Additional environmental analysis would be needed to determine the interactions of the proposed corridors and these environmental constraints. Limited environmental documentation may be required if changes to existing railroad rights-of-way to implement the proposed rail service are minimal. However, from an overview perspective, the locations listed above could have the most complex environmental issues within the corridor. Once more detailed design information is available, further environmental information would be prepared to determine the significance of impacts. None of these concerns, however, represents a "fatal flaw" for the Richmond to South Hampton Roads HSR.

## ENVIRONMENTAL RESOURCES AND CONSTRAINTS

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### 2.1 PROJECT DESCRIPTION AND LOCATION

The proposed Richmond to South Hampton Roads HSR corridor would originate at Main Street Station in Richmond and terminate at Harbor Park in Norfolk, passing through six cities, five counties, and several small towns along the way. A general location map of the study area and location of the alternatives is provided in Figure 2-1.

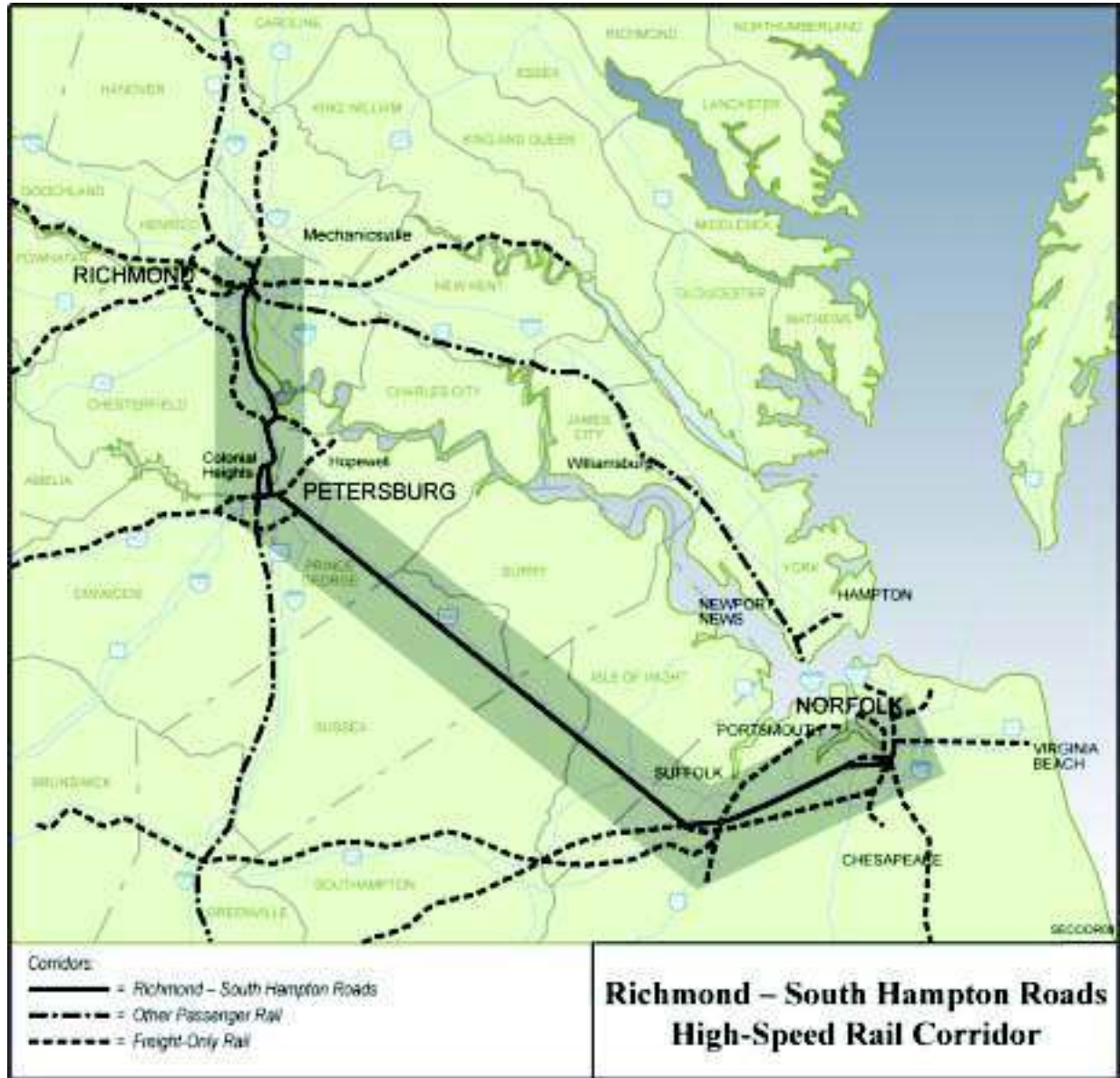
The alternatives that were considered for this analysis would follow essentially the same alignment throughout most of the corridor, except through the city of Colonial Heights and across the Appomattox River. The alternative that includes an alignment through Petersburg on the original Atlantic Cost Line Railroad route between Dunlop and the NS Main Line will be referred to in this document as the Dunlop Connection. The alternative that includes an alignment that heads southwest to Ettrick and connects to the NS Main Line east of the existing CSX Appomattox River Bridge will be referred to as the Ettrick Connection. The alternatives converge at the location of the old downtown Petersburg station, following the same alignment for the remainder of the distance to Norfolk. A more detailed look at the Dunlop and Ettrick Connections is provided in Figure 2-2. For the most part, both alternatives utilize existing railroad tracks or would be constructed almost entirely within existing railroad rights-of way.

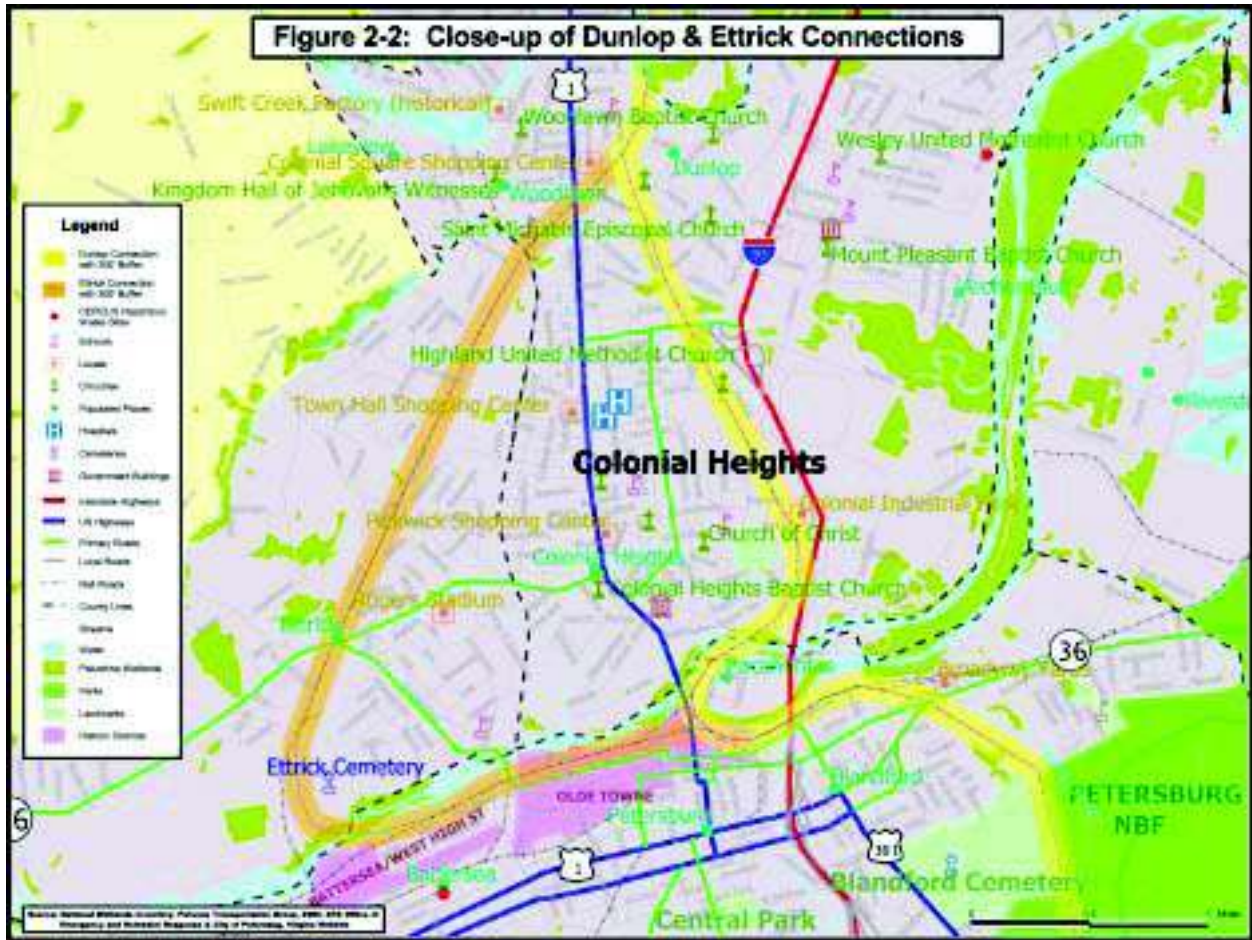
Because the existing bridge over the Appomattox River has a single-track, it was necessary to consider alternative alignments that would minimize scheduling conflicts between passenger and freight trains at the river crossing. Duplicating the existing high-bridge would be more expensive than other potential options, and different routes across the Appomattox could have the potential to better serve downtown Petersburg with a downtown station, if feasible. As a result, the following alternatives were considered:

- Continuing on the A Line to a connection at Collier;
- Restoring the S Line to a Secoast Connection (at Chaparral Steel) with a high bridge, upstream; and
- Restoring the S Line to a West Connection to the NS Main with a high bridge, upstream.

Most of the alternatives were dismissed due to cost, circuitry, and/or interference with freight trains. The second and third options would require a high bridge to carry a restored S Line upstream from the existing A Line bridge. None offered a more desirable station location than either the Dunlop or Ettrick Connections.

Figure 2-1: Location of Richmond to South Hampton Roads High-Speed Rail Feasibility Study





Using the NS Belt Line would be likely to reduce the length of the S Line that would need to be restored, but this route would be longer for passenger trains and would have more freight train movements. This would have necessitated more second track, increasing the cost without resolving the freight and passenger train conflicts. After comparing the various possibilities, the Dunlop and Ettrick alternatives were found to be substantially better than the others, and no further study of the others was undertaken.

A more detailed description of these alternatives is provided in the *Richmond to South Hampton Roads High-Speed Rail Feasibility Study* prepared by Parsons Transportation Group, Inc.

## **2.2 ENVIRONMENTAL CONSTRAINTS MAPPING**

Environmental constraints mapping was developed from existing GIS data and is presented in three large maps of the study area. The northern portion of the study area from Richmond to south of Petersburg is shown in Map 1; the counties of Prince George, Sussex, Surry, Southampton, and Isle of Wight are covered in Map 2; and the southeastern portion of the study area from Suffolk to Norfolk is illustrated in Map 3. The alternative routes for the HSR corridor with a 300-foot (ft) buffer surrounding each alignment are illustrated on these maps. The surrounding natural, cultural, and community resources along the alignments are illustrated and labeled also.

A Geographic Information System (GIS) database was created in ArcView 3.2a by compiling natural, cultural, and community resources data from ESRI, Tiger, the Federal Emergency Management Agency (FEMA), and the U.S. Fish and Wildlife Service (FWS) National Wetlands Inventory (NWI). Additional features were digitized and labels were added to the GIS based on information from the U.S. Environmental Protection Agency (EPA) Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS), Alexandria Drafting Company (ADC) maps for Petersburg and Vicinity (7th Edition), City of Petersburg website, and U.S. Geologic Survey (USGS) topographic quadrangle maps for the project area. While some resources may not be visible on the printed environmental constraints maps due to the illustration of the 300-foot buffer, all existing resources are contained within the GIS database and were included in the analysis of constraints.

## **2.3 TRAFFIC**

Potential impacts to roadway traffic from the implementation of HSR passenger service between Richmond and South Hampton Roads were assessed based on information from the GIS database and ADC maps for the project area. Road names and classifications were used to determine the compatibility of HSR operations with existing traffic volumes at road crossings throughout the HSR corridor. Additional traffic data was not collected for this analysis.

Detailed information about current train operations along the rail segments that comprise the proposed Richmond-South Hampton Roads HSR corridor can be found in the *Richmond to South Hampton Roads High-Speed Rail Feasibility Study*.

Due to the lack of readily available traffic information at this preliminary stage, a general assessment of potential roadway traffic issues was conducted. The assessment considered all roadways within the study area that would be crossed by the HSR right of way and also identified the type of crossing: above-grade (roadway crosses rail line via a bridge), at-grade, or

below-grade (rail line crosses roadway via a bridge). This information is presented in the Appendix B.

As indicated in Appendix B, a total of 136 roadway crossings of various types and roadway classifications are located within the corridor study area. In the area just north of the Appomattox River, two rail segments are proposed: the Ettrick Connection, which would follow an existing active rail LINR, and the Dunlop Connection, which would follow an abandoned rail right-of-way east of the Ettrick Connection. Both segments would merge with the NS Main Line on the south side of the Appomattox River. The Ettrick connection would cross the river on a bridge downstream from the A Line bridge, and at a lower elevation, to join the NS Line east of the bridge. The Dunlop Connection would join the NS Line at a location just east of the existing U.S. Route 1 bridge over the Appomattox River (Dr. Martin Luther King, Jr. Memorial Bridge). Aside from these two alternative segments, the proposed HSR corridor follows one route between Richmond and South Hampton Roads. The total number of roadway crossings, including above-, below- and at-grade, along the HSR corridor is 133 on the Ettrick Connection, whereas the total number of roadway crossings on the Dunlop Connection is 129.

Of all the roadway crossings identified in Appendix B, those designated as at-grade crossings pose the greatest traffic and safety concerns. At-grade crossings involving U.S.- and state-designated highways pose the greatest traffic and safety concerns and will need to be closely evaluated at the next stage of this project to identify potential traffic impacts and safety issues. Possible resolutions and/or mitigation measures could include grade separation options, upgraded signal and gate systems, or even the closure of an at-grade crossing. Refer to the Public Safety section of this preliminary environmental screening report for additional information.

### ***Intracoastal Waterway***

The proposed HSR right of way would cross the South Branch of the Elizabeth River; designated as the Intracoastal Waterway, on a vertical lift bridge. Although once a mainline track with an operational traffic control system, this rail line now experiences very little freight activity, and train speed is limited to only 10 miles per hour. The provision of HSR passenger service along this section of rail would result in a noticeable increase in the number of trains crossing the Intracoastal Waterway, and a corresponding increase in the number of bridge closings. Presently, the vertical lift bridge is left in the open position, yielding the right-of-way to boat traffic along the Intracoastal Waterway. The additional number of bridge closings would result in temporary delays to boaters but is not considered an adverse impact on the Intracoastal Waterway because the bridge closings would be limited to only a few closings per day, would be of a short duration, and would coincide with train schedules that will be available to the public.

## **2.4 LAND USE AND NEIGHBORHOODS**

### **2.4.1 General Land Use**

Like many areas across the United States, development within the proposed HSR corridor has been influenced primarily by transportation infrastructure. Nineteenth-century rail construction spawned the growth of numerous communities, some of which were later bypassed with the construction of the interstate highway system in the 1950s and 1960s.

The termini for the HSR corridor are located in the major population centers of Richmond and Norfolk. The northwestern terminus would be the Main Street Station in Richmond, which is proposed to be reopened in 2003. The southeastern terminus is located on the eastern side of the parking lot of Harbor Park, the minor league baseball stadium in Norfolk. Land use along the proposed HSR corridor in the cities of Richmond, Norfolk, and Petersburg consists of dense commercial, retail, and industrial development, and, to a lesser degree, park, residential and institutional land uses. In suburban areas, such as Chesterfield County, the city of Colonial Heights, the city of Suffolk, and the city of Chesapeake, land uses along the corridor are primarily commercial, retail, and industrial, with a higher concentration of medium and high density residential development. Residential development is particularly concentrated along the Chesapeake/Portsmouth City line, immediately north of the HSR right of way.

Numerous rural communities along U.S. Route 460, including Disputanta, Waverly, Wakefield, Ivor, and Windsor among others, are located between the major populated areas at the northwestern and southeastern termini of the route. Land use along the rail corridor through this region is primarily agricultural, with very limited commercial, light industrial, and low-density residential development located proximate to modest town centers. In Suffolk and the western portion of Chesapeake, the HSR right of way passes along the northern boundary of the Great Dismal Swamp National Wildlife Refuge, an expansive, undeveloped area consisting primarily of forested wetlands.

An existing GIS database, field notes, and ADC mapping were used for this general land use assessment. The GIS database contained very little land use information other than points designating populated areas along the corridor. Local jurisdictions were not contacted for plans of development, land use, or zoning information. A more detailed analysis of land use may be required at a later time, in which case, local contacts would be made to obtain and review this information.

#### **2.4.2 Land Use Impacts**

The proposed route is comprised entirely of active rail lines or abandoned rail rights-of-way that run either through or adjacent to established cities and towns. With the exception of new passenger stations and right-of-way modifications through Colonial Heights and Petersburg, the only location requiring new construction would be near Kilby, where the Norfolk Southern (NS) railroad would be connected to the CSXT line. This area is characterized by low-density residential and agricultural land uses.

The use of existing or abandoned railroads throughout the HSR corridor is expected to avoid altering regional land use patterns. Land use development patterns are more likely to be influenced by the amount of land available for development or redevelopment; regional and local markets; and comprehensive land use and development plans and zoning ordinances of local governments.

Given that all of the affected communities are already located near existing active rail lines and have experienced rail traffic for a number of years, the effects that the Richmond to South Hampton Roads HSR passenger service would have on changes in land use patterns is anticipated to be minimal. Station development or redevelopment and grade crossing studies would be conducted with local and state agency planners to ensure compatibility with existing plans. No adverse land use impacts are anticipated from the proposed undertaking.

Some communities could benefit from the proposed HSR passenger service because no rail passenger service presently operates between Richmond and South Hampton Roads. The activation of HSR passenger service could alter the approach to long-term land use planning in some communities to spur development and increase redevelopment.

**2.4.3 Population**

Population data for the HSR corridor were collected from the U.S. Census Bureau and were supplemented by information contained in the *Tier I DEIS for the Southeast Corridor High Speed Rail; Washington D.C. to Charlotte, NC* (August 8, 2001). These data were sorted by county and towns and compiled into two tables.

There are 11 counties/cities and 4 towns located along the proposed HSR corridor. The population of each county/city and town is listed in Table 2-1, which also provides a comparison of 2000 population data to 1990 population data, indicated by the percent growth and or percent decrease over that 10-year period. The most populated areas along the proposed HSR corridor are Chesterfield County and the city of Richmond at the northwestern terminus and the cities of Chesapeake and Norfolk at the southeastern terminus. The corridor from Prince George County through and including Isle of Wight County is rural in character, with a population relatively dispersed over a large area.

**Table 2-1  
 Population for Cities, Counties, and Selected Towns along the HSR Corridor**

County/City/Town	2000 Population	1990 Population	Percent Change 1990-2000
City of Richmond*	189,700	203,056	-6.6
Chesterfield County*	253,365	209,274	21.1%
City of Colonial Heights*	16,235	16,064	1.1%
City of Petersburg*	34,398	38,386	-10.4%
Prince George County	33,047	26,206	20.7%
Sussex County	12,504	9,753	22.0%
Southampton County	17,482	17,010	2.7%
Isle of Wight County	29,728	24,169	18.7%
City of Suffolk	63,677	49,604	22.1%
City of Chesapeake	199,184	137,238	31.1%
City of Norfolk	234,403	261,319	-10.3%
Town of Waverly	2,309	2,223	3.9%
Town of Wakefield	1,038	1,070	-3.0%
Town of Ivor	320	1,025	-1.2%
Town of Windsor	916	324	-10.6%

\*Estimated 1999 population obtained from *Tier I DEIS for the Southeast Corridor High Speed Rail; Washington D.C. to Charlotte, NC* (August 8, 2001).

Collectively, the study area has experienced a total population growth of 8.47 percent based on the percent change from 1990 to 2000. In general, overall population totals in the study area increased from approximately 992,000 in 1990, to 1.08 million in 2000. Three cities experienced a decline in population during this period: Richmond, Petersburg, and Norfolk. Every town located along the rail line experienced a loss of population except for the Town of Waverly. The largest population growth was experienced in the city of Chesapeake.

A general breakout of population characteristics within the study area is provided in Table 2-2. In terms of ethnicity, the population along the corridor is primarily white, as 7 out of the 11 jurisdictions have a higher percentage of whites than other ethnic groups. Richmond, Petersburg, and Norfolk, and Sussex County have majority non-white populations. The Towns of Waverly and Wakefield also have non-white populations as the majority.

Richmond and Norfolk have the greatest number of households, with the average number of persons per household ranging from 2.25 in Richmond to 2.81 in Chesterfield County. Based on 1997 income statistics, median household incomes ranged from a low of \$25,428 in Petersburg to a high of \$55,324 in Chesterfield County, with an overall study area average of \$36,805. Richmond, Norfolk, and Wakefield had the highest percentage of persons at or below the poverty level.

#### **2.4.4 Environmental Justice Populations**

Over the past several decades, public concerns have increased over economic, racial, and ethnic fairness in the distribution of the environment and socioeconomic burdens of transportation projects, as well as the economic and mobility benefits derived from transportation projects. A series of federal legislation and policies have been implemented to respond to these concerns, specifically, Title VI of the Civil Rights Act and the Environmental Justice Executive Order (EO 12898) of 1994.

##### ***Definition of Environmental Justice***

The term “environmental justice” as well as related terms “minority” and “low-income” are not explicitly defined in Executive Order 12898. The Executive Order states that environmental justice is achieved when the actions of Federal agencies impose no disproportionately high and adverse environmental effects on low-income and minority populations. Data sources for this analysis were gathered from the U.S. Census Bureau and focus specifically on minority and low-income populations. Information on median household incomes and percent of persons below the poverty level is contained in Table 2-2. Information relative to the racial composition of the population within the Richmond-South Hampton Roads HSR corridor, as well as the racial composition of the population of the Commonwealth of Virginia as a whole, is provided in Table 2-3.

In general, the population of the counties/cities along the proposed corridor is 58.1 percent white, 38.3 percent African American, 1.5 percent Hispanic, 0.16 percent American Indian, and 1.25 percent Asian or Pacific Islander. Compared to the Commonwealth of Virginia, the corridor has approximately 20 percent more African-Americans and approximately 12 percent fewer whites. There are approximately 3 percent fewer Hispanics along the corridor and approximately 2.5 percent fewer Asians and Pacific Islanders.

**Table 2-2  
Population Characteristics for Cities, Counties, and Selected Towns along the HSR Corridor**

County/City	Ethnicity		Age		Housing		Income, 1997 model-based estimate	
	White (%)	Other (%)	Under 18 years (%)	65 years & older (%)	Households	Persons per household	Median household income (\$)	Percent below poverty
City of Richmond*	39.8	60.2	20.1	17.5	85,268	2.25	29,234	24.9
Chesterfield County*	81.9	18.1	29.0	5.6	73,665	2.81	55,324	6.4
City of Colonial Heights*	95.4	4.6	21.0	16.9	6,332	2.51	40,923	7.5
City of Petersburg*	24.4	75.6	23.0	17.1	14,664	2.48	25,428	25.6
Prince George County	60.9	39.1	25.1	7.3	10,159	2.76	44,845	9.1
Sussex County	36.4	63.6	19.6	13.4	4,126	2.41	27,489	21.0
Southampton County	56.0	44.0	22.7	14.2	6,279	2.53	33,943	17.1
Isle of Wight County	71.1	28.9	25.4	12.2	11,319	2.61	39,331	11.6
City of Suffolk	53.8	46.2	27.8	11.4	23,283	2.69	34,560	16.4
City of Chesapeake	66.9	33.1	28.8	9.0	69,900	2.79	45,427	10.1
City of Norfolk	48.4	51.6	24.0	10.9	86,210	2.45	28,350	24.4
Town of Waverly+	36.7	63.3	25.4	18.6	810	2.47	23,714	11.4
Town of Wakefield+	47.5	52.5	24.9	18.4	423	2.45	20,550	24.3
Town of Ivor+	76.3	23.7	20.0	21.6	139	2.37	24,821	13.6
Town of Windsor+	89.7	10.3	23.8	12.4	389	2.35	26,125	8.0

\* Estimated 1999 population characteristics obtained from *Tier I DEIS for the Southeast Corridor High Speed Rail; Washington D.C. to Charlotte, NC* (August 8, 2001). +Income data from 1990 Census.

**Table 2-3**  
**Minority Populations for Cities, Counties, and Selected Towns along the HSR Corridor**

County/City	White	African American	Hispanic	American Indian	Asian and Pacific Islander	Other
City of Richmond*	43.3%	55.4%	0.4%	0.2%	0.8%	0.3%
Chesterfield County*	84.7%	12.9%	0.7%	0.3%	1.9%	0.2%
City of Colonial Heights*	97.0%	0.4%	0.7%	0.0%	2.2%	0.4%
City of Petersburg*	26.5%	72.1%	0.3%	0.3%	0.8%	0.3%
Prince George County	59.1%	32.5%	4.9%	0.4%	1.9%	2.2%
Sussex County	36.3%	62.1%	0.8%	0.1%	0.1%	0.5%
Southampton County	55.8%	42.9%	0.7%	0.2%	0.2%	0.3%
Isle of Wight County	70.6%	27.1%	0.9%	0.3%	0.3%	0.3%
City of Suffolk	53.3%	43.5%	1.3%	0.3%	0.8%	0.4%
City of Chesapeake	65.9%	28.5%	2.0%	0.4%	1.9%	0.7%
City of Norfolk	47.0%	44.1%	3.8%	0.5%	2.9%	1.7%
Town of Waverly	36.7%	61.8%	1.2%	0.1%	0%	1.4%
Town of Wakefield	47.5%	51.3%	0.4%	0.2%	0%	1.1%
Town of Ivor	76.3%	19.7%	0%	1.3%	0%	2.7%
Town of Windsor	89.7%	9.1%	1.0%	0.4%	0%	0.8%
Commonwealth of Virginia 2000 Census	70.2%	19.6%	4.7%	0.3%	3.8%	2.0%

\* Estimated 1999 minority populations obtained from *Tier I DEIS for the Southeast Corridor High Speed Rail; Washington D.C. to Charlotte, NC* (August 8, 2001).

Note: Percentages do not add up to 100% in most cases due to individuals reporting two or more races.

The most recent U.S. Census data (2000) for the corridor would have to be obtained at the block level for all census blocks immediately adjacent to the proposed right of way to conduct a specific environmental justice assessment. This information would then be compared to population and income statistics available for Virginia as a whole. The information contained in this section is provided as a general planning overview of the population characteristics in the study area and is not intended to be an environmental justice analysis for this project. However, two towns located along the proposed alignment on Route 460 have large concentrations of minority populations: Waverly and Wakefield. Any disproportionate impacts to these communities would have to be mitigated as the project moved into the design phase. Of particular concern are impacts to the Waverly community, since the rail line is located in close proximity to residents who could experience noise increases and are most likely environmental justice populations.

## 2.5 COMMUNITY FACILITIES AND SERVICES

Existing community facilities, including schools, religious institutions, cemeteries, hospitals, civic centers, police and fire stations, airports, parks and recreational areas, and bus terminals, were identified along the proposed HSR corridor. The locations of existing facilities were determined

using the GIS database developed from ESRI data, as well as ADC maps for certain portions of the corridor. The type of each community facility and its location in relation to the HSR alignment are listed in Table 2-4. All community facilities included in the GIS database are illustrated on the large environmental constraints maps prepared for this study.

**Table 2-4  
Community Services and Facilities Within 300 Feet of the HSR Alignment**

#	Name	County/City/Locale	Approximate Distance From HSR Alignment	Notes
<b>Schools</b>				
1	Lakeview School	Chesterfield County	300 feet west	Along Ettrick Connection.
2	Suffolk High School	City of Suffolk	275 feet south	
3	West School	City of Norfolk	200 feet west	
<b>Religious Institutions</b>				
1	Faith Baptist Church	City of Colonial Heights	150 feet east	Along Dunlop Connection.
2	First Baptist Church Disputanta	Prince George County	200 feet east (estimated)	Observed during fieldwork.
3	Bethany Presbyterian Church	Isle of Wight	250 feet east	
4	Missouri Church	City of Suffolk	130 feet north	
5	Bethlehem Christian Church	City of Suffolk	270 feet south	
6	United Methodist Church	City of Chesapeake	100 feet north (estimate)	Observed during fieldwork.
<b>Cemeteries</b>				
1	Blandford Cemetery	City of Petersburg	Easternmost border abuts HSR right of way	30,000 Confederate Soldiers buried here. Site of first Memorial Day celebration.
2	Sacred Heart Cemetery	Prince George County	125 feet west	
3	Town of Windsor Cemetery	Isle of Wight County	265 feet southwest	
4	Tyler Cemetery	Isle of Wight County	125 feet southwest	
5	Mount Olive Cemetery	City of Norfolk	265 feet west	
<b>Airports</b>				
1	Hampton Roads Airport	City of Suffolk	300 feet north	Southern tip of property falls within buffer.
<b>Landmarks</b>				
1	Mayo's Island	City of Richmond	HSR right of way crosses eastern portion of island	Existing bridge over island.
2	Defense General Supply Center	Chesterfield County	Eastern-most tip of landmark falls within 300' HSR right of way buffer	Located predominantly west of HSR right of way.

**Table 2-4  
Community Services and Facilities Within 300 Feet of the HSR Alignment**

#	Name	County/City/Locale	Approximate Distance From HSR Alignment	Notes
3	Petersburg National Battlefield	City of Petersburg	HSR right of way bisects western-most section of Battlefield	Predominantly east of right of way. Existing railroad between battlefield and historic Blandford Cemetery.
4	Cemetery	Prince George County	Small cemetery east of right of way, almost entirely within 300' buffer	Unnamed in GIS database.
<b>Parks and Recreational Areas</b>				
1	Petersburg National Battlefield	City of Petersburg	Westernmost section of park is bisected by HSR right of way	Southwestern portion of battlefield is designated a public park.

Sources: GIS Database provided by Parsons Transportation Group, Inc. and the most recent ADC mapping for the study area cities and counties.

In addition to the schools identified within 300 feet of the proposed HSR right of way, three schools are located just beyond the 300-foot buffer:

- Thomas Jefferson Elementary School, Suffolk, approximately 375 feet south of proposed HSR right of way.
- Paul D. Camp Community College, Suffolk, approximately 375 feet north of proposed HSR right of way.
- Ruffner Junior High School, Norfolk, approximately 360 feet west of proposed HSR right of way.

In addition to the religious institutions identified within 300 feet of the proposed HSR right of way, the following religious institutions are located just beyond the designated 300-foot buffer:

- Saint Michael's Episcopal Church, Colonial Heights, approximately 335 feet east of the proposed HSR right of way (Dunlop Connection).
- Sacred Heart Church, Prince George County, approximately 450 feet east of proposed HSR right of way.
- Saint Paul's Baptist Church, Suffolk, approximately 325 feet north of proposed HSR right of way.
- Saint Mary's Church, Chesapeake, approximately 460 feet south of proposed HSR right of way.

According to the GIS database and ADC maps, there are no state capitols, municipal courthouses, town halls, libraries, municipal auditoriums, county jails, police stations, fire/rescue stations, or hospitals within 300 feet of the proposed HSR right of way. Several of these community resources and facilities are located in the general vicinity of the HSR right of way but none will be adversely affected by the proposed project.

There are no hospitals or bus/transportation terminals within 300 feet of the proposed HSR right of way.

## **2.6 PARKS, RECREATION AREAS, AND WILDLIFE REFUGES**

Other than the Petersburg National Battlefield Park, there are no other public or private parks or recreational areas within 300 feet of the HSR right of way. There are two golf courses in close proximity to the right of way, the Prince George Golf Course, located west of the right of way in Disputanta, and the Suffolk Golf Course, located south of the right of way in Suffolk. An athletic field is located west of the proposed Dunlop Connection in Colonial Heights, north of the Appomattox River. The Great Dismal Swamp National Wildlife Refuge (NWR) is the only national wildlife refuge located within 300 feet of the right of way.

The right of way of the proposed HSR service passes through the western section of the Petersburg National Battlefield, located in the northeastern portion of Petersburg. A portion of the battlefield is also located in Prince George County. The battlefield commemorates the Civil War battles in 1864 and 1865 that resulted in the failure of General Ulysses S. Grant to capture Richmond. The southwestern portion of the battlefield is designated as a public park.

The right of way of the proposed HSR service passes through the northern portion of the Great Dismal Swamp NWR, which encompasses portions of Suffolk and Chesapeake. The HSR service would operate on an existing railroad along the boundary of the refuge and would not displace any portion of the NWR. Although the wetlands and other habitats in the refuge would not be directly affected by the operation of HSR, increased noise and vibration could disturb nearby wildlife populations. Due to the infrequency of the noise and vibration associated with HSR, these impacts are expected to be low.

## **2.7 NOISE**

Passenger trains generally travel through or near populated areas, making evaluating noise and vibration a key part of the environmental impact assessment process. Noise and vibration are often major concerns of surrounding communities.

The Federal Railroad Administration (FRA) and the Federal Transit Administration (FTA) have developed guidance manuals that include criteria for noise and vibration impact evaluation, High-Speed Ground Transportation Noise and Vibration Impact Assessment and Transit Noise and Vibration Impact Assessment. The FTA classifies receptors according to three categories; each is based on land use. Category 1 includes areas where quiet is an essential element of their intended purpose, such as concert pavilions or national landmarks. Category 2 includes residences and buildings where people sleep, while Category 3 includes institutional land uses with daytime and evening uses, such as schools, places of worship, and libraries.

There are six places of worship, five cemeteries, four landmarks, three schools, and one park located within the 300-foot buffer that may be affected by noise and vibration. Additional information for each of these sites is provided in Table 2-4.

## 2.8 AIR QUALITY

In accordance with the Clean Air Act and the 1990 Clean Air Act Amendments, all regulatory regions are classified as either attainment or non-attainment areas. The classifications are based on adherence to National Ambient Air Quality Standards (NAAQS) established by the EPA. States are required to develop State Implementation Plans intended to maintain and enforce NAAQS within each air quality region.

Five municipalities along the HSR corridor are designated as ozone maintenance areas. Maintenance areas are classified as being in attainment of clean air standards, but subject to the state maintenance plan. The five maintenance areas include Chesterfield County and the cities of Richmond, Suffolk, Chesapeake, and Norfolk. The proposed HSR project is expected contribute to the region's long-term attainment of clean air goals by reducing overall vehicle emissions. However, a quantitative analysis of the affect of the proposed HSR service on regional and local air quality has not been conducted. A more detailed air quality analysis would be required for future environmental documentation.

## 2.9 WATERS, WETLANDS, AND FLOODPLAINS

### 2.9.1 Surface Waters

Surface waters in the vicinity of the HSR corridor were mapped using GIS data from ESRI and National Wetland Inventory (NWI) mapping. The study area encompasses portions of the following four watersheds, as defined by the USGS: Lower James River, Appomattox River, Blackwater River, and Hampton Roads. The Lower James River, Appomattox, and Hampton Roads watersheds are part of the James River Basin and the larger Chesapeake Bay Watershed. The Blackwater River watershed is part of the Chowan and Dismal Swamp Basin. The proposed HSR service would cross 29 named, perennial streams between Richmond and Norfolk. Stream crossings in each watershed are listed below:

- **Lower James River Watershed:** James River, Goose Creek, Falling Creek, Kingsland Creek, and the North Great Branch and the South Great Branch of Proctors Creek.
- **Appomattox River Watershed:** Ashton Creek, Timsbury Creek, Swift Creek, Oldtown Creek, Appomattox River, and Poor Creek.
- **Blackwater River Watershed:** Blackwater Swamp, Second Swamp, Warwick Swamp, Spring Branch, Coppahaunk Swamp, Tucker Swamp, Blackwater River, Burnt Mill Swamp, and Antioch Swamp.
- **Hampton Roads Watershed:** Eley Swamp, Cohoon Creek/Lake Meade, Lake Kilby, Shingle Creek, Southern Branch Elizabeth River, Gilligan Creek, Jones Creek, and Eastern Branch Elizabeth River.

Major river crossings along the corridor include the James River in Richmond, the Appomattox River in Petersburg, the Blackwater River at the border of Southampton and Isle of Wight counties, and the Southern and Eastern Branches of the Elizabeth River in Norfolk. Because no additional infrastructure would be required at these crossings to operate HSR, neither HSR alternative would adversely affect these surface waters.

The Ettrick Connection would require a new bridge to cross the Appomattox River. This bridge would be constructed within the 6.2-mile segment of the Appomattox River that is designated as a State Scenic River (from the base of the Lake Chesdin Dam to the Route 36 bridge crossing

in Petersburg). Construction of the bridge could permanently alter historic districts and floodplains along the river and could temporarily affect aquatic life and habitats. The Dunlop Connection would cross the Appomattox River east of the Route 36 bridge and outside the boundaries of the State Scenic River designation. However, the old Atlantic Coast Line Railroad bridge over the Appomattox would need to be rebuilt for the Dunlop Connection. This construction could also impair floodplains and degrade aquatic habitats. Further investigation would be necessary to determine the nature and degree of these effects.

### **2.9.3 Wetlands**

The locations and classifications of wetlands within the 300-foot buffer of the HSR alignments were established using NWI maps, which are generally used for planning purposes only. Field surveys were not conducted to verify this mapping. The wetland system descriptions used in this report are from Cowardin et al. (1979).

The buffers for each alternative encompass more than 575 acres of palustrine, estuarine, riverine, and lacustrine wetlands. Palustrine wetlands include all non-tidal wetlands dominated by trees, shrubs, persistent emergent plants, mosses or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean-derived salts is below 0.5 parts per thousand (ppt). Estuarine wetlands consist of deepwater tidal habitats and adjacent tidal wetlands that are usually semi-enclosed by land, but have open, partly obstructed, or sporadic access to the open ocean, and in which ocean water is at least occasionally diluted by freshwater runoff from land. Riverine wetlands include all wetlands and deepwater habitats contained within a channel, with the exception of wetlands dominated by persistent vegetation and habitats with salinity greater than 0.5 ppt. Lacustrine wetlands include wetlands and deepwater habitats that are situated in a topographic depression or a dammed river channel. Wetlands in this classification lack trees, shrubs, persistent emergent plants, emergent mosses or lichens, and occupy more than 20 acres (8 hectares) in area.

Most wetlands located within the 300-foot buffer of the HSR right of way, for both the Ettrick and Dunlop Connections, are non-tidal, palustrine forested wetlands, or freshwater swamps. These areas account for approximately 60 percent of the wetlands within the right of way buffer, and other palustrine wetlands account for an additional 20 percent of that total area. Approximately 15 percent of the wetland area within the HSR right of way buffer is actually occupied by waters that are included in the classifications for estuarine, lacustrine, and riverine wetlands. The remaining 4 percent of the wetland area consists of estuarine emergent wetlands, estuarine scrub-shrub wetlands, and estuarine shore. Wetlands are located throughout the corridor, primarily along larger streams and rivers. The area occupied by these various wetland systems within the buffers of the HSR alternatives is summarized in Table 2-5. Wetlands in the Great Dismal Swamp occupy the large undeveloped area between Suffolk and Chesapeake, but much of the area of the swamp lies outside the 300-foot buffer for the corridor. A small portion of the Hampton Roads Wetland Mitigation Bank is also adjacent to the right of way near the proposed Sunray station, but no direct impacts to the mitigation bank are anticipated.

The 300-foot buffer for the Ettrick Connection alternative encompasses 7.8 additional acres of riverine wetlands compared to the alternative for the Dunlop Connection. The Ettrick Connection would extend farther along the banks of the Appomattox River than the Dunlop Connection. The presence of wetlands within the 300-ft buffer surrounding the right of way does not imply that all or part of these areas would be affected by the construction and implementation of HSR. HSR service would operate on existing railroad tracks, or on new tracks constructed within the existing railroad right-of way. Because major improvements to

bridges and culverts are not anticipated as part of HSR implementation, wetlands adjacent to the right-of way are not likely to be disturbed.

**Table 2-5  
Existing Wetlands Within 300 Feet of the HSR Corridor Alternatives**

Wetland System	Dunlop Connection		Ettrick Connection	
	Area (ac)	Percent of Total	Area (ac)	Percent of Total
Total Estuarine	62.6	11	62.6	11
Total Lacustrine	27.2	5	27.2	5
Total Palustrine	461.3	80	460.6	79
Total Riverine	25.6	4	34.0	6
<b>Total Wetlands</b>	576.6	100	584.4	100

### 2.9.4 Floodplains

In cooperation with state and local governments, FEMA has developed flood boundary and flood insurance mapping. In accordance with Executive Order 11988 – Floodplain Management, floodplains and regulatory floodways within the study area were identified using the *Flood Insurance Study* and associated mapping for the corridor. Since not all local governments within the study area participate in FEMA's National Flood insurance Program (NFIP), only limited information was available for some areas. Many rural communities in southern Virginia do not participate in the program. Floodplain mapping was not electronically available for any locations within the study area, with the exception of Norfolk, and is therefore not illustrated on the environmental constraints mapping. Floodplain mapping also was not readily available for the Colonial Heights segment of the HSR corridor, where the alternatives take different paths.

The NFIP defines a floodplain as any land area susceptible to being inundated by water. The floodplain includes both the floodway and the floodway fringe. The floodway is defined as the channel of the stream and adjacent floodplain area that should be kept free of any encroachment so that a 100-year flood event may occur without increasing the level and extent of base flood elevations. The base, or 100-year flood, is defined as an event that is equaled or exceeded, on average, once every hundred years. The floodway fringe, or the 100-year floodplain, is the area between the floodway boundary and the outer limits of the 100-year floodplain boundary.

Throughout the study area, 100-year floodplains are found adjacent to most of the major surface waters and some of the smaller tributaries. These include the James River, Appomattox River, Blackwater River, and Southern Branch of Elizabeth River. In total, the HSR corridor would cross 27 mapped floodplains between Richmond and Norfolk. From preliminary analysis, both alternatives would be located within floodplain boundaries. More detailed engineering design is needed to determine the extent of interaction with floodplains.

## 2.10 WILDLIFE AND HABITATS

### 2.10.1 Federal and State-Listed Species

Based on searches of the Fish and Wildlife Information Service (FWIS) of the Virginia Department of Game and Inland Fisheries (VDGIF), 34 animal species with endangered, threatened, or special concern status have been documented to occur within 3 miles of the proposed HSR right of way from Richmond to Norfolk. The Division of Natural Heritage (DNH) in the Virginia Department of Conservation and Recreation also publishes county lists of threatened and endangered plant and animal species and unique ecological communities. One federally listed plant species is documented in Chesterfield County. Counties along the HSR corridor contain 19 unique ecological communities, and 2 known bird-nesting sites. The DNH county lists of federal and state-listed animal species were not used to assess the potential for species to occur within the HSR corridor. The FWIS database was searched using multiple locations along the corridor, in order to obtain more detailed records for threatened and endangered species.

Sensitive joint-vetch (*Aeschynomene virginica*) is the only plant species with federal or state status with known to occur in the cities and counties encompassing the HSR corridor. *A. virginica* is listed as federally threatened and has been documented in Chesterfield County. The habitat for this species is described by the U.S. Fish and Wildlife Service (FWS) as the intertidal zone where plants are flooded twice daily, plant diversity is high (50 species per acre), and annual species predominate. Suitable habitat for this species may exist along the tidal portions of the James River, Swift Creek, and the Appomattox River, but these areas are generally located east of the HSR right of way, far outside the 300-foot buffer.

A complete list of threatened, endangered, and rare animal species for each location searched along the HSR corridor is provided in Appendix A. Of the 34 animal species identified in the FWIS database as having the potential to be affected by the HSR alignment, the red-cockaded woodpecker (*Picoides borealis borealis*) is listed as federally endangered, the piping plover (*Charadrius melodus melodus*) and bald eagle (*Haliaeetus leucocephalus leucocephalus*) are listed as federally threatened, and 4 species are listed as federal species of concern. The bald eagle is also a state-endangered species. Of the federal species of concern, the eastern big-eared bat (*Corynorhinus rafinesquii macrotis*) and Henslow's sparrow (*Ammodramus henslowii susurrans*) are also listed as state-endangered and state-threatened, respectively. A third state-endangered species found within 3 miles of the proposed right of way is the blackbanded sunfish (*Enneacanthus chaetodon*). In addition, four other state-threatened species have been documented to occur within 3 miles of the right of way: Mabee's salamander (*Ambystoma mabeei*), peregrine falcon (*Falco peregrinus*), loggerhead shrike (*Lanius ludovicianus ludovicianus*), and Dismal Swamp southeastern shrew (*Sorex longirostris fisheri*).

The FWIS records do not indicate the exact location of the species and do not necessarily mean that the species would occur even within 300 feet of the rail line. Nonetheless, the presence of any threatened or endangered animal species is not considered a fatal flaw, because the HSR service is unlikely to alter the availability of suitable habitat.

### 2.10.2 Fisheries Issues

The National Marine Fisheries Service was consulted to determine the presence or absence of Essential Fish Habitat (EFH) in the vicinity of the proposed right of way. EFH refers to the habitats of marine, estuarine, and anadromous finfish, mollusks, and crustaceans, which are

broadly defined in the 1996 amendments to the Magnuson-Stevens Act as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." The corridor does not encompass any areas with EFH designations, but the nearby James River estuary is designated as EFH for several species. Within the James River estuary, the EFH is designated in the mixing water/brackish salinity zone (0.5 percent < salinity < 25.0 percent) for juveniles and adults of the following species: windowpane flounder (*Scopthalmus aquosus*), bluefish (*Pomatomus saltatrix*), Atlantic butterflyfish (*Peprilus triacanthus*), summer flounder (*Paralichthys dentatus*) (designation includes larvae), and black sea bass (*Centropristus striata*).

### 2.10.3 General Habitats

Habitats along the HSR corridor were characterized based on field observations of land use and vegetation cover types. Detailed habitat surveys were not conducted, but NWI maps and digital aerial photos of the study area were used to develop general descriptions of fields, forests, and wetlands located along the corridor.

Habitats along more rural portions of the corridor primarily consist of dry pine forests, open agricultural fields, and forested wetlands. Forested areas, many of which are classified as wetlands, tend to be concentrated along large river systems and their smaller tributaries. These fields, pine forest, and swamps are fairly evenly distributed along the HSR corridor, interrupted only by the development associated with small towns such as Disputanta, Waverly, Wakefield, and Windsor. The Great Dismal Swamp NWR, located between Suffolk and Chesapeake, contains the largest expanse of wildlife habitat along the corridor, most of which is forested. The potential impacts to these habitats are estimated to be low, because implementation of the proposed project would not displace forested areas or fields.

Wildlife habitats in urban and suburban areas, particularly in the cities of Richmond and Petersburg, are very limited due to the density of commercial, residential, and industrial development. The natural areas that remain are typically fragmented by development and degraded by the proximity of noisy highways. The potential impacts to these urban and suburban habitats are expected to be low. The highest quality habitats in these cities are located along the banks of the James and Appomattox Rivers. Because these rivers are already bridged, operating HSR service across them is not expected to degrade their wildlife benefits. The landscape of Norfolk is also very urban, but it offers relatively high-quality habitat for many coastal species due to its location at the intersection of several river systems and its proximity to the Chesapeake Bay estuary. At the crossing of the Eastern Branch of the Elizabeth River, the proposed HSR service also would operate on existing movable bridges, which would not be modified by any of the alternative service levels. HSR operations through Chesapeake and Norfolk are not expected to significantly alter the quality or availability of existing wildlife habitats. While the increased noise and frequency of trains passing through any habitat could potentially degrade its quality, the effect would be temporary and would not represent a fatal flaw for HSR service.

### 2.10.4 Unique Habitats

Based on DNH records, no unique ecological communities are found in the cities of Richmond, Petersburg, or Norfolk, and the only unique community found in Chesterfield County is a tidal freshwater marsh. Communities found in Prince George County include coastal plain bottomland hardwoods, coastal plain depression pond, and tidal freshwater marsh. Sussex and Southampton counties contain several unique communities, including bald cypress-tupelo swamp, basic mesic forest, coastal plain bottomland hardwoods, fluvial terrace woodlands,

mesic mixed hardwood forest, and pine/scrub oak sandhill. Other ecological communities, such as coastal plain wet meadow, coastal plain/piedmont acidic seepage swamp, high pocosin, loblolly pine forest, non-riverine pine - hardwood forest, oxbow pond, peatland Atlantic white cedar forest, pond pine forest/woodland, streamhead Atlantic white cedar forest, tidal baldcypress woodland/savanna, tidal oligohaline marsh are also found in Sussex, Southampton, Isle of Wight, Suffolk, and Chesapeake. More information on the locations of these communities within each city and county would be necessary to evaluate how HSR operations would affect them.

Additionally, DNH manages several natural area preserves in southeastern Virginia, including Dendron Swamp Natural Area Preserve, Blackwater Ecological Preserve, and Antioch Pines Natural Area Preserve. Because these preserves are generally located in undeveloped areas, away from population centers, they are sufficiently removed from the HSR right of way that they would not be affected.

## **2.11 HISTORIC AND ARCHAEOLOGICAL RESOURCES**

### **2.11.1 Overview**

During the nineteenth century, the advent of railroad transportation enhanced the feasibility of the development of commercial centers inland, away from rivers and ports. In Virginia, numerous nineteenth-century towns were established and prospered due to the textile and tobacco industries and their proximity to rail lines. Therefore, many historic properties, districts, and archaeological sites are likely to be found along the proposed corridor.

The available GIS database and ADC mapping used to conduct the preliminary environmental screening analysis contained very little information pertaining to cultural resources for the project corridor. Therefore, an Internet search was conducted at [www.nr.nps.gov](http://www.nr.nps.gov), a site maintained by the National Parks Service (NPS), to identify the presence of any listed or eligible National Register historic properties, districts or archaeological sites within the study area. However, to thoroughly and accurately identify the presence of cultural resources along the proposed HSR corridor, a detailed research effort would be necessary and would involve consultation with the Virginia Department of Historic Resources (VDHR) in Richmond and a detailed review of existing files maintained at that location. Therefore, the information provided below is solely for the purpose of providing a general overview as to the potential for cultural resources along the proposed HSR corridor.

### **2.11.2 Richmond**

Established in 1737, Richmond supports a rich political, architectural, and military history. Richmond replaced Williamsburg as the capital of Virginia in 1779 and was the capitol of the Confederacy during the Civil War. Richmond contains several historic neighborhoods, eighteenth- and nineteenth-century town homes, Victorian homes, neo-classical architecture, and various historic churches, monuments, and landmarks. The city contains several National Historic Landmarks. Richmond's Main Street Station, now undergoing restoration, is listed on the National Register of Historic Places (NRHP). Presently, passenger trains do not stop at Main Street Station, although Amtrak service to Newport News uses the easternmost station tracks. The City of Richmond is working with Amtrak and the DRPT to re-institute rail passenger service into and through the station, with the station serving as the hub of the HSR passenger service to Norfolk, Virginia and Charlotte, North Carolina.

### **2.11.3 Chesterfield County**

Review of the GIS database, ADC maps, and the NPS internet site revealed that there are no sites listed or eligible for the NRHP, historic districts, or archaeological sites within 300 feet of the proposed HSR right of way in Chesterfield County.

### **2.11.4 Colonial Heights**

Review of the GIS database, ADC maps, and the NPS internet site revealed that there are no sites listed or eligible for the NRHP, districts, or archaeological sites within 300 feet of the proposed HRS right of way in Colonial Heights.

### **2.11.5 Petersburg**

Petersburg is home to several historic sites, including the Petersburg National Battlefield, the Old Towne Historic District, and several eighteenth- and nineteenth-century structures. The proposed Ettrick Connection would pass directly through the Old Towne Historic District along the southern shore of the Appomattox River. Farther to the southeast, the HSR right of way would pass through the western section of the Petersburg National Battlefield, the site of the longest siege in American history in which General Ulysses S. Grant failed to capture Richmond in 1864 and 1865. The rail line actually serves as the eastern boundary of the Blandford Cemetery, a site where approximately 30,000 Confederate soldiers are buried and where the first Memorial Day was observed. The railroad through this area is presently active, accommodating frequent freight movements associated with the coal export industry in Norfolk.

Also of note in Petersburg is the island of Pocahontas, located just east of the Dr. Martin Luther King, Jr. Memorial Bridge that carries U.S. Route 1 over the Appomattox River. According to Delaney Ward of the City of Petersburg, Pocahontas is historically significant, but to date has not been listed on the National Register of Historic Places. Although there has been much alteration to the housing on the island, there is some justification for a sympathetic assessment because of damage incurred in a hurricane in 1993. The island's street network was laid out in 1752, and the island was incorporated into Petersburg in 1784. It was one of the first African-American settlements in the country.

In comparing the Dunlop Connection and the Ettrick Connection, both have the potential for interaction with cultural resources. The Dunlop Connection would include new tracks that would be provided for trains southbound to Florida. It appears that this construction would be within the boundaries of the Battersea Historic District. More detailed design information and a comprehensive cultural resources analysis are needed to determine the affect of the proposed HSR service on this historic district and the Pocahontas neighborhood.

### **2.11.6 Prince George County**

Review of the GIS database, ADC maps, and the NPS internet site revealed that there are no sites listed or eligible for the NRHP, districts, or archaeological sites within 300 feet of the proposed HRS right of way in Prince George County.

### **2.11.7 Sussex County**

Review of the GIS database, ADC maps, and NPS internet site revealed that there is one site listed on the NRHP that is near the proposed HSR right of way, although it cannot be determined from the address whether the site falls within the 300-foot buffer used for the

environmental screening analysis. The site is the Miles B. Carpenter House located along U.S. Route 460 in Waverly, and it was listed on the NRHP on November 13, 1989. There are no historic districts or archaeological sites within 300 feet of the proposed HRS right of way in Sussex County, according to the data resources consulted.

#### **2.11.8 Southampton County**

Review of the GIS database, ADC maps, and NPS internet site revealed that there are no listed or eligible National Register historic properties, districts, or archaeological sites within 300 feet of the proposed HRS right of way in Southampton County.

#### **2.11.9 Isle of Wight County**

Review of the GIS database, ADC maps, and NPS internet site revealed that there are no listed or eligible National Register historic properties, districts, or archaeological sites within 300 feet of the proposed HRS right of way in Isle of Wight County.

#### **2.11.10 Suffolk**

Review of the GIS database, ADC maps, and NPS internet site revealed that there is one site listed on the NRHP that is near the proposed HSR right of way, although it cannot be determined from the address whether the site falls within the 300-foot buffer used for the environmental screening analysis. The site is a professional building located at 100 North Main Street in Suffolk, and it was listed on the NRHP on August 12, 1999. There are no historic districts or archaeological sites within 300 feet of the proposed HRS right of way in Suffolk, according to the data resources consulted.

#### **2.11.11 Chesapeake**

Review of the GIS database, ADC maps, and NPS internet site revealed that there are no listed or eligible National Register historic properties, districts, or archaeological sites within 300 feet of the proposed HRS right of way in the city of Chesapeake.

#### **2.11.12 Norfolk**

Review of the GIS database, ADC maps, and NPS internet site revealed that there are no listed or eligible National Register historic properties, districts, or archaeological sites within 300 feet of the proposed HRS right of way as it passes through the southern section of Norfolk, south of the Eastern Branch of the Elizabeth River. The Berkley North Historic District, a National Register district roughly bounded by Bellamy Avenue on the north, Pescara Creek on the east, Berkley Avenue on the south and Interstate 464 on the west, is located just west of the proposed HSR right of way but beyond the 300 foot buffer used in this environmental screening analysis.

### **2.12 HAZARDOUS WASTE SITES**

The EPA has defined hazardous waste as any waste material (or combination of waste materials) that may pose a hazard to human health, welfare, or the environment. Such wastes are characterized as possessing reactive, toxic, infectious, explosive, flammable, corrosive, or radioactive qualities. Hazardous waste sites include, but are not limited to landfills, dumps, pits, lagoons, salvage areas, and storage tanks. Information on documented hazardous waste

sites within the study was obtained from the EPA Comprehensive Environmental Response Compensation and Liability Act (CERCLA) information System (CERCLIS), which tracks sites with the potential to release hazardous substances into the environment. This database included 16 hazardous waste sites that are located within 2 miles of the proposed HSR right of way. With six sites located near the right of way, Richmond has the highest concentration of sites. Three sites are near the right of way in Chesapeake, two in Chesterfield County, and one site each is near the right of way in Colonial Heights, Petersburg, Sussex County, Suffolk, and Norfolk.

In Chesapeake, St. Julians Creek Annex (U.S. Navy) is located on 490 acres of land adjacent to the HSR right of way, immediately south of the boundary between the cities of Portsmouth and Chesapeake. The property extends west to Brentwood, south to St. Julians Creek, and east to the South Branch of the Elizabeth River. Current facilities at St. Julians Creek Annex include administrative offices, light industrial shops, and storage facilities for tenant naval commands, but the property has been used for various military purposes since 1849, including ordnance and material storage and ammunition supply. Waste from former operations was deposited onsite, creating numerous sources of potential contamination (Source: Superfund NPL Assessment Program (SNAP) Database). More information would be necessary to determine the precise locations of contamination on this property and the proximity of contamination to the HSR right of way.

## **2.13 PUBLIC SAFETY**

Implementation of the HSR line would affect traffic flow near at-grade road crossings. At-grade crossings with high traffic volumes would be considered for grade separation. The GIS database and ADC maps show the number of grade crossings to differ slightly for the two alignments. A route using the Dunlop Connection would have 98 at-grade crossings, while a route using the Ettrick Connection would have 101. The total number of roadway crossings, including above-, below- and at-grade, would range from 129 to 133 for the Dunlop and Ettrick Connections respectively.

Additionally, increased vehicular and pedestrian traffic would be expected at transit stations. Control measures at stations, pedestrian crossings, and intersections would include various combinations of signs, signals, gates, pavement markings, and crosswalks.



Appendix A

Federal and State Endangered, Threatened, and Species of Special Concern Documented Within 3 Miles of the HSR Right of way

Common Name	Scientific Name	Status	Richmond	Petersburg	Disputanta	Waverly	Wakefield	Zuni	Kilby	Chesapeake	Norfolk
<b>Amphibians and Reptiles</b>											
Salamander, Mabee's	<i>Ambystoma mabeei</i>	ST						Y			
Frog, carpenter	<i>Rana virgatipes</i>	SS					Y				
Terrapin, northern diamond-backed	<i>Malaclemys terrapin terrapin</i>	FS									Y
<b>Birds</b>											
Sparrow, saltmarsh sharp-tailed	<i>Ammodramus caudacutus diversus</i>	SS								Y	Y
Sparrow, Henslow's	<i>Ammodramus henslowii susurrans</i>	FSST									Y
Egret, great	<i>Ardea alba egretta</i>	SS	Y	Y	Y	Y	Y			Y	Y
Finch, purple	<i>Carpodacus purpureus</i>	SS		Y						Y	Y
Thrush, hermit	<i>Catharus guttatus</i>	SS		Y						Y	Y
Creeper, brown	<i>Certhia americana</i>	SS		Y						Y	Y
Plover, piping	<i>Charadrius melodus melodus</i>	FT								Y	Y
Harrier, northern	<i>Circus cyaneus</i>	SS		Y						Y	Y
Wren, sedge	<i>Cistothorus platensis</i>	SS		Y						Y	Y
Heron, little blue	<i>Egretta caerulea caerulea</i>	SS				Y	Y				Y
Heron, tricolored	<i>Egretta tricolor</i>	SS									Y
Falcon, peregrine	<i>Falco peregrinus</i>	ST								Y	Y
Moorhen, common	<i>Gallinula chloropus cachinnans</i>	SS		Y							Y
Eagle, bald	<i>Haliaeetus leucocephalus leucocephalus</i>	FTSE		Y					Y	Y	Y
Shrike, loggerhead	<i>Lanius ludovicianus ludovicianus</i>	ST		Y		Y				Y	Y
Rail, black	<i>Laterallus jamaicensis</i>	FS								Y	Y
Crossbill, red	<i>Loxia curvirostra</i>	SS									Y
Night-heron, yellow-crowned	<i>Nyctanassa violacea violacea</i>	SS								Y	Y
Pelican, brown	<i>Pelecanus occidentalis carolinensis</i>	SS									Y

Appendix A

Federal and State Endangered, Threatened, and Species of Special Concern Documented Within 3 Miles of the HSR Right of way

Common Name	Scientific Name	Status	Richmond	Petersburg	Disputanta	Waverly	Wakefield	Zuni	Kilby	Chesapeake	Norfolk
Woodpecker, red-cockaded	<i>Picooides borealis borealis</i>	FE				Y	Y			Y	Y
Kinglet, golden-crowned	<i>Regulus satrapa</i>	SS		Y						Y	Y
Nuthatch, red-breasted	<i>Sitta canadensis</i>	SS		Y						Y	Y
Dickcissel	<i>Spiza americana</i>	SS									Y
Tern, least	<i>Sterna antillarum</i>	SS									Y
Tern, Caspian	<i>Sterna caspia</i>	SS									Y
Tern, Forster's	<i>Sterna forsteri</i>	SS		Y						Y	Y
Wren, winter	<i>Troglodytes troglodytes</i>	SS		Y						Y	Y
Owl, barn	<i>Tyto alba pratincola</i>	SS	Y	Y							Y
<b>Fish</b>											
Sunfish, blackbanded	<i>Enneacanthus chaetodon</i>	SE			Y	Y					
<b>Mammals</b>											
Bat, eastern big-eared	<i>Corynorhinus rafinesquii macrotis</i>	FSSE					Y				
Shrew, Dismal Swamp southeastern	<i>Sorex longirostris fisheri</i>	ST						Y			
	<b>TOTAL SPECIES DOCUMENTED</b>	34	2	14	2	5	5	2	1	18	29

Status	Translation	Status	Translation
FE	Federal Endangered	SE	State Endangered
FT	Federal Threatened	ST	State Threatened
FP	Federal Proposed	SS	State Special Concern
FC	Federal Candidate	SC	State Candidate
FS	Federal Species of Concern		

**Locations of Road Crossings Along HSR Route**

No.	Roadway Name	County/City	Type of Crossing*	Notes
1	Main St	Richmond	Above-Grade	
2	Dock St	Richmond	Above-Grade	
3	State Hwy 195 (Downtown Expressway)	Richmond	Above-Grade	
4	Maury St	Richmond	At-Grade	
5	Connecting Rd	Richmond	Above-grade	Connector to I-95 from the west
6	Gordon Ave.	Richmond	Below-Grade	
7	Goodes St	Richmond	At-Grade	
8	Unnamed Road	Richmond	At-Grade	
9	Commerce Rd	Richmond	At-Grade	
10	Lumkin Ave.	Richmond	At-Grade	
11	Ruffin Rd	Richmond	Above-Grade	
12	Bells Rd	Richmond	At-Grade	
13	Dale Ave	Richmond	At-Grade	
14	Cogbill Rd	Chesterfield	Below Grade	
15	State Hwy 150 (Chippenham Pkwy)	Chesterfield	Above-Grade	
16	Station Rd	Chesterfield	At-Grade	
17	Marina Dr	Chesterfield	At-Grade	
18	Elliham Ave	Chesterfield	Above-Grade	
19	U.S. Hwy 1 (U.S. Hwy 301)	Chesterfield	Above-Grade	
20	Kingsland Rd	Chesterfield	At-Grade	
21	Brinkley Rd	Chesterfield	At-Grade	
22	State Hwy 288	Chesterfield	At-Grade	
23	Old Lane	Chesterfield	At-Grade	
24	Centralia Rd	Chesterfield	At-Grade	
25	State Hwy 10 (W. Hundred Rd)	Chesterfield	Below-Grade	
26	Dodomead Rd	Chesterfield	At-Grade	North of Curtis St
27	Curtis St	Chesterfield	At-Grade	
28	West St	Chesterfield	At-Grade	
29	U.S. Hwy 1 (U.S. Hwy 301)	Chesterfield	Below-Grade	
30	Indian Hill Rd	Chesterfield	At-Grade	
31	Woods Edge Rd	Chesterfield	At-Grade	
32	Pine Forest Dr	Chesterfield	At-Grade	
33	Ellerslie Ave	Colonial Heights	Above-Grade	Dunlop (Abandoned) & Ettrick Connections
34	U.S. Hwy 1 (U.S. Hwy 301)	Colonial Heights	Below Grade	Ettrick Connection
35	Temple Ave	Colonial Heights	Above-Grade	Dunlop (Abandoned) Connection
36	Conduit Rd	Colonial Heights	At-Grade	Dunlop (Abandoned) Connection
37	Bridge St	Colonial Heights	Above-Grade	Dunlop (Abandoned) Connection

**Locations of Road Crossings Along HSR Route**

<b>No.</b>	<b>Roadway Name</b>	<b>County/City</b>	<b>Type of Crossing*</b>	<b>Notes</b>
38	Branders Bridge Rd	Chesterfield	At-Grade	Ettrick Connection
39	Dupuy Rd	Chesterfield		Ettrick Connection
40	State Hwy 36 (Fleet St)	Chesterfield	Below-Grade	Ettrick Connection
41	Squaw Alley	Chesterfield	At-Grade	Ettrick Connection
42	Cross St	Chesterfield	At-Grade	Ettrick Connection
43	U.S. Hwy 1 (U.S. Hwy 301)	Chesterfield	Above-Grade	Ettrick Connection
44	Phoenix St	Petersburg	At-Grade	
45	5 <sup>th</sup> St	Petersburg	At-Grade	
46	Interstate 95 (I-95)	Petersburg	Above-Grade	
47	State Hwy 36 (E. Washington St)	Petersburg	Below-Grade	
48	Siege Rd	Petersburg	Above-Grade	
49	U.S. Hwy 460	Petersburg	Above-Grade	
50	Poe Lane	Petersburg	At-Grade	
51	Wagner Rd	Petersburg	Above-Grade	
52	Interstate 295 (I-295)	Prince George	Above-Grade	
53	State Hwy 629	Prince George	At-Grade	
54	Enterprise Dr	Prince George	At-Grade	
55	State Hwy 156 (Prince George Dr)	Prince George	At-Grade	
56	Unnamed Road	Prince George	At-Grade	South of State Hwy 156
57	Unnamed Road	Prince George	At-Grade	Connects U.S. Hwy 460 to Golf Course Dr
58	Golf Course Dr	Prince George	Below-Grade	
59	Summit Lane	Prince George	At-Grade	
60	Robin Rd	Prince George	At-Grade	
61	State Hwy 625 (Arwood Rd)	Prince George	At-Grade	
62	Unnamed Road	Prince George	At-Grade	Connects to U.S. Hwy 460 from west, south of State Hwy 625
63	Alden Rd	Prince George	At-Grade	
64	State Hwy 602 (Cabin Point Rd)	Sussex	At-Grade	
65	Maifield Ave	Sussex	At-Grade	
66	State Hwy 40 (W. Main St)	Sussex	At-Grade	
67	Beaver Dam Rd	Sussex	At-Grade	
68	Unnamed Road	Sussex	At-Grade	Connects to U.S. Hwy 460 from west, south of Beaver Dam Rd
69	Walnut Hill Rd	Sussex	At-Grade	
70	Unnamed Rd	Sussex	At-Grade	Connects to U.S. Hwy 460 from west, south of Walnut Hill Rd
71	Chinquapin Rd	Sussex	At-Grade	
72	Tunnel Rd	Sussex	At-Grade	
73	State Hwy 628	Sussex	At-Grade	

**Locations of Road Crossings Along HSR Route**

<b>No.</b>	<b>Roadway Name</b>	<b>County/City</b>	<b>Type of Crossing*</b>	<b>Notes</b>
74	Unnamed Road	Sussex	At-Grade	Connects to Fredenburg Rd from west, south of State Hwy 628
75	Unnamed Road	Sussex	At-Grade	Connects to U.S. Hwy 460 from west
76	Unnamed Road	Sussex	At-Grade	Connects to U.S. Hwy 460 from west
77	Unnamed Road	Southampton	At-Grade	Connects to U.S. Hwy 460 from west
78	Sadler Rd	Southampton	At-Grade	
79	Unnamed Road	Southampton	At-Grade	Connects U.S Hwy 460 to Bell Rd
80	Unnamed Road	Southampton	At-Grade	Extension of Proctor's Bridge Rd that crosses U.S. Hwy 460 and rail right of way as it heads west.
81	Unnamed Road	Southampton	At-Grade	Connects to U.S. Hwy 460 from west
82	State Hwy 616	Southampton	At-Grade	
83	Unnamed Road	Southampton	At-Grade	Connects to U.S. Hwy 460 from the west
84	Tucker Swamp Rd	Southampton	Above-Grade	
85	Unnamed Road	Isle of Wight	At-Grade	Connects Zuni Circle to Thomas Wood Trail
86	Yellow Hammer Rd	Isle of Wight	At-Grade	
87	Ecella Rd	Isle of Wight	At-Grade	
88	Unnamed Road	Isle of Wight	At-Grade	South of Ecella Rd and connects to U.S. Hwy 460 from west
89	Antioch Rd	Isle of Wight	At-Grade	
90	Unnamed Road	Isle of Wight	At-Grade	Connects to U.S. Hwy 460 from west
91	U.S. Hwy 258 (S. Prince Blvd)	Isle of Wight	At-Grade	
92	State Hwy 603 (Bank St)	Isle of Wight	At-Grade	
93	Court St	Isle of Wight	At-Grade	
94	Old Suffolk Rd	Isle of Wight	At-Grade	
95	State Route 607 (Old Mill Rd)	Suffolk	At-Grade	
96	Old Myrtle Rd	Suffolk	At-Grade	
97	Kings Fork Rd	Suffolk	At-Grade	
98	Lake Meade Dr	Suffolk	At-Grade	
99	Indian Trail	Suffolk	At-Grade	
100	U.S. Hwy 58	Suffolk	Above-Grade	
101	Lake Kirby Rd (Lake Cahoon Rd)	Suffolk	Above Grade	
102	U.S. Hwy 58 Business Route (Constance Rd West)	Suffolk	At-Grade	

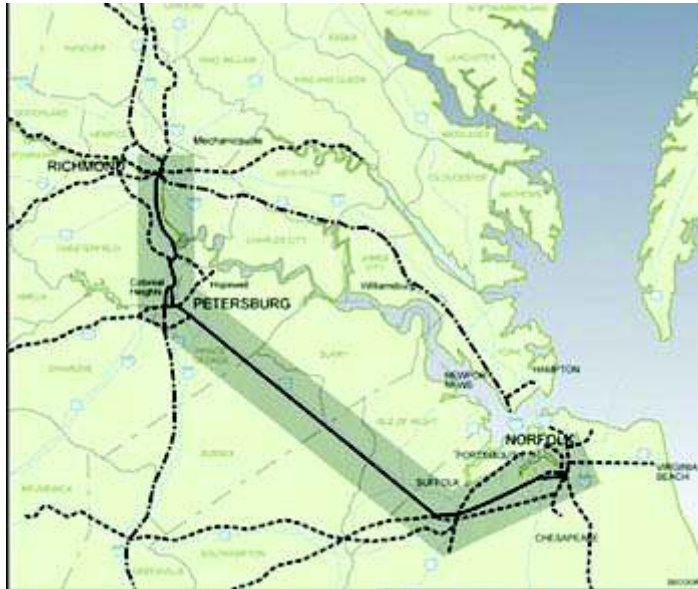
**Locations of Road Crossings Along HSR Route**

No.	Roadway Name	County/City	Type of Crossing*	Notes
103	Broad St	Suffolk	Above Grade	
104	Pine St	Suffolk	At-Grade	
105	State Hwy 10 (State Hwy 32)	Suffolk	At-Grade	
106	Pinner St	Suffolk	At-Grade	
107	Moore Ave	Suffolk	At-Grade	
108	Kingsboro St	Suffolk	At-Grade	
109	Suburban Dr	Suffolk	At-Grade	
110	U.S. Hwy 13 (State Hwy 337)	Suffolk	At-Grade	
111	Unnamed Road	Suffolk	At-Grade	Connects to U.S. Hwy 13 from south
112	Unnamed Road	Suffolk	At-Grade	Connects to U.S. Hwy 13 from south
113	Unnamed Road	Suffolk	At-Grade	Connects to U.S. Hwy 13 from south
114	Bob Foeller Dr	Suffolk	At-Grade	
115	Bisco St	Chesapeake	At-Grade	
116	Snowden St	Chesapeake	At-Grade	Abandoned Rail Corridor
117	Homestead Rd	Chesapeake	At-Grade	Abandoned Rail Corridor
118	U.S. Hwy 31 (Military Hwy)	Chesapeake	Above-Grade	Abandoned Rail Corridor
119	Interstate 64 (I-64)	Chesapeake	Above Grade	Abandoned Rail Corridor
120	Cavalier Blvd	Chesapeake	At-Grade	
121	Gust Lane	Chesapeake	At-Grade	
122	Deep Creek Blvd	Chesapeake	At-Grade	
123	U.S. Hwy 17 (George Washington Hwy North)	Chesapeake	At-Grade	
124	Rosemont Ave	Chesapeake	At-Grade	
125	Interstate 464 (I-464)	Chesapeake	Above-Grade	
126	U.S. Hwy 460 (Bainbridge Blvd)	Chesapeake	Above-Grade	
127	Rodgers St	Chesapeake	At-Grade	
128	Chesapeake Ave	Chesapeake	At-Grade	
129	Park Ave	Chesapeake	At-Grade	
130	Ohio St	Chesapeake	At-Grade	
131	Liberty St	Chesapeake	At-Grade	
132	U.S. Hwy 460 (22 <sup>nd</sup> St)	Chesapeake	Above-Grade	
133	Berkley Ave	Norfolk	At-Grade	First Crossing
134	Berkley Ave	Norfolk	At-Grade	Second Crossing
135	East Indian River Rd	Norfolk	At-Grade	
136	Park Ave	Norfolk	At-Grade	End of proposed HSR Corridor

Sources: GIS database (ESRI) and the most recent ADC mapping for the study area cities and counties.

# Richmond to South Hampton Roads High-Speed Rail Feasibility Study

## TASK 3 - RIDERSHIP AND REVENUE FORECASTING



Prepared for:  
Virginia Department of  
Rail and Public Transportation

Prepared by:



as a subconsultant to



May 2002

Virginia Department of Rail and Public Transportation

**RICHMOND TO SOUTH HAMPTON ROADS  
HIGH SPEED RAIL FEASIBILITY STUDY**

Ridership and Revenue Forecasting Report  
Executive Summary

Submitted by  
AECOM Consulting Transportation Group, Inc



As a subconsultant to  
Parsons Transportation Group

March 2002

Draft South Hampton Roads HSR  
Ridership and Revenue Forecasting Report  
**Executive Summary**

The ridership and revenue forecasts for rail service from Richmond to South Hampton Roads were developed using information originally assembled for the Southeast High Speed Rail Study in 1996 and recently updated by AECOM for the North Carolina DOT and Amtrak. In addition, data from the 1996 Hampton Roads Crossing Study were obtained from VDOT to supplement the Southeast HSR study travel base.

The model used for this analysis is an adaptation of a spreadsheet model that has been used in many applications for Amtrak and Georgia and North Carolina DOTs to evaluate intercity rail alternatives. The spreadsheet models were developed based market research and physical data such as highway networks, socio-economic variables, and service characteristics of public modes.

The study team examined nine service alternatives for passenger rail service to Norfolk along the existing CSXT lines from the existing Richmond- Staples Mill station through Richmond’s Main Street station to Petersburg, then along the Norfolk Southern line from Petersburg to Norfolk. The alternatives vary with speed (79 mph to 110 mph) and frequency (one to six daily round trips). The exhibit below provides a summary of the alternatives operating characteristics between Newport News / Norfolk and the Richmond Main Street Station.

**Alternative Specification Summary**

Alternative	Maximum Allowed Speed*	Frequency		Travel Time	
		Newport News – Richmond	Norfolk-Richmond	Newport News – Richmond	Norfolk-Richmond
BASE	79 mph	2	0	1:30	
1	79 mph	2	1	1:30	1:43
2	90 mph	2	1	1:30	1:35
3	79 mph	2	2	1:30	1:43
4	90 mph	2	2	1:30	1:35
5	79 mph	2	4	1:30	1:43
5A	79 mph	4	4	1:30	1:43
6	90 mph	2	4	1:30	1:35
7	110 mph	2	4	1:30	1:26
8	110 mph	2	6	1:30	1:26

\* between Richmond and Norfolk only; speeds between Richmond and Newport News remain at a 79 mph maximum allowed speed in all alternatives

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Ridership and revenue forecasts were prepared for each of the nine alternatives for forecast years of 2010 and 2025. A summary of forecast results for 2025 are included in the table below. The trips reported in the table correspond to trips between Hampton Roads, Petersburg, Richmond, Washington DC, and the Northeast Corridor.

The forecast results show a consistent increase in performance measures as the speed and frequency of service increases. The low frequency alternatives have low incremental ridership gains because the new service does not provide a significant improvement over the existing Newport News service. As the speed and frequency of the South Hampton Roads service increases the incremental ridership and revenue increase significantly.

**Summary of Forecast Results for 2025**

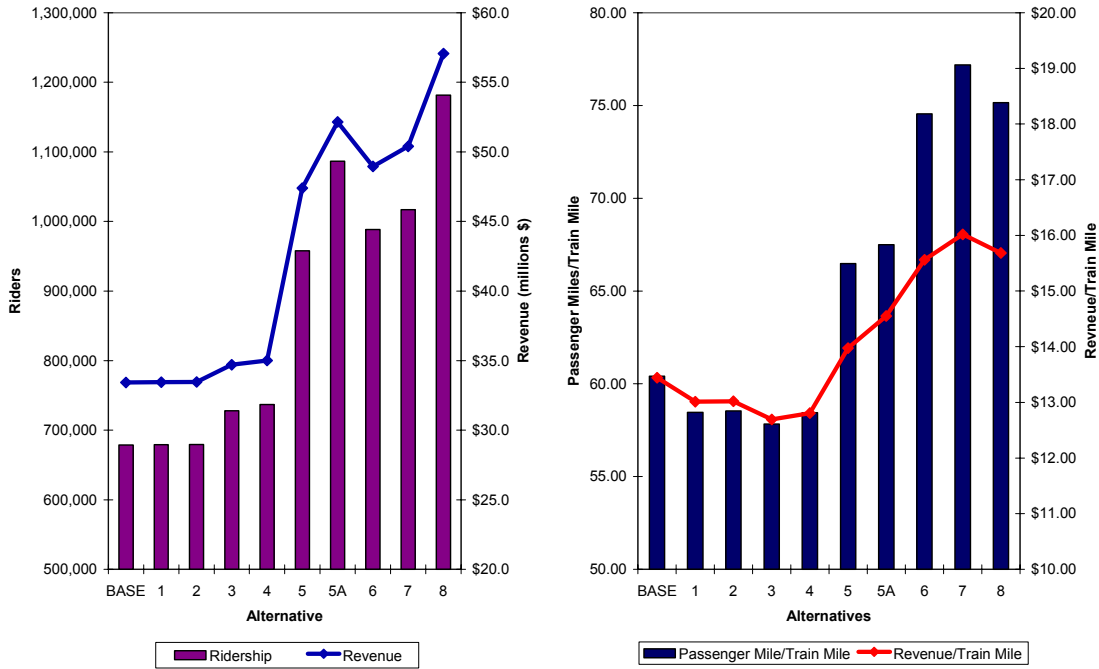
Alt	Total Riders	Total Revenue (millions \$)	Passenger Miles (millions)	Train Miles (millions)	Revenue/ Train Mile	Pass Mi/ Train Mile
Base	678,700	\$33.430	150.200	2.486	\$13.45	60.4
1	679,100	\$33.450	150.260	2.570	\$13.01	58.5
2	679,500	\$33.460	150.450	2.570	\$13.02	58.5
3	728,000	\$34.700	158.110	2.734	\$12.69	57.8
4	737,000	\$35.010	159.800	2.734	\$12.81	58.5
5	957,800	\$47.390	225.420	3.391	\$13.98	66.5
5A	1,086,600	\$52.150	241.940	3.584	\$14.55	67.5
6	988,400	\$48.960	234.530	3.146	\$15.56	74.5
7	1,017,000	\$50.400	242.860	3.146	\$16.02	77.2
8	1,181,500	\$57.060	273.420	3.638	\$15.68	75.2

It is important to note that the ridership and revenue increase at a faster rate than train miles for most of the higher frequency and speed alternatives. The following charts display forecasted riders and revenue and passenger miles and revenue per train mile. These charts illustrate the benefit of faster and more frequent service. Revenue per train mile increases from the base in all alternatives except for alternatives with low frequency. Passenger miles per train mile also generally increase after falling slightly in the low frequency alternatives.

The slightly lower performance of Alternatives 3 and 4, relative to Alternatives 1 and 2 as well as Alternative 8, relative to Alternative 7, reflects the diminishing return of additional frequencies as the timetable of trains expands. Because of the more than seven (7) hour running time between Norfolk and New York, it is not practical for all of the new Norfolk train frequencies operate north of Washington – they would depart or arrive at the end point station at a poor time of day and/or conflict with other Northeast Corridor

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 Ridership and Revenue Forecasting Report  
 operations. This is the case with the additional frequency provided in Alternatives 3 and 4 and one of the two additional frequencies provided in Alternative 8.

### Forecast Results and Performance Measures for 2025



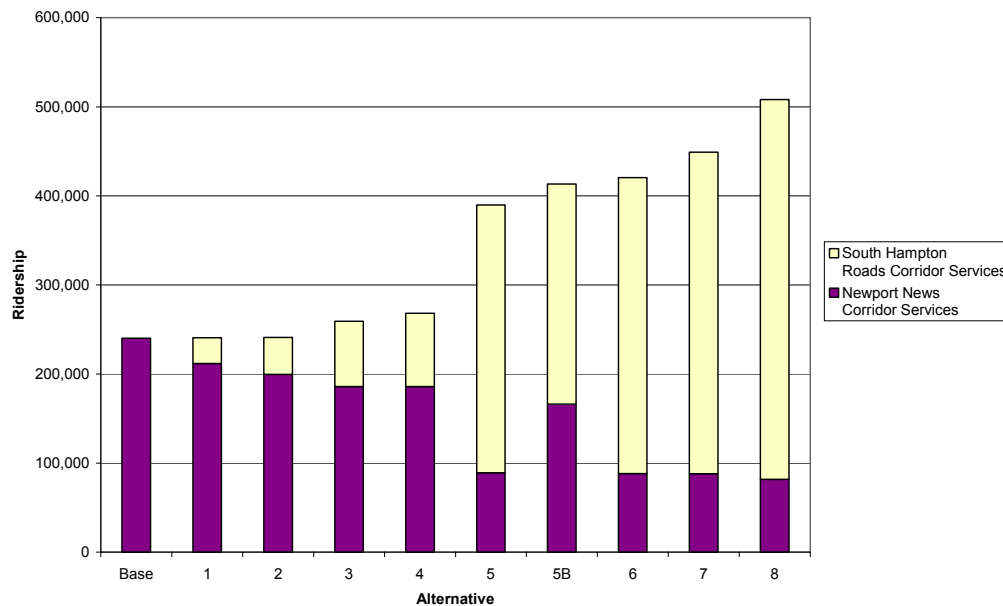
The next exhibits show ridership and revenue to/from the Hampton Roads area, served by the existing Newport News/Williamsburg corridor services and the new South Hampton Roads corridor service. As these exhibits show, there is an overall increase in ridership and revenue to/from the Hampton Roads area as the combined service frequencies and travel times improve across the service alternatives. Similarly, the exhibit shows the increasing diversion of ridership/revenue from the Newport News/Williamsburg corridor services, as passengers shift to the improved frequencies and travel times along the South Hampton Roads corridor service to/from Richmond and point north.

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**Hampton Roads Rail Ridership and Revenue for 2025**

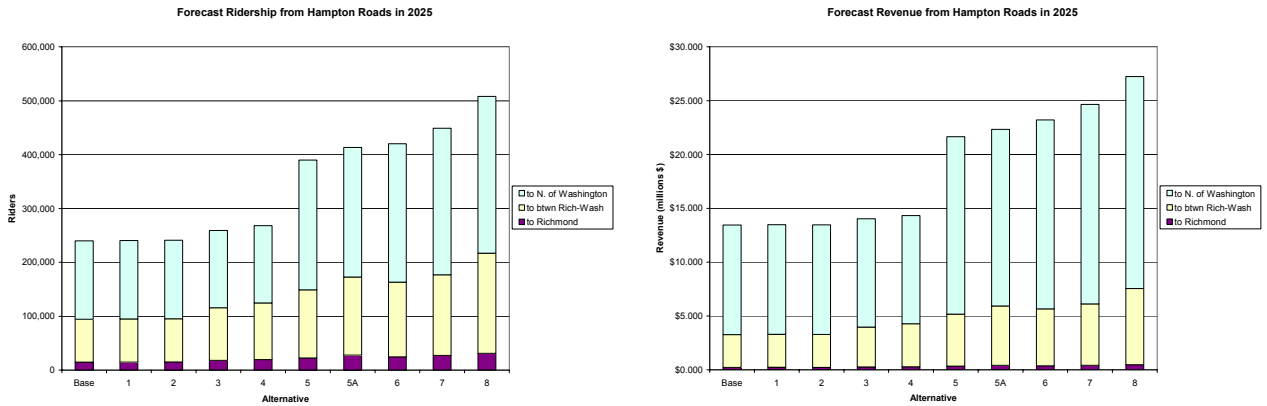
Alt	Newport News / Williamsburg Corridor Services		South Hampton Roads Corridor Services		Hampton Roads Total	
	Riders	Revenue (millions\$)	Riders	Revenue (millions\$)	Riders	Revenue (millions\$)
Base	240,200	\$13.460			240,200	\$13.460
1	211,800	\$12.460	28,800	\$1.020	240,600	\$13.480
2	199,500	\$11.970	41,500	\$1.510	241,000	\$13.480
3	185,900	\$11.380	73,300	\$2.650	259,200	\$14.030
4	185,900	\$11.380	82,300	\$2.960	268,200	\$14.340
5	89,000	\$4.870	300,800	\$16.780	389,800	\$21.650
5A	166,100	\$9.190	247,100	\$13.150	413,200	\$22.340
6	88,200	\$4.840	332,200	\$18.380	420,400	\$23.220
7	88,000	\$4.830	361,000	\$19.830	449,000	\$24.660
8	81,800	\$4.590	426,300	\$22.660	508,100	\$27.250

Forecast Ridership for Hampton Roads Corridors 2025



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Another important characteristic of the Hampton Roads area ridership and revenue forecasts is their north-end origin-destination. The exhibit below provides a graphical illustration of the relative significance of Hampton Roads ridership and revenue to/from Richmond, points north of Richmond to as far as Washington, and points north of Washington. As the exhibits show, very little Hampton Roads ridership and revenue is associated with travel to/from Richmond and, as in the base, most ridership and, in particular, revenue is associated with trips to/from points beyond Washington.



The next exhibit summarizes the total ridership and revenue forecasts for each of the alternatives including the above figures for the Hampton Roads area as well as impacts between Petersburg/Richmond and points north. As the exhibit shows, ridership and revenue also increase as new frequencies are introduced at Petersburg and, in some alternatives, Richmond.

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Ridership and Revenue Forecasting Report

**Hampton Roads, Richmond, and Other Markets  
Rail Ridership and Revenue for 2025**

Alt	Hampton Roads		Richmond/Petersburg & markets to the north		Total	
	Riders	Revenue (millions\$)	Riders	Revenue (millions\$)	Riders	Revenue (millions\$)
Base	240,200	\$13.460	438,500	\$19.970	678,700	\$33.430
1	240,600	\$13.480	438,500	\$19.970	679,100	\$33.450
2	241,000	\$13.480	438,500	\$19.970	679,500	\$33.460
3	259,200	\$14.030	468,800	\$20.670	728,000	\$34.700
4	268,200	\$14.340	468,800	\$20.670	737,000	\$35.010
5	389,800	\$21.650	568,000	\$25.740	957,800	\$47.390
5A	413,200	\$22.340	673,400	\$29.810	1,086,600	\$52.150
6	420,400	\$23.220	568,000	\$25.740	988,400	\$48.960
7	449,000	\$24.660	568,000	\$25.740	1,017,000	\$50.400
8	508,100	\$27.250	673,400	\$29.810	1,181,500	\$57.060