REPRINT
03/25/22

REPORT OF THE VIRGINIA DEPARTMENT OF RAIL AND PUBLIC TRANSPORTATION

2021 Commonwealth Corridor Feasibility Study (SJR50, 2020)

TO THE GOVERNOR AND
THE GENERAL ASSEMBLY OF VIRGINIA

SENATE DOCUMENT NO. 3

COMMONWEALTH OF VIRGINIA
RICHMOND
2022

2021 COMMONWEALTH CORRIDOR FEASIBILITY STUDY

Virginia Department of Rail and Public Transportation

January 2022

Table of Contents

Appendices

Figures

Tables

1. Executive Summary

On March 5, 2020, the Virginia Senate approved Virginia Senate Joint Resolution No. 50[1] requesting that the Virginia Department of Rail and Public Transportation (DRPT) study the feasibility of an east-west Commonwealth Corridor passenger rail service connecting Hampton Roads, Richmond, and the New River Valley. DRPT has prepared the 2021 Commonwealth Corridor Feasibility Study to fulfill this requirement.

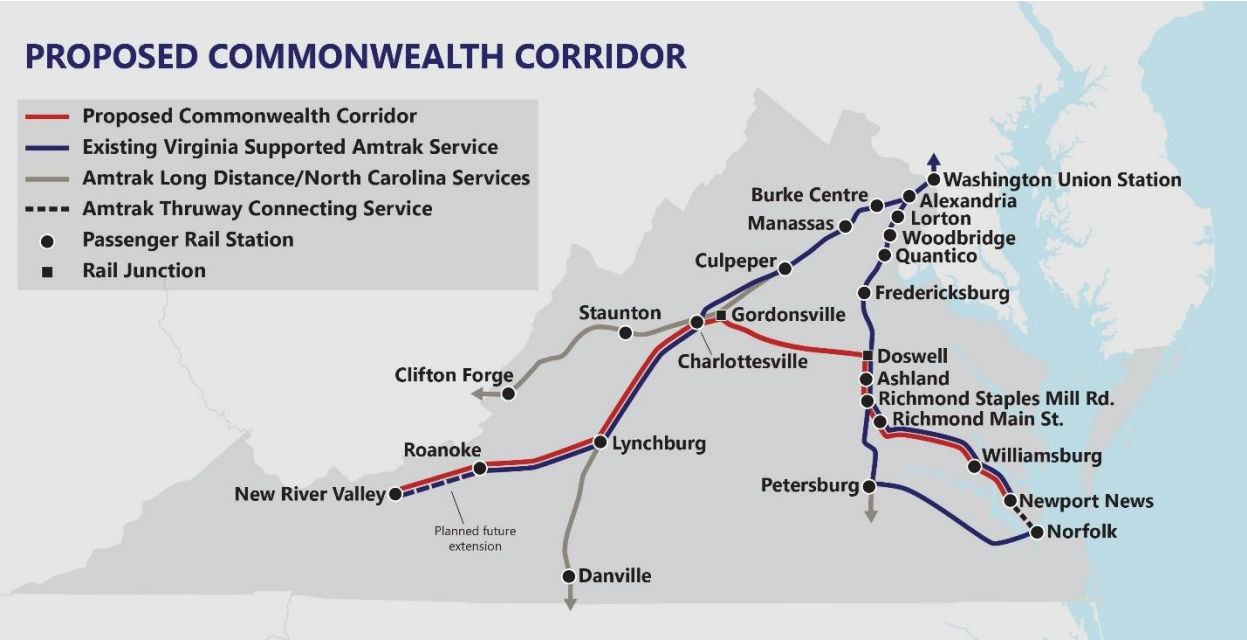
1.1. Project Description

The Commonwealth Corridor Feasibility Study was undertaken to assess the feasibility, desirability, and possibility of expanding intercity passenger rail service on an east-west, cross-state corridor linking Hampton Roads, Richmond, and the New River Valley. The study includes a description of the proposed corridor, summary of public outreach efforts, a proposed initial service plan, forecasted range of ridership, needed capital improvements and their estimated costs to provide the service, an estimate of high-level operating and maintenance costs, and recommended next steps. The Class I freight railroads in the region, CSX and Norfolk Southern, have not evaluated or agreed to the proposed service, including any capacity needs to support the proposed service. Capacity needs to accommodate proposed service will require evaluation and approval from the Class I freight railroads as further described in Section 9.

Figure 1.1 depicts the proposed Commonwealth Corridor along with existing state-supported Amtrak passenger rail services. Consistent with previous projects to implement new intercity passenger rail service in Virginia, existing track infrastructure is proposed to be used for providing east-west service. DRPT used information from two public outreach efforts to gauge potential interest in the Commonwealth Corridor service. The rail segment between Gordonsville and Doswell is the only segment of the Commonwealth Corridor where intercity passenger rail service does not currently exist or is not actively being implemented. As such, DRPT investigated this segment in further detail to understand the type and probable extent of capital improvements needed to upgrade the infrastructure to enable passenger rail service.

[1] https://lis.virginia.gov/cgi-bin/legp604.exe?201+ful+HJ55H1

FIGURE 1.1: PROPOSED COMMONWEALTH CORRIDOR



1.2. Service Plan

The equipment assumed for Commonwealth Corridor service is a diesel-powered, bidirectional push-pull trainset similar to the integrated trainsets Amtrak will deploy in the future on state-supported services in Virginia and other states. Each trainset is assumed to have one food-service car, one Business Class car, and several coaches, one of which will be a coach cab car located at the end of the trainset and equipped with an engineer's cab to allow for push-pull operation. No turning or "wyeing" is required at each end of the line. Commonwealth Corridor equipment is assumed to be leased from Amtrak similar to the Commonwealth's current practice of leasing Amtrak equipment for its state-supported Northeast Regional services. Recurring equipment lease costs are included in the Operations and Maintenance Needs.

An initial service plan was developed to meet estimated passenger demand, to achieve DRPT's cross-state transportation goals, and to identify infrastructure improvements needed for the service. The service plan was based on preliminary assessments of the statewide travel demand model and associated ridership, existing infrastructure conditions, known future infrastructure upgrades, existing and planned Amtrak service in the state, and public outreach. The statewide travel demand model identified several popular submarkets in Virginia along the cross-state alignment of the Commonwealth Corridor. To attract these cross-state travel markets, a service between the New River Valley, Roanoke, Lynchburg, Charlottesville, Richmond, and Hampton Roads was proposed.

Newport News serves as the eastern endpoint for Commonwealth Corridor passenger trains in the initial phase of service analyzed by the feasibility study. Newport News was selected based on several factors, including responses received from online public surveys, DRPT's experience managing existing state-supported rail corridors, faster trip time to serve Hampton Roads, and lower anticipated capital investments. Similar to existing Amtrak Thruway shuttles to Norfolk and Virginia Beach, the service plan assumes Amtrak Thruway motorcoach connections at Newport News to these markets. The selection of

Newport News as the Hampton Roads rail terminus by the study does not preclude future expansions of Commonwealth Corridor service that could include passenger trains operating directly to Norfolk.

The initial service plan consists of two daily round trips operating between the Newport News Bland Boulevard station (anticipated to open in 2022) and the New River Valley passenger rail station (potential service start in 2025). Service characteristics such as a one-seat ride “end-to-end" service and an initial service frequency of two daily round trips reflect input gathered during public outreach.

Table 1.1 depicts the conceptual Commonwealth Corridor train schedules. The timetable was developed to provide morning and evening departures from each end of the corridor while minimizing conflicts with existing and proposed future passenger services. The timetable also minimizes needed capital improvements by scheduling known train meets where passing sidings or double-track infrastructure already exists.

TABLE 1.1: COMMONWEALTH CORRIDOR CONCEPTUAL SCHEDULE

1109 (read down)	1111 (read down)	Mile	Station	1110 (read up)	1112 (read up)
9:45 AM	4:40 PM	0	Newport News – Bland Blvd	1:25 PM	8:35 PM
9:59 AM	4:54 PM	15	Williamsburg	1:02 PM	8:12 PM
10:51 AM	5:46 PM	62	Richmond – Main Street	12:10 PM	7:20 PM
11:16 AM – Arr 11:21 AM – Dep	6:11 PM – Arr 6:16 PM – Dep	70	Richmond – Staples Mill Road	11:46 AM – Dep 11:41 AM – Arr	6:56 PM – Dep 6:51 PM – Arr
11:35 AM	6:30 PM	81	Ashland	11:19 AM	6:29 PM
12:57 PM	7:52 PM	158	Charlottesville	9:57 AM	5:07 PM
2:10 PM – Arr 2:13 PM – Dep	9:05 PM - Arr 9:08 PM - Dep	219	Lynchburg	8:40 AM – Dep 8:37 AM – Arr	3:50 PM – Dep 3:47 PM – Arr
3:32 PM	10:27 PM	271	Roanoke	7:21 AM	2:31 PM
4:21 PM	11:11 PM	306	New River Valley	6:35 AM	1:40 PM

1.3. Ridership Forecast

DRPT developed ridership forecast estimates for the Commonwealth Corridor to assess potential passenger demand for the service and confirm the proposed service plan approach. DRPT estimated the total ridership demand for the proposed Commonwealth Corridor and individual market pairs by

implementing a hybrid approach using the Virginia Statewide Travel Demand Model (VSTM) production-attraction data for intercity rail and Amtrak FY2019 origin-destination (OD) data to appropriately scale the VSTM data to annual trips. FY2019 data was used as the most recent data source for Amtrak given the significant reduction in person trips in 2020 due to the COVID-19 pandemic.

An estimated 177,200 potential annual passengers would board proposed Commonwealth Corridor services in 2040. This estimate is reflective of two roundtrips per day. Assuming constant ridership across the year and all services, the model estimates an average of approximately 121 passengers per scheduled Commonwealth Corridor revenue train trip, totaling 485 daily passengers onboard the four daily trips. It is important to note that the preliminary ridership estimates developed for this study are intended to be used for high-level planning purposes only and do not reflect the presence of other passenger rail services in Virginia and related network ridership effects. It is possible that some diversion of ridership from existing routes could occur; however, net new ridership was not estimated due to the long range and high-level nature of this study. Ridership estimates for the corridor represent the total estimated annual trips between all possible market pairs along the corridor and is not reflective of total station ons/offs.

1.4. Infrastructure Needs

The Commonwealth Corridor is organized into the following six segments based on rail ownership, characteristics, and geography:

1. Newport News to Richmond
2. Richmond to Doswell
3. Doswell to Charlottesville
4. Charlottesville to Lynchburg
5. Lynchburg to Roanoke
6. Roanoke to New River Valley

All segments of the proposed Commonwealth Corridor feature existing track, with all but one segment currently hosting passenger rail service or anticipated to host passenger rail service by 2025. Gordonsville to Doswell is the sole portion of the Commonwealth Corridor where passenger rail service does not currently exist and is not currently planned. This segment will require significant infrastructure improvements to accommodate passenger trains, such as new or upgraded track, signals, passing sidings or segments of double track, and grade crossing improvements.

Passenger train storage and servicing facilities are also needed at Newport News and the New River Valley to store, clean, and service train equipment. These facilities could be an expansion of facilities currently being planned at each corridor endpoint to support train storage and servicing and would be in addition to what is already planned for existing and future state-supported routes at these terminal locations.

No new passenger rail stations are needed for proposed Commonwealth Corridor service. All assumed Commonwealth Corridor stations already exist or are anticipated to be complete prior to the implementation of Commonwealth Corridor service. This includes the Newport News Station, which is under construction as of October 2021, and the New River Valley Station, which is being planned as part of the Western Rail Initiative.

The infrastructure needs identified in this report are high-level needs that have not been evaluated or agreed upon by CSX or Norfolk Southern. Proposed future service and necessary capacity needs to accommodate any new service will require evaluation and approval from the Class I freight railroads as further described in Section 9.

1.5. Estimated Costs

DRPT used the initial service plan to develop order-of-magnitude estimates of infrastructure costs to initiate passenger service on the Commonwealth Corridor in addition to recurring operating and maintenance (O&M) and leasing costs.

Estimated capital costs quantified the infrastructure needed to support new passenger service at a speed of 79 MPH. Segments planned to host future passenger under other projects were assumed to have their infrastructure costs already accounted for by those projects. Project costs were estimated with a base year of 2021. An annual inflation rate of 3% per year was used to escalate costs to 2030.

Due to the very high-level concept of this estimate and limited project scope information, a full maximum contingency of 50% has been applied. The chosen contingency acknowledges that some potentially significant cost elements such as bridge structures or environmental mitigation were not included in the cost estimate.

The estimate of known infrastructure costs required to initiate passenger service on the Commonwealth Corridor is approximately $416.5 million in 2030 dollars. The estimate includes costs for construction, contingency, professional services, and other agency costs, and also includes limited earthwork and environmental work assuming existing track alignment is utilized. The estimate does not include more extensive environmental review or any structural work. As previously noted, estimate totals include 50% contingency.

Table 1.2 depicts Commonwealth Corridor summary capital costs. Due to existing infrastructure and previous improvements made to establish state-supported Amtrak services on much of the corridor, most capital costs are concentrated on the Charlottesville to Doswell segment of the corridor which features little to no passenger service today.

This table does not include costs for additional track capacity on host railroad freight lines to support the proposed service. Additional capital costs are likely to emerge as DRPT works with its Class I host freight railroads to determine if additional capacity improvements are needed to mitigate freight impacts from the proposed passenger rail service.

TABLE 1.2: SUMMARY OF KNOWN CAPITAL COSTS

Corridor Segment	2021 Costs ($M)				Escalated to 2030 ($M)
	Construction	Other Costs	Contingency	Total	
Layover Facility Upgrades	$3.0	$0.4	$1.7	$5.1	$6.7
Doswell-Gordonsville	$145.0	$21.8	$83.4	$250.1	$326.3
Gordonsville-Charlottesville	$28.0	$4.2	$16.1	$48.3	$63.0
Charlottesville Reconfiguration	$9.1	$1.4	$5.2	$15.7	$20.5
Total	**$185.1**	**$27.8**	**$106.4**	**$319.2**	**$416.5**

*Note: Table does not include capital costs to build additional track capacity on host freight railroad trackage to support the service. Those costs will be developed by DRPT with host railroad input at a future stage of the project and are anticipated to increase the total capital investment needed to implement service.

Annual O&M costs and capital cost payments for the leasing of Amtrak train equipment were estimated to identify order-of-magnitude recurring annual costs for Commonwealth Corridor service.

The estimated annual O&M cost for Commonwealth Corridor service is $25.1 million. O&M costs were estimated using Federal Fiscal Year (FFY) 2019 payments for Virginia state-supported Northeast Regional services. These payments were used to calculate the estimated O&M costs for Commonwealth Corridor services per revenue train mile.

The estimated annual equipment leasing cost for the Commonwealth Corridor is $2.46 million. Train equipment costs were assessed under the assumption that Virginia will lease Amtrak equipment, similar to the current arrangement with state-supported Northeast Regional services. Train equipment costs are based on DRPT's FFY 2019 capital cost payments to Amtrak for train equipment and are calculated according to the number of revenue trains in operation. Three trainsets in daily revenue service are assumed based on the initial service plan.

The total estimated annual combined O&M and equipment leasing cost is $27.55 million. Summary costs are depicted in Table 1.3.

TABLE 1.3: SUMMARY OF ANNUAL O&M AND EQUIPMENT LEASING COSTS

	$M
Annual O&M Cost	$25.1
Annual Commonwealth Corridor Equipment Leasing Cost	$2.46
Total Annual O&M and Equipment Leasing Cost	**$27.55**

1.6. Conclusion and Next Steps

The Commonwealth Corridor Feasibility Study examines the potential for service expansion on an east-west, cross-state corridor and concludes that it is possible to provide passenger rail service on this corridor, albeit with substantial capital investments for track and signals, train equipment, additional capacity, and expanded maintenance and storage facilities.

DRPT will work with the Virginia Passenger Rail Authority (VPRA) and stakeholders to consider the following potential next steps to advance the project:

- Coordination with Class I Freight Railroads
- Coordination with the Buckingham Branch Railroad
- Coordination with Amtrak
- Examine Potential for Intercity Bus Service
- Updated and refined market analysis
- Identify funding sources for capital and O&M costs
- Preparation of key planning and environmental documents

2. Introduction

On March 5, 2020, the Virginia Senate approved Virginia Senate Joint Resolution No. 50[2] requesting that the Virginia Department of Rail and Public Transportation (DRPT) study the feasibility of an east-west Commonwealth Corridor passenger rail service connecting Hampton Roads, Richmond, and the New River Valley.

The Commonwealth Corridor Feasibility Study was undertaken to assess the feasibility, desirability, and possibility of expanding intercity passenger rail service on an east-west, cross-state corridor linking Hampton Roads, Richmond, and the New River Valley. The study includes a description of the proposed corridor, summary of public outreach efforts, a proposed initial service plan, forecasted range of potential ridership, potential capital improvements and their estimated costs to provide the service, an estimate of high-level operating and maintenance costs, and recommended next steps.

Two online surveys provided public feedback on the corridor as the study progressed, which informed the proposed service plan and provided an understanding of potential markets and trip purposes.

The Commonwealth Corridor Feasibility Study is envisioned as the first step in a process for implementing east–west intercity passenger rail service in Virginia. It builds on DRPT's successful efforts to incrementally expand state-supported intercity passenger rail services on other corridors serving the eastern and central parts of the Commonwealth. The Commonwealth Corridor Feasibility Study includes recommendations for leveraging existing and programmed future investments in passenger rail service under initiatives such as Transforming Rail in Virginia and the Western Rail Initiative that also would benefit the implementation of an east-west service.

[2] https://lis.virginia.gov/cgi-bin/legp604.exe?201+ful+HJ55H1

3. Corridor Description

The Commonwealth Corridor, as defined by the General Assembly, is a cross-state, east-west intercity passenger rail corridor connecting Hampton Roads, Richmond, and the New River Valley regions of Virginia. Figure 3.1 depicts a map of the proposed Commonwealth Corridor along with existing state-supported Amtrak services. Consistent with previous projects to implement new intercity passenger rail service in Virginia, existing track infrastructure is proposed to be used for providing east-west service. For the purposes of this study and related analysis efforts, the Commonwealth Corridor has been divided into the following six route segments:

1. Hampton Roads to Richmond (provided with direct rail service to Newport News and connecting Amtrak Thruway service to Norfolk)
2. Richmond to Doswell
3. Doswell to Charlottesville
4. Charlottesville to Lynchburg
5. Lynchburg to Roanoke
6. Roanoke to New River Valley

FIGURE 3.1: PROPOSED COMMONWEALTH CORRIDOR

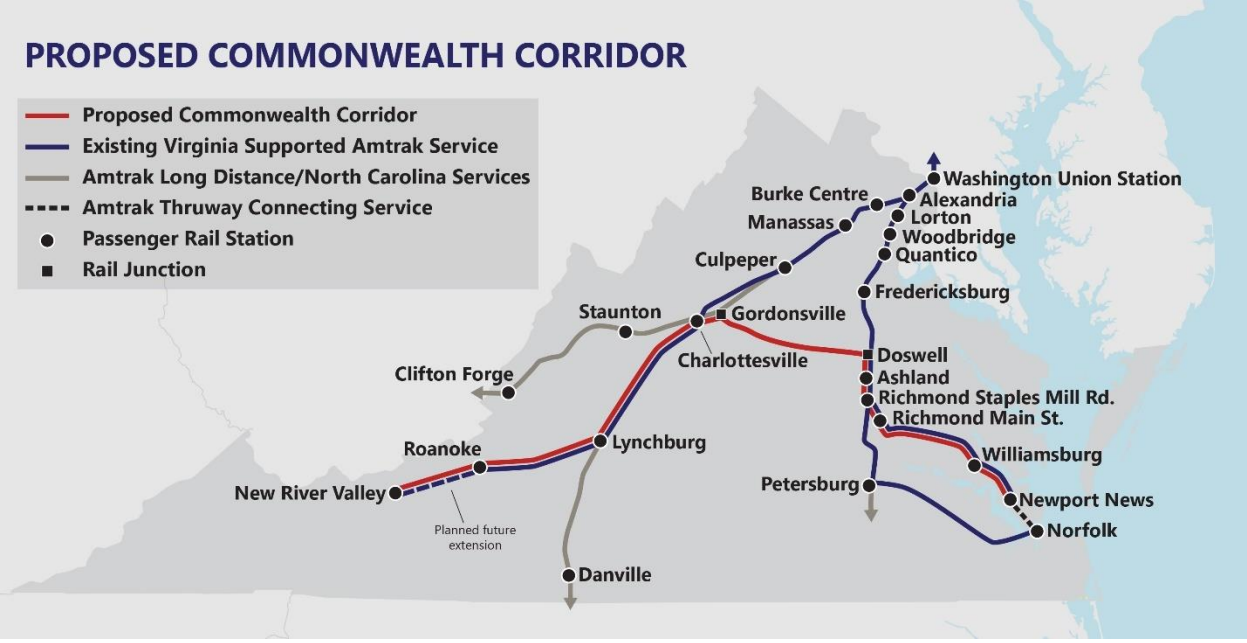


Table 3.1 provides a high-level summary of the six rail segments considered in the corridor, including segment length, ownership, subdivisions, number of passenger and freight trains per day, and track speed. Detailed descriptions of the corridor segments and existing conditions are provided in **Appendix A**.

TABLE 3.1: COMMONWEALTH CORRIDOR ROUTE SEGMENT SUMMARY

Route Segment Endpoints	Approximate Length	Owner	Subdivision Name	Average Trains per Day	Maximum Authorized Train Speeds
Newport News to Richmond	78 miles	CSXT	Peninsula Subdivision	Passenger: 4 Freight: 9	Passenger: 79 mph Freight: 50 mph
Richmond to Doswell	17 miles	CSXT[3]	RF&P Subdivision	Passenger: 20 Freight: 10-20	Passenger: 70 mph Freight: 40-60 mph
Doswell to Charlottesville	71 miles	BB	Piedmont Subdivision (Doswell-Gordonsville, 48 miles); North Mountain Subdivision (Gordonsville-Charlottesville, 23 miles)	Passenger: 1 Freight: 5-10	Passenger: 60 mph Freight: 25-40 mph
Charlottesville to Lynchburg	62 miles	NS	Washington District	Passenger: 4 Freight: 20-30[3]	Passenger: 79 mph Freight: 45-60 mph
Lynchburg to Roanoke	49 miles	NS	Blue Ridge District (Lynchburg-Vinton); Roanoke Terminal (Vinton-Roanoke)	Passenger: 2 Freight: 14	Passenger: 70 mph Freight: 40-60 mph
Roanoke to New River Valley	35 miles	NS	N-Line/Christiansburg District/Roanoke Terminal (Roanoke-Salem, 6 miles); V-Line/Whitethorne District (Salem in West Roanoke - Merrimac, 29 miles)	Passenger: 0 Freight: V-Line: 6-18[4] N-Line: 30-40[3]	Passenger: N/A Freight: 40 mph (V-Line)[3]

3.1. Newport News to Richmond

The Newport News to Richmond segment is comprised of 78 miles on CSXT-owned territory – 70.5 miles from Newport News to AM Junction, 3.5 miles from AM Junction to South AY Interlocking in Richmond, and 4 miles from South AY Interlocking to Greendale in Richmond. Four Amtrak Northeast Regional trains operate daily between Newport News, AM Junction in downtown and Richmond, and South AY Interlocking, making intermediate station stops at Williamsburg, and Richmond Main Street Station. From AY Junction to Greendale, the line is part of CSXT's I-95 corridor.

At AY Interlocking, Newport News originating/terminating trains are joined by passenger trains to/from Norfolk, North Carolina, Georgia, and Florida. These services use the CSXT North End Subdivision, a mainline double-track route around the west side of Richmond, to continue their journey.

Between AY Interlocking and Staples Mill Road station, passenger trains operate around the western perimeter of CSXT's Acca Yard, a major regional freight switching and classification on a set of bypass

[3] VRPA will acquire under the Transforming Rail In Virginia initiative
[4] According to FRA Grade Crossing Inventory

tracks. DRPT's investment in additional bypass track capacity has enabled the Commonwealth to increase passenger service south of Richmond. Under the Transforming Rail in Virginia initiative, VPRA will purchase some of the right-of-way in the area and advance a series of infrastructure improvements that will allow state-supported Amtrak service to double.

Richmond Staples Mill Road Station is located between South AY Interlocking and Greendale and is served by a total of 18 Amtrak Northeast Regional and long-distance trains to/from the north. (In addition, Amtrak's long-distance Auto Train passes by the station but does not stop there).

VPRA has long-term plans to construct additional mainline tracks and crossovers between AM Junction and South AY Interlocking. The additional track capacity planned would permit existing and proposed passenger trains to/from Norfolk and the Southeast that currently bypass Main Street Station on a higher-speed freight alignment that avoids downtown Richmond to be diverted onto the Bellwood Subdivision and serve Main Street Station.

VPRA also has long-term plans to construct two new passenger train bypass tracks on the east side of Acca yard between the South AY Interlocking and Greendale interlocking to improve passenger train operations in the Richmond area; this will provide a higher-speed route around the Acca Yard terminal area for passenger trains and a direct connection to CSXT's Bellwood Subdivision and the route to Main Street Station without crossing yard tracks. As part of the Acca East Bypass project, new high-level station platforms for the Staples Mill Road Station will be constructed to serve the east side bypass tracks.

3.2. Richmond to Doswell

The Richmond to Doswell segment is comprised of 17 route miles on the CSXT-owned RF&P Subdivision, a high-density main line with two main tracks that is used by state-supported Amtrak Northeast Regional trains and several long-distance trains. The line is part of CSXT's busy I-95 corridor which spans the entire Eastern U.S., linking cities, ports, and manufacturing regions along the eastern seaboard. As part of the Transforming Rail in Virginia initiative, VPRA will acquire some of the right-of-way on this portion of the corridor and advance a series of infrastructure improvements that will allow state-supported Amtrak service to double. This segment of the corridor includes one existing passenger rail station at Ashland, which is currently served by five state-supported Northeast Regional roundtrip trains, including services operating between Washington, D.C. and Norfolk (two daily roundtrip trains), Washington, D.C. and Newport News (two daily roundtrip trains), and Washington, D.C. and Richmond (one daily roundtrip train).

3.3. Doswell to Charlottesville

The Doswell to Charlottesville segment is comprised of approximately 71 route miles: 48 miles from Doswell to Gordonsville on the CSXT-owned and Buckingham Branch Railroad-leased Piedmont Subdivision and 23 miles from Gordonsville to Charlottesville on the CSXT-owned and Buckingham Branch Railroad-leased North Mountain Subdivision. The Doswell to Gordonsville portion of the Doswell to Charlottesville segment is the only part of the proposed Commonwealth Corridor where passenger rail service either does not currently operate or is not actively being developed. The last passenger rail service to operate on this portion of the corridor was the Newport News section of the *James Whitcomb Riley* in June of 1976.

The 71 miles of CSXT-owned track between Doswell and Charlottesville will soon be transferred to the VPRA as part of the Transforming Rail in Virginia agreement. Under the agreement Buckingham Branch Railroad will continue to lease the line for freight operations. The 48-mile portion from Doswell to Gordonsville is a light density main line currently used only by freight trains. Freight traffic consists of local freight trains operated by the Buckingham Branch and overhead freight trains operated by CSXT, which has trackage rights on the Buckingham Branch main line between Richmond and Clifton Forge. At Doswell, a low-speed connection exists that would enable passenger trains to operate in a progressive move eastward from the Buckingham Branch trackage and southward onto the CSXT RF&P Subdivision to continue to Richmond. This connecting track is currently used by CSXT freight trains as needed.

The 23-mile portion from Gordonsville to Charlottesville currently has one Amtrak long-distance service, the *Cardinal*, which operates three days per week in each direction between New York, NY and Chicago, IL. This segment also includes an existing passenger rail station at Charlottesville, served by the Amtrak *Cardinal* train. The line is a light density main line for freight operations. At Charlottesville, a slow-speed connecting track exists to enable trains traveling westward on the Buckingham Branch Railroad's North Mountain Subdivision to diverge and operate southward on the NS Washington District. This connecting track is currently used to interchange freight traffic between CSXT and Buckingham Branch.

Further details on the Charlottesville to Doswell segment including an infrastructure assessment is included in **Appendix B**.

3.4. Charlottesville to Lynchburg

The Charlottesville to Lynchburg segment is comprised of 62 route miles. The segment is a high-density mainline with alternating sections of single main track and two main tracks used by both freight and passenger trains. Passenger traffic on this segment consists of one Virginia state-supported Amtrak Northeast Regional train operating daily in each direction between Washington, D.C. and Roanoke and Amtrak long-distance trains operating between New York, NY and New Orleans, LA. The line is part of NS's Crescent Corridor, a busy north-south freight transportation lane that links consumer markets and manufacturing regions between New Orleans, Memphis, Atlanta, and the Northeast. This portion of the corridor includes an existing passenger rail station at Lynchburg, currently served by one Amtrak Northeast Regional roundtrip train operating between Roanoke, Washington, and the Northeast Corridor, and one Amtrak long-distance roundtrip train, the *Crescent*, operating between New York, NY and New Orleans, LA.

This segment is connected to the adjacent segment serving Roanoke via a single Connecting Track that exists between NS's Kinney Yard (Blue Ridge District) and Montview Yard (Washington District). The Connecting Track enables passenger trains from Charlottesville traveling to Roanoke on the north-south NS Washington District main line to diverge onto the east-west NS Blue Ridge District.

3.5. Lynchburg to Roanoke

The Lynchburg to Roanoke segment is comprised of 49 route miles from Lynchburg to Roanoke on NS's Blue Ridge District. This segment currently has one state-supported Amtrak Northeast Regional roundtrip per day, which originates and terminates at a passenger rail station in downtown Roanoke. Previously, DRPT funded several capacity improvement projects on this segment prior to the introduction of service to Roanoke in 2017. A second roundtrip train to Roanoke is planned to begin in 2022.

3.6. Roanoke to New River Valley

The Roanoke to New River Valley segment is comprised of 35 route miles: 6 miles from Roanoke to Salem on NS's N-Line and 29 miles from Salem to the New River Valley on Norfolk Southern's (NS) Virginian Line (V-Line). Among the Commonwealth Corridor segments, the Roanoke to New River Valley segment is one of two that does not currently have passenger rail service.

The portion of the segment from Salem to the New River Valley is part of the Commonwealth's $257 million Western Rail Initiative which includes the purchase of the V-Line. The Western Rail initiative will advance improvements to accommodate passenger rail service, including necessary track and signal upgrades between Roanoke and New River Valley. Upgrades include new bypass tracks around the Roanoke Yard to allow passenger rail operations west of the Roanoke station, a new passenger station and platform in the Blacksburg/Christiansburg area of the New River Valley, and a maintenance and storage facility.

4. Public Outreach and Feedback

DRPT conducted two online public MetroQuest surveys to gauge preliminary interest and preferences for service in the Commonwealth Corridor. The first survey took place in May and June of 2021; the second took place in July 2021.

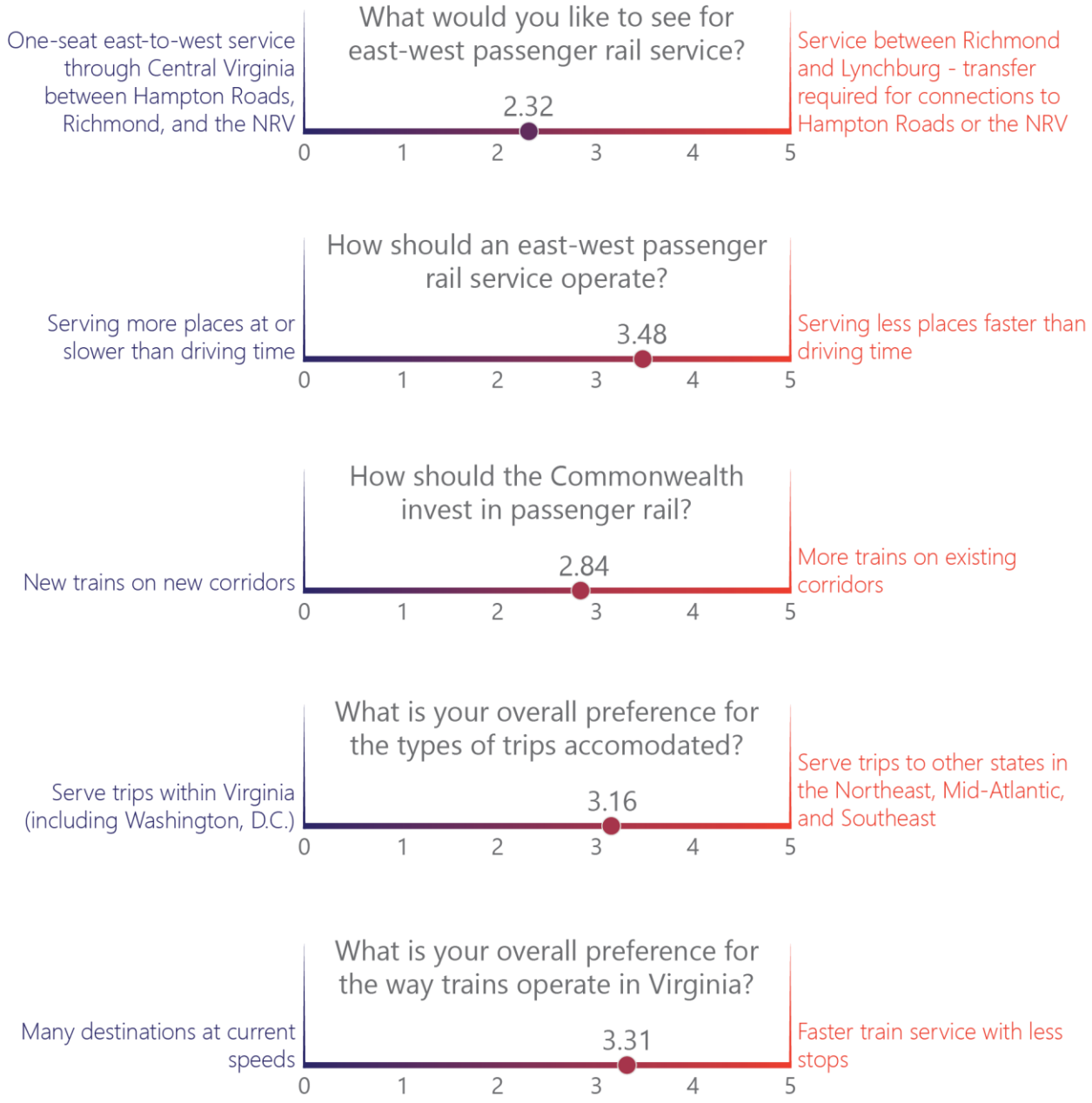
As part of a larger outreach effort associated with DRPT's update of the State Rail Plan, the first survey gauged the public's preference on general approaches to future Commonwealth Corridor service. A series of general preference questions were posed, each with a sliding bar scale featuring competing preferences at each end. Respondents indicated their preference by marking a location on the sliding bar scale that favored one of the two preferences or was neutral. Figure 4.1 depicts the questions posed and preferences among survey respondents. Overall, respondents expressed a stronger preference toward faster rail service with less stops. Additionally, a marginal preference was indicated for a one-seat ride between Hampton Roads, Richmond, and the New River Valley.

The second survey focused solely on the Commonwealth Corridor and sought more detailed priorities and preferences from respondents related to future service, frequencies, destinations, and stations. The survey was comprised of three primary exercises – priority ranking, tradeoffs, and destination map plotting.

The priority ranking exercise included various service, destination, and amenity priorities related to future Commonwealth Corridor service. The top priorities among respondents in ranked order were:

1. Faster train travel
2. New station destinations
3. Cheaper than driving
4. Eastern connections
5. Western connections
6. Last mile connections
7. Upgraded stations
8. Train amenities

FIGURE 4.1: FIRST ONLINE SURVEY REPONSES



The tradeoff exercise was organized around the five categories of cost, trips, last mile, destinations, and connections, each with a sliding bar scale featuring competing preferences at each end. Figure 4.2 depicts the responses from the tradeoff exercise. Below is a summary of preferences as it relates to each tradeoff.

- Cost – preference to pay more for faster trip options
- Trips – preference to see more daily departures serving fewer places
- Last mile – strong preference for more bus and rail transit last mile connections
- Destinations – strong preference for one seat ride service in shorter east-west segments allowing greater frequencies and shorter trip times
- Connections – slight preference for direct train to Norfolk with timed connection to Newport News, though most responses were neutral

The last exercise featured an interactive map in which users could plot one or more destinations and identify their trip purpose and frequency of that trip. Using the home zip code data respondents entered during the survey, origin-destination data was assembled to depict potential origin-destination pairs along the Commonwealth Corridor. Data were filtered to identify 1,234 origin-destination pairs that lie within proximity of the Commonwealth Corridor (within 25 miles) and were far enough apart for intercity rail travel trips (trips between different station areas). Several popular origin-destination pairs were revealed from the data, including the top ten origin-destination pairs listed below and depicted in Figure 4.3.

1. Charlottesville – Richmond
2. Charlottesville – Norfolk
3. Norfolk-Richmond
4. Charlottesville – Roanoke
5. Charlottesville – Williamsburg
6. Richmond – Roanoke
7. Charlottesville – New River Valley
8. New River Valley – Richmond
9. Norfolk – Roanoke
10. Charlottesville – Lynchburg

FIGURE 4.2: SECOND ONLINE SURVEY - TRADEOFFS

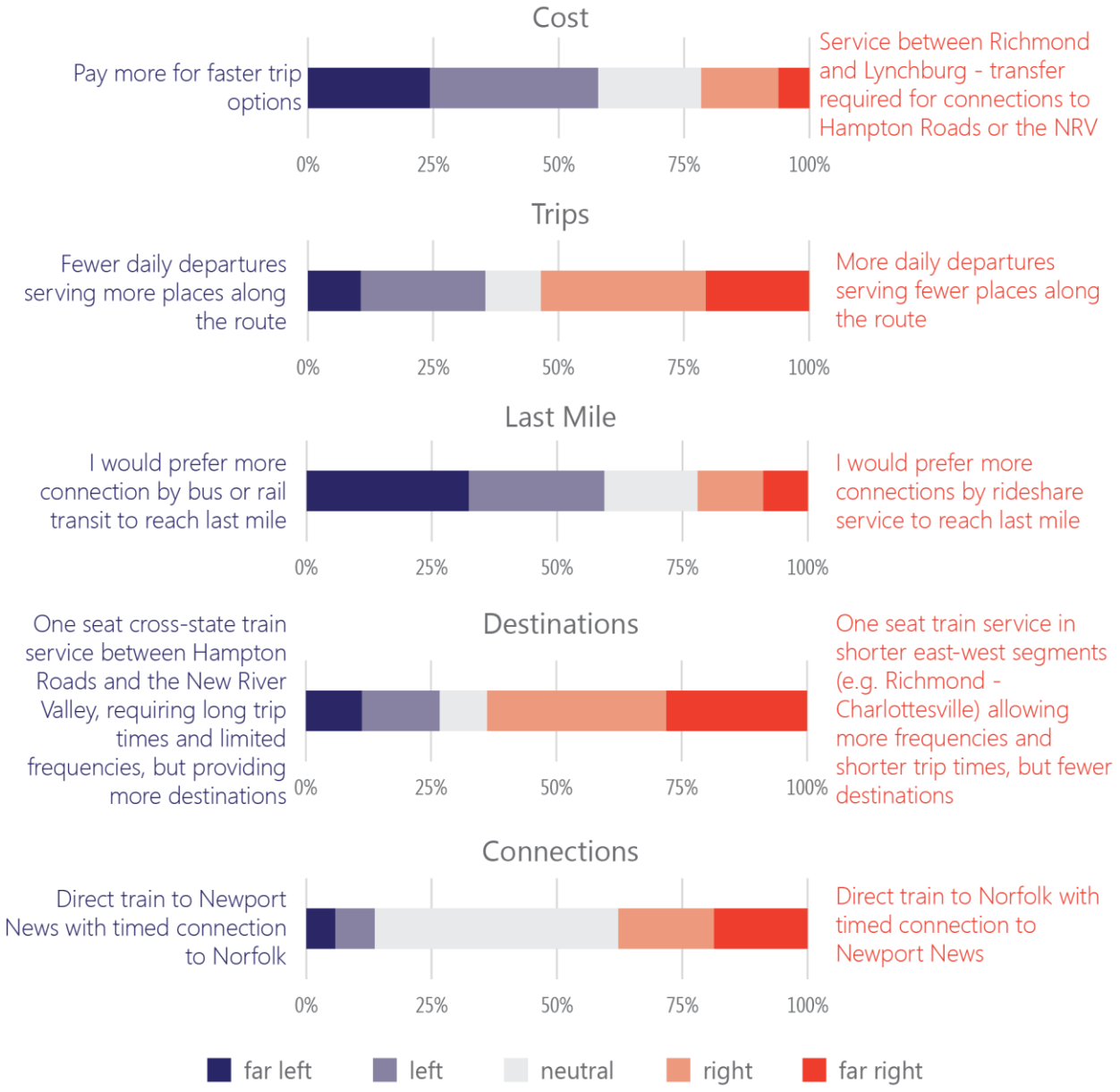
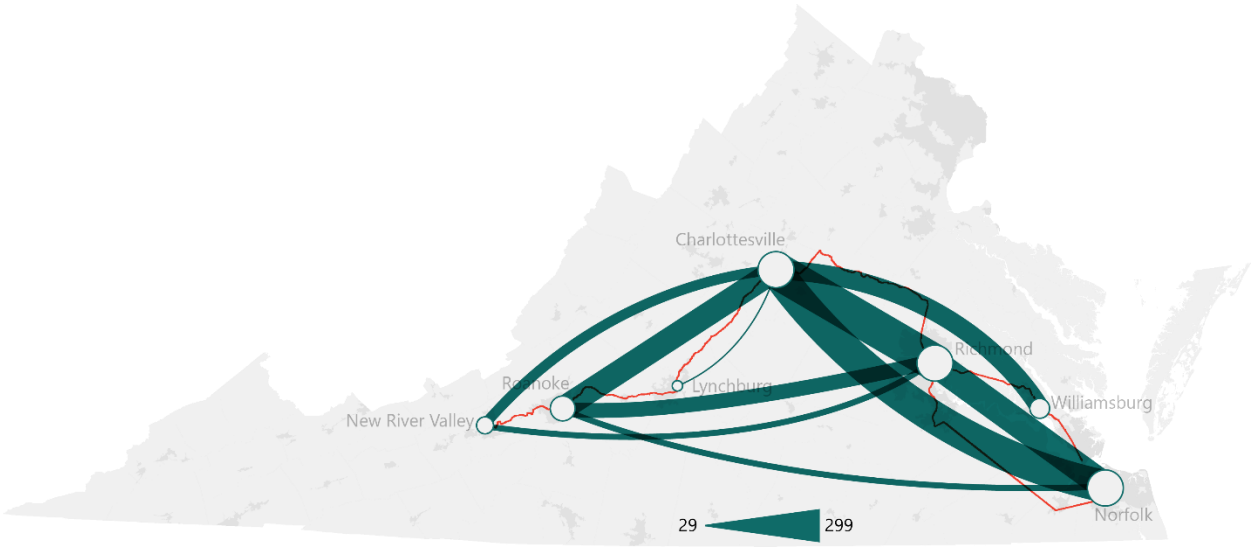


FIGURE 4.3: SECOND ONLINE SURVEY - TOP 10 ORIGIN-DESTINATION PAIRS



The results and feedback received from the public surveys were considered during the development of the conceptual service plan presented in this report.

5. Proposed Service Plan

DRPT developed an initial service plan based on preliminary assessments of the statewide travel demand model and associated ridership, existing infrastructure conditions and known future upgrades, existing and planned Amtrak service in the state, and public outreach. Early analysis of cross-state travel using the statewide travel demand, and ridership forecast estimates developed from the model, showed that within the proposed travel corridor linking Hampton Roads, Richmond and the New River Valley several submarkets of cross-state travel between intermediate regions existed. These subregional travel markets included Hampton Roads-Richmond, Hampton Roads-Charlottesville, Richmond-Charlottesville, Charlottesville-Lynchburg, and Charlottesville-Roanoke. The analysis indicated that travel demand and potential ridership from subregional travel markets would provide a significant component of total ridership for a cross-state intercity passenger rail service, in particular travel demand between Charlottesville and metropolitan areas to the east and to the west.

DRPT proposed a Commonwealth Corridor route that links Hampton Roads, Richmond, Charlottesville, Lynchburg, Roanoke, and the New River Valley to better attract these interregional cross-state travel markets. Although a corridor serving Charlottesville added circuity to an end-to-end cross-state trip between the Hampton Roads, Richmond, and the New River Valley, the proposed routing provided several advantages, including the ability to serve the strong intermediate market at Charlottesville. The route also enabled the use of segments of existing rail infrastructure where intercity passenger rail service already was being provided on north-south routes and where passenger rail stations already existed.

DRPT selected Newport News as the eastern endpoint for Commonwealth Corridor passenger trains in the initial phase of service implementation analyzed by the feasibility study based on information from the online public surveys and DRPT's experience managing existing state-supported rail corridors. Service to additional Hampton Roads destinations would be offered by Amtrak Thruway motorcoaches that would make timed connections with passenger trains at Newport News and carry passengers to and from the Amtrak station at Harbor Park in Norfolk, as well as Virginia Beach. This Amtrak Thruway service would be similar to the existing Amtrak Thruway shuttles that transfer passengers from Virginia Beach and Norfolk to trains at Newport News operating to and from Washington, D.C. The selection of Newport News as the Hampton Roads rail terminus for the purposes of the initial service feasibility study does not preclude future expansions of Commonwealth Corridor service that would include passenger trains operating directly to Norfolk.

Several factors informed the selection of Newport News as the eastern terminus of passenger rail service in the feasibility study. A primary factor was the shorter rail distance from Richmond to the Hampton Roads area when compared to Norfolk, which provides a trip time that is approximately one hour faster, lowers operating costs, and is anticipated to require lower capital investments in additional track capacity to accommodate the service. Richmond to Newport News passenger rail service would require coordination with only one Class I railroad, while a Richmond-Norfolk passenger rail service would utilize mainlines owned by both CSXT and NS. Passenger trains serving Newport News are also able to make an intermediate station stop in Williamsburg, which was identified during the public outreach as a popular destination for tourism and business travel.

For planning purposes, DRPT developed a proposed Commonwealth Corridor initial service plan consisting of two daily round trips operating between the Newport News Bland Boulevard station

(anticipated to open in 2022) and the New River Valley passenger rail station (potential service start in 2025). The proposed schedules provide a one-seat ride “end-to-end" service across the corridor, for which participants in outreach efforts had expressed a preference. By offering more than one round trip at the startup of service, same-day return trips could be possible in certain segments of the corridor, and riders would have more travel flexibility and a choice of departure times, which were additional service attributes that survey respondents ranked highly. DRPT developed conceptual train schedules for the service plan that estimates trip times, station stops, and feasible service windows that provide for morning and evening departures from each endpoint while minimizing conflicts at shared facilities with other existing and planned intercity passenger rail services.

DRPT used the following inputs to estimate trip times for the Commonwealth Corridor conceptual timetables:

- Estimated Newport News-Doswell trip times were based on existing state-supported Amtrak Northeast Regional schedules and proposed Transforming Rail in Virginia Phase 2 Base Schedule for Regional trains, and additional planned improvements:
    - Estimates a reduction in trip time of 7-8 minutes from existing passenger train times between Newport News and Williamsburg based on the relocation of the Newport News station to the Bland Boulevard site.
    - Estimates a reduced running time of 24-25 minutes between Richmond Main Street Station and Richmond Staples Mill Road Station based on a DRPT engineering analysis for potential S-Line upgrades to support enhanced intercity passenger rail service on the CSXT S-Line (Bellwood Subdivision) between Centralia, Richmond Main Street Station, and Acca Yard.
    - Includes a proposed 5-minute station dwell at Richmond Staples Mill Road Station for a crew change.
- Estimated Doswell-Charlottesville trip times of 1:10 were based on a preliminary engineering analysis of Buckingham Branch conditions and potential upgrades for passenger rail service.
- Estimated Charlottesville-Roanoke trip times were based on existing state-supported Amtrak Northeast Regional passenger rail schedules.
- Estimated Roanoke-Merrimac trip time of approximately 45 minutes was based on DRPT’s “Virginian Line Planning Study”.

Table 5.1 depicts the proposed daily eastbound and westbound Commonwealth Corridor conceptual schedule.

TABLE 5.1: COMMONWEALTH CORRIDOR CONCEPTUAL SCHEDULE

1109 (read down)	1111 (read down)	Mile	Station	1110 (read up)	1112 (read up)
9:45 AM	4:40 PM	0	Newport News – Bland Blvd.	1:25 PM	8:35 PM
9:59 AM	4:54 PM	15	Williamsburg	1:02 PM	8:12 PM
10:51 AM	5:46 PM	62	Richmond – Main Street	12:10 PM	7:20 PM
11:16 AM – Arr 11:21 AM – Dep	6:11 PM – Arr 6:16 PM – Dep	70	Richmond – Staples Mill Road	11:46 AM – Dep 11:41 AM – Arr	6:56 PM – Dep 6:51 PM – Arr
11:35 AM	6:30 PM	81	Ashland	11:19 AM	6:29 PM
12:57 PM	7:52 PM	158	Charlottesville	9:57 AM	5:07 PM
2:10 PM – Arr 2:13 PM – Dep	9:05 PM – Arr 9:08 PM – Dep	219	Lynchburg	8:40 AM – Dep 8:37 AM – Arr	3:50 PM – Dep 3:47 PM – Arr
3:32 PM	10:27 PM	271	Roanoke	7:21 AM	2:31 PM
4:21 PM	11:11 PM	306	New River Valley	6:35 AM	1:40 PM

In order to reduce potential capital investments, the conceptual timetables were planned to enable passenger trains moving in opposite directions to meet in locations where passing sidings or double-track freight rail infrastructure currently exists. This includes meets with existing Amtrak Northeast Regional and long-distance trains serving Virginia as well as additional passenger trains planned to operate by 2030 under the Western Rail Initiative and Transforming Rail in Virginia[5].

The conceptual service plan makes use of existing intercity passenger rail stations in Virginia, including facilities at Lynchburg, Charlottesville, and Richmond where passengers can connect to other Amtrak trains operating on north-south routes through Virginia to destinations in the Northeast, Mid-Atlantic, Midwest, and Southeast. The proposed initial service plan was designed to capture cross-state travel, markets, recognizing that most segments of the Commonwealth Corridor already have existing passenger trains providing direct service from Virginia to Washington, D.C., and the Northeast Corridor. However, future stages of Commonwealth Corridor cross-state service expansion may consider departures that would provide timed transfers with other passenger rail services in order to minimize wait times at transfer locations.

[5] https://transformingrailva.com/wp-content/uploads/2021/05/11.1.1.27-Exhibit-D-CRA.pdf

6. Ridership Forecast

DRPT developed ridership forecast estimates for the Commonwealth Corridor to assess potential passenger demand for the service and confirm the proposed service plan approach. Using the Virginia Statewide Travel Demand Model (VSTM), corridor ridership was first evaluated to compare the corridor's eastern endpoints of Newport News and Norfolk. Newport News generated a higher estimated ridership, which likely resulted from a combination of the shorter rail travel time from Newport News and its geographic location in the northwestern part of the Hampton Roads region to Richmond and other points west along the proposed Commonwealth Corridor. The higher estimated ridership for Newport News confirmed this location as the proposed service plan's eastern terminus.

DRPT estimated the total ridership demand for the proposed Commonwealth Corridor and individual market pairs by implementing a hybrid approach using the VSTM production-attraction data for intercity rail and Amtrak FY2019 origin-destination (OD) data to appropriately scale the VSTM data to annual trips. FY2019 data was used as the most recent data source for Amtrak given the significant reduction in person trips in 2020 due to the COVID-19 pandemic.

6.1. Ridership Forecast Estimate & Methodology

DRPT simulated the proposed Commonwealth Corridor service using the 2015 and 2040 VSTM and conducted a select route analysis to identify the potential travel market. These long-distance passenger rail estimates by Travel Analysis Zone (TAZ) from the VSTM were aggregated into districts based on Virginia's city and county boundaries. These districts were used to identify the general long distance travel market served by each passenger rail station on the proposed route.

DRPT then compared district-level average weekday VSTM OD estimates from 2015 to observed Amtrak FY2019 boarding data on existing state-supported Amtrak services in Virginia. Amtrak FY2019 boarding data also includes connecting bus service between Roanoke and the New River Valley. DRPT scaled the weekday VSTM estimates to match the observed Amtrak annual boarding data based on estimated and observed values at the Newport News station. This scaling converted from weekday to annual ridership and smoothed differences between model estimates and observed data. Next, the annual ridership estimates were converted from production-attraction format to origin-destination format. Short-distance passenger rail markets less than 50 miles such as the Newport News-Williamsburg market are not simulated by the VSTM. Values for these markets were based on observed data from Amtrak's OD data.

Following the development of the scaled OD table, DRPT estimated Commonwealth Corridor ridership for the horizon year of 2040 using a pair-by-pair growth factor estimate based on VSTM 2040 forecasts. Overall, the VSTM estimates a 9% increase in total passenger rail activity between the model base year of 2015 and 2040. Market pairs with a decline in activity were held constant considering the overall growth trends of the Commonwealth through 2040. Ridership estimates for the corridor represent the total estimated annual trips between all possible market pairs along the corridor and is not reflective of total station ons/offs.

Overall, the hybrid VSTM and Amtrak OD data scaled model estimated 177,200 potential annual passengers in 2040 onboard proposed Commonwealth Corridor services. This estimate is reflective of two roundtrips per day. Assuming constant ridership across the year and all services, the model

estimates an average of approximately 121 passengers per scheduled Commonwealth Corridor revenue train trip, totaling 485 daily passengers onboard the four daily trips.

It is important to note that the preliminary ridership estimates developed for this study are intended to be used for high-level planning purposes only and do not reflect the presence of other passenger rail services in Virginia and related network ridership effects. Estimated ridership between market pairs served by existing intercity rail services is reflective of the total annual ridership expected for two roundtrip trains per day. Net new ridership was not estimated due to the long range and high-level nature of this study.

Table 6.1 depicts the model's estimated 2040 origin-destination table. Most notably, Newport News and Charlottesville are significant drivers of ridership on the Commonwealth Corridor. Travel between these markets represents nearly 40% of all estimated trips on the corridor. Additionally, 55% of all trips originate or terminate in Newport News or Charlottesville, followed by Richmond (11%), Roanoke (11%), and Williamsburg (7%).

TABLE 6.1: ESTIMATED 2040 PASSENGER ORIGIN-DESTINATION MATRIX

	Newport News	Williams-burg	Richmond*	Ashland	Charlottes-ville	Lynchburg	Roanoke	New River Valley	Total
Newport News	0	100	5,300	700	33,100	7,900	3,500	1,300	51,900
Williams-burg	100	0	2,600	500	6,300	1,400	1,000	400	12,300
Richmond*	5,300	2,600	0	100	200	1,000	6,200	3,800	19,200
Ashland	700	500	100	0	100	500	1,800	1,000	4,700
Charlottes-ville	33,100	6,300	200	100	0	100	2,100	3,400	45,300
Lynchburg	7,900	1,400	1,000	500	100	0	100	100	11,100
Roanoke	3,500	1,000	6,200	1,800	2,100	100	0	4,000	18,700
New River Valley	1,300	400	3,800	1,000	3,400	100	4,000	0	14,000
Total	**51,900**	**12,300**	**19,200**	**4,700**	**45,300**	**11,100**	**18,700**	**14,000**	**177,200**

*includes ridership to/from Richmond Main Street and Richmond Staples Mill Stations

7. Potential Infrastructure Needs

7.1. Overview and Assumptions

While all segments of the proposed Commonwealth Corridor have existing railroad track, several portions do not currently have passenger rail service operating on them. These segments will require infrastructure improvements to accommodate passenger trains, such as new or upgraded track, signals, passing sidings or segments of double track, and grade crossing enhancements or modifications. In addition, facilities to store, clean, and service equipment will be needed. Passenger train storage and servicing facilities are currently being planned or constructed at Newport News and the New River Valley to support the improvement or expansion of existing state-supported passenger trains between those locations and Washington, D.C. For the purposes of this study, expansions of the planned Newport News and New River Valley layover facilities are proposed in order to accommodate the trainsets that would be needed to deliver Commonwealth Corridor service. The feasibility of these expanded layover facilities is described further in Section 7.5. Infrastructure needs are organized by the six corridor segments described in Section 3.

No new stations are proposed for Commonwealth Corridor service as all stations either currently exist or are planned to be constructed before the start of Commonwealth Corridor rail service. This includes Newport News Bland Boulevard Station, which is under construction and planned to open in 2022, and the future New River Valley Station, which will be built as part of the Western Rail Initiative to extend Amtrak Northeast Regional service from Roanoke in 2025.

The Commonwealth Corridor service proposes to use segments of Class I railroad trackage that will be expanded in the near-term to accommodate additional passenger trains frequencies to and from Washington, D.C. under the Transforming Rail in Virginia initiative. It should be noted that Commonwealth Corridor trains are not part of the increased service frequencies that have been contractually agreed to under Transforming Rail in Virginia. The Commonwealth Corridor service likely will require additional track capacity on the Class I railroad segments beyond the improvements that will be constructed under Transforming Rail in Virginia.

The infrastructure needs identified in this report are high-level needs that have not been evaluated or agreed upon by the Class I freight railroads. The necessary capacity needs to accommodate any new service will require evaluation and approval from the Class I freight railroads as further detailed in Section 9.

7.2. Track & Signals

7.2.1. Newport News to Richmond

No explicit track and signal improvement needs are identified at this time for new passenger rail service between Newport News and Richmond due to the Transforming Rail in Virginia and DC2RVA initiatives. However, this segment uses existing freight rail infrastructure that supports high-density mainline freight operations and freight terminal operations at Newport News and Richmond, which must be preserved. Future stages of Commonwealth Corridor planning will require close coordination with CSX Transportation to determine what, if any, additional track capacity is required to reliably accommodate

a regularly scheduled Commonwealth Corridor passenger service of two daily roundtrips and not materially impact freight rail services in this segment.

7.2.2. Richmond to Charlottesville

Richmond to Doswell

No explicit track and signal improvement needs are identified at this time for new passenger service between Richmond and Doswell due improvements planned under the Transforming Rail in Virginia program. However, this segment uses existing freight rail infrastructure that supports high-density mainline freight operations and freight terminal operations at Richmond, which must be preserved. Future stages of Commonwealth Corridor planning will require close coordination with CSX Transportation to determine what, if any, additional track capacity is required to reliably accommodate a regularly scheduled Commonwealth Corridor passenger service of two daily roundtrips and not materially impact freight rail services in this segment.

Doswell to Gordonsville

Analysis of this segment determined that the improvements needed to upgrade the infrastructure to 79 mph passenger operation without modifying the existing track alignment between Doswell and Gordonsville include:

- Rebuild track over entire segment (approximately 49 miles) including mainline turnouts.
- 2 new passing sidings capable of supporting 10,000-foot freight trains.
- Modifications to existing grade crossings to allow increased speed.
- Installation of new ABS signal system.
- Installation of Positive Train Control.

While it is assumed two passing sidings are needed for combined freight and passenger operations, future stages of Commonwealth Corridor planning will require close coordination with Buckingham Branch Railroad to determine what, if any, additional track capacity is required to reliably accommodate a regularly scheduled Commonwealth Corridor passenger service of two daily roundtrips and not materially impact freight rail services in this segment.

Gordonsville to Charlottesville

Limited track and signal improvement needs have been identified between Gordonsville and Charlottesville due to existing passenger rail service and capacity on this segment. Improvements include:

- Establishment of passenger connection at Charlottesville to connect Buckingham Branch and NS. Includes necessary crossover to access Charlottesville Station.
- Approximately 5 miles of curve superelevation adjustment/surfacing is required.
- 2 existing passing sidings extended to be capable of supporting 10,000-foot freight trains.
- Installation of Positive Train Control.
- Modifications to existing grade crossings to allow increased speed.

While two new passing sidings for combined freight and passenger operations have been assumed for planning and cost estimating purposes, future stages of Commonwealth Corridor planning will require

close coordination with Buckingham Branch Railroad to determine what, if any, additional track capacity is required to reliably accommodate a regularly scheduled Commonwealth Corridor passenger service of two daily roundtrips and not materially impact freight rail services in this segment.

7.2.3. Charlottesville to Lynchburg

No explicit track and signal improvement needs are identified at this time for new passenger service between Charlottesville and Lynchburg due to the Western Rail Initiative and previous infrastructure improvements between Charlottesville and Lynchburg. However, this segment uses existing freight rail infrastructure that supports high-density mainline freight operations and freight yard operations at Lynchburg, which must be preserved. Future stages of Commonwealth Corridor planning will require close coordination with Norfolk Southern to determine what, if any, additional track capacity is required to reliably accommodate a regularly scheduled Commonwealth Corridor passenger service of two daily roundtrips and not materially impact freight rail services in this segment.

7.2.4. Lynchburg to New River Valley

No explicit track and signal improvement needs are identified at this time between Lynchburg and the New River Valley for new passenger service due to the Western Rail Initiative and previous infrastructure improvements between Lynchburg and Roanoke. However, this segment uses existing freight rail infrastructure that supports high-density mainline freight operations and freight terminal operations at Roanoke, which must be preserved. Future stages of Commonwealth Corridor planning will require close coordination with Norfolk Southern to determine what, if any, additional track capacity is required to reliably accommodate a regularly scheduled Commonwealth Corridor passenger service of two daily roundtrips and not materially impact freight rail services in this segment.

7.3. Stations

All proposed Commonwealth Corridor stations either currently exist or are anticipated to be complete prior to the implementation of Commonwealth Corridor service. This includes the Newport News Station, which is under construction as of October 2021, and the New River Valley Station, which is being planned as part of the Western Rail Initiative. As a result, no station platform work is included in the infrastructure needs by this study.

Amtrak is currently making ADA improvements at the Charlottesville station which will enable the station to meet ADA regulations. Track and signal infrastructure improvements at Charlottesville will allow proposed Commonwealth Corridor services to serve the existing Buckingham Branch-facing platform which is identified for ADA improvements, though further improvements in the future may be required.

7.4. Train Equipment

It is assumed that DRPT will lease train equipment from Amtrak similar to the Commonwealth's current practice of leasing Amtrak equipment for its state-supported Northeast Regional services. Recurring equipment lease costs are included in the subsequent Operations and Maintenance Needs section.

7.5. Maintenance and Storage Facility

Under the initial Commonwealth Corridor service plan developed for this study, trainsets are proposed to use layover and storage facilities located at each end of the line in New River Valley and Newport News. DRPT will construct a two-track storage facility in the New River Valley as part of the Western Rail initiative to serve equipment used for state-supported Amtrak Northeast Regional services between the New River Valley and Washington, D.C. Rather than construct a separate storage facility for Commonwealth Corridor equipment, the capital cost estimate for this service assumes that the planned New River Valley facility would be expanded to provide storage for two additional trainsets.

DRPT is currently constructing a three-track storage facility near the new Newport News Bland Boulevard Station, which will serve equipment used on the three daily roundtrips planned for state-supported Amtrak Northeast Regional services between Newport News and Washington, D.C. Rather than construct a separate storage facility for Commonwealth Corridor equipment, the capital cost estimate for this service assumes that the Newport News facility could be expanded to provide storage for two additional trainsets (one regularly used and one spare). Considering space constraints in the vicinity of the Newport News Bland Boulevard Station, two additional storage tracks may be needed elsewhere. The turnaround wye track that is currently used to turn southbound Amtrak trains bound for Newport News for their return trip north is a potential alternative site. Future push-pull equipment is anticipated which would enable the wye to potentially be used for train storage.

Layover and storage facilities are assumed to have adequate space to store the entire consist (locomotive plus cars) and feature a paved surface area surrounding the tracks. Heavy maintenance and 92-day inspections are assumed to take place elsewhere, such as Amtrak's Ivy City Yard in Washington, D.C. or a potential future facility in Richmond.

7.6. Capital Cost Estimate & Methodology

An order-of-magnitude estimate of infrastructure costs required to initiate passenger service on the Commonwealth Corridor pursuant to the proposed initial service plan was developed and organized according to the six previously described corridor segments. Table 7.1 depicts infrastructure work required by corridor segment.

TABLE 7.1: SUMMARY INFRASTRUCTURE WORK REQUIRED

Commonwealth Corridor Segment	Infrastructure Work Required
Newport News to Richmond	Layover Facility Improvements; other improvements to be determined with host railroad at a future stage
Richmond to Doswell*	To be determined with host railroad at a future project stage
Doswell to Charlottesville	Significant Upgrades/Reconstruction
Charlottesville to Lynchburg*	To be determined with host railroad at a future project stage
Lynchburg to Roanoke	To be determined with host railroad at a future project stage
Roanoke to New River Valley	Layover Facility Improvements; other improvements to be determined with host railroad at a future stage

*Work at the Doswell to Charlottesville segment boundaries will be required.

Estimated costs were quantified for the currently known or identified infrastructure needs required to support new passenger service at a speed of 79 MPH. Segments planned to host future passenger service under other projects were assumed to have their infrastructure costs already accounted for by those projects. Project costs were estimated according to a base year of 2021. An annual inflation rate of 3% per year was used to escalate costs to 2030.

Additional capital costs are likely to emerge as a result of DRPT's future coordination with its Class I host freight railroads to determine if capacity improvements are needed to mitigate freight impacts from the proposed passenger rail service.

Due to the very high-level concept of this estimate at the feasibility stage of project development and lack of developed scope, a full maximum contingency of 50% has been applied. The chosen contingency also reflects that some potentially significant cost elements such as bridge structures or environmental mitigation were not included in the cost estimate.

The order-of-magnitude estimate of known infrastructure costs required to initiate passenger service on the Commonwealth Corridor is approximately $416.5 million in 2030 dollars Based on the described assumptions and further details presented in **Appendix B** and **Appendix C.** The estimate includes costs for construction, contingency, professional services, and other agency costs. This total also includes limited earthwork and environmental work assuming existing track alignment is utilized and a contingency of 50%, but does not include more extensive environmental review or any structural work. Table 7.2 depicts Commonwealth Corridor summary capital costs.

TABLE 7.2: SUMMARY OF KNOWN CAPITAL COSTS

Corridor Segment	2021 Costs ($M)*				Escalated to 2030 ($M)
	Construction	Other Costs	Contingency	Total	
Layover Facility Upgrades	$3.0	$0.4	$1.7	$5.1	$6.7
Doswell-Gordonsville	$145.0	$21.8	$83.4	$250.1	$326.3
Gordonsville-Charlottesville	$28.0	$4.2	$16.1	$48.3	$63.0
Charlottesville Reconfiguration	$9.1	$1.4	$5.2	$15.7	$20.5
Total	**$185.1**	**$27.8**	**$106.4**	**$319.2**	**$416.5**

*Note: Table does not include capital costs to build additional track capacity on host freight railroad trackage to support the service. Those costs will be developed by DRPT with host railroad input at a future stage of the project and are anticipated to increase the total capital investment needed to implement service.

It is important to note that sufficient data has neither been collected nor analyzed to fully determine the near-term or long-term impacts of the COVID-19 pandemic on capital costs or construction activities related to the cost estimate developed for the Commonwealth Corridor. These impacts, along with government recovery efforts to offset the impacts of the pandemic, will need to be evaluated once those recovery programs are completed.

8. Operations and Maintenance Needs

8.1. Overview and Assumptions

DRPT sponsors and financially supports several Amtrak services today that are subject to the Passenger Rail Investment and Improvement Act of 2008 (PRIIA) Section 209 Cost Allocation Policy. This policy defines all operating and maintenance (O&M) costs for Amtrak's state-supported routes, which are defined as those operating less than 750 miles in length. At approximately 306 miles in length, the proposed Commonwealth Corridor service would be subject to the Section 209 Cost Allocation Policy. Existing DRPT payments for Virginia state-supported Northeast Regional services are used as the basis for operations and maintenance cost estimates for future Commonwealth Corridor services. Note the existing Section 209 cost allocation policy could be modified in the future based on content that is included in the recently passed Infrastructure Investment and Jobs Act (HB 3684).

The study assumed train equipment will be leased from Amtrak in a similar manner to what occurs today with Virginia's state-supported Northeast Regional service. As such, train equipment leasing costs would be recurring and are presented as an element of O&M costs.

It is estimated that three trainsets will be required in regular daily service under the proposed conceptual schedule of two daily roundtrips with morning and evening departures from each end of the corridor. Two trainsets would originate at the New River Valley station and one trainset would originate at the Newport News station. The morning eastbound train from the New River Valley is assumed to

turn as the evening westbound train departing Newport News. A fourth trainset is included as a spare trainset for capital cost estimating purposes.

The train consist is proposed to be a diesel-powered push-pull trainset similar to the integrated trainsets Amtrak will deploy in the future on state-supported services in Maine (the *Downeaster*) and New York (*Empire Service*). Each trainset is assumed to have one food-service car, one Business Class car, and several coaches, one of which will be a coach cab car located at the end of the trainset and equipped with an engineer's cab to allow for push-pull operation. Trainsets currently used in *Downeaster* and *Empire* service typically have five cars, which is a consistent size and arrangement appropriate to the ridership forecasts for Commonwealth Corridor service. However, for cost estimating purposes, the standard 8-car Northeast Regional trainset used on existing state-supported services in Virginia was used in the feasibility study since detailed operations and equipment cost data were available. No turning or "wyeing" is required at each end of the line for a push-pull trainset, thereby reducing the amount of time needed for the train to change direction; O&M costs are also reduced.

8.2. O&M Cost Estimate & Methodology

Federal Fiscal Year (FFY) 2019 payments for Virginia state-supported Northeast Regional services were used to calculate the estimated O&M costs for Commonwealth Corridor services per revenue train mile. FFY 2019 actual expenses were used to reflect pre-COVID state-supported service and frequency costs.

Table 8.1 depicts the Section 209 O&M cost categories used to develop the Commonwealth Corridor O&M estimate.

TABLE 8.1: O&M COST CATEGORIES

Route Costs		
Train & Engine Crew Labor	Reservations & Call Centers	Block & Tower Operations
Car & Locomotive Maintenance	Stations	Terminal Yard Operations
Onboard Passenger Technology	Station Technology	Terminal Maintenance of Way (MoW)
Onboard Services (OBS)-Crew	Commissions	Insurance
Commissary Provisions	Customer Concession	
Route Advertising	Regional/Local Police	
Additives		
Marketing	Maintenance of Equipment (MoE)	Police
Train and Engine Crew (T&E)	Onboard Services (OBS)	Sign System Server (SSS)
Third Party Costs		
Host Railroad Maintenance of Way	Host Railroad Performance Incentives	Fuel

For the 12 months comprising FFY 2019 (October 2018 – September 2019), the actual expenses per revenue train mile were calculated for each Virginia state-supported route, which include route 46 (Roanoke – Washington), route 47 (Newport News – Washington), route 50 (Norfolk – Washington), and route 51 (Richmond – Washington). All O&M costs are adjusted to remove any Northeast Corridor related O&M costs from Virginia's payments and thus excluded from these calculations. Train turnaround costs were also excluded considering future equipment would likely consist of bi-directional push-pull consists similar to the integrated trainsets Amtrak will deploy in the future on state-supported services in Maine (the *Downeaster*) and New York (*Empire* Service).

The average O&M cost per revenue train mile for existing Virginia state-supported services is approximately $55.28 in 2019 USD. This estimate is the recommended O&M cost per revenue train mile for Commonwealth Corridor services.

Using the average O&M cost per revenue train mile, the total annual O&M cost for Commonwealth Corridor services was calculated assuming two daily roundtrips of 612 miles over 365 days per year. Estimated annual O&M costs are depicted in Table 8.2.

In addition to annual O&M costs for Commonwealth Corridor rail service, Amtrak Thruway Bus service O&M costs were also estimated assuming a connecting motorcoach service from Newport News to Norfolk and Virginia Beach is offered for each Commonwealth Corridor arrival and departure into Newport News and Norfolk. Similar connecting motorcoach service is currently offered for Northeast Regional arrivals and departures at Newport News and Norfolk. Annual O&M costs for connecting motorcoach services for these existing connections were sourced to estimate the cost of connecting motorcoach service for Commonwealth Corridor trains at Newport News. Estimated annual connecting motorcoach O&M costs are also depicted in Table 8.2.

TABLE 8.2: COMMONWEALTH CORRIDOR ESTIMATED O&M COST (2019 USD)

Cost per Revenue Train Mile	$55.28
Revenue Route Miles	306
Annual Revenue Train Miles	446,760
Annual Commonwealth Corridor O&M Cost (train only)	$24,697,000
Annual Connecting Motorcoach O&M Cost	$393,000
Annual O&M Cost	$25,090,000

Train equipment costs are based on DRPT's FFY 2019 capital cost payments to Amtrak for train equipment. The annual cost per daily revenue trainset is approximately $820,000, excluding recurring maintenance and operating costs. This cost represents the lease cost of Amtrak equipment for Virginia's state-supported services. Assuming three trainsets are in daily revenue service for Commonwealth Corridor service comprised of a similar consist as existing Northeast Regional trains (one locomotive, one business class car, one café car, and seven coach cars), the total annual cost for equipment is approximately $2.46 million. Estimated annual train equipment leasing costs are depicted in Table 8.3.

TABLE 8.3: COMMONWEALTH CORRIDOR ESTIMATED EQUIPMENT LEASING COST (2019 USD)

Monthly Capital Expense per Revenue Consist	$68,335
Annual Capital Expense per Revenue Consist	$820,022
Annual Commonwealth Corridor Equipment Leasing Cost	$2,460,000

For recurring cost estimation purposes, the total annual O&M and equipment leasing cost is an estimated $27.55 million.

9. Next Steps

The Commonwealth Corridor Feasibility Study represents a high-level investigation of the potential for expanding intercity passenger rail service on an east-west, cross-state corridor. The study concludes that it is possible to provide passenger rail service on this corridor, albeit with substantial capital investments for track and signals, train equipment, additional capacity, and expanded maintenance and storage facilities in the New River Valley and Newport News. DRPT will work with VPRA and stakeholders to consider the following potential next steps to advance the project.

Coordination with Class I Freight Railroads

The Class I freight railroads have not evaluated or agreed to the proposed service, including any capacity needs of the proposed service. DRPT will need to coordinate with NS and CSXT to determine the number and types of capacity improvements or other projects on host railroad trackage that would be needed to deliver reliable scheduled passenger rail service on the Commonwealth Corridor without materially impacting freight rail operations. This will inform passenger-related infrastructure requirements to further determine potential engineering improvements and capital investments on segments of the corridor beyond Charlottesville to Doswell. NS and CSXT may require different or additional capital investments which could change the cost estimate developed for this feasibility study.

It is important to emphasize that the sample schedule developed for this study was created independent of the Class I's operating needs. DRPT/VPRA would need to enter into contract agreements with NS and CSXT to perform a detailed operations model to understand current and projected freight volumes and schedules and determine what capital improvements would be needed to avoid an impact to freight operations. This effort could include development of phasing scenarios, future freight volumes, and program costs. With additional information from the Class I's on freight operations, more in-depth engineering efforts should be advanced to refine capital improvements and their costs.

Coordination with the Buckingham Branch Railroad

For planning and cost estimating purposes, the infrastructure analysis assumed two passing sidings for combined freight and passenger operations between Charlottesville and Doswell. Future stages of Commonwealth Corridor planning will require close coordination with Buckingham Branch Railroad to determine what, if any, additional track capacity is required to reliably accommodate a regularly scheduled Commonwealth Corridor passenger service of two daily roundtrips and not materially impact freight rail services in this segment.

Coordination with Amtrak

When examining additional passenger service on the segments beyond Charlottesville to Doswell, the agreements in place with the Class I railroads will need to be examined to determine whether and how they can accommodate an increase in service. Additionally, discussions with Amtrak will need to take place to better determine equipment needs (e.g., to confirm the number and configuration of trainsets, as well as the proposed maintenance facility modifications at each end of the line to accommodate Commonwealth Corridor service and provisions for preventive maintenance and inspections) as well as train crew needs and assignments.

Additionally, coordination with Amtrak on improvements at the Charlottesville Station will be needed to determine if further ADA improvements are warranted beyond those already proposed by Amtrak to meet ADA regulations.

Examine Potential for Intercity Bus Service

DRPT will work with Amtrak and other bus service providers as appropriate to examine the potential for new or additional intercity bus service serving the Commonwealth Corridor. This could function as an interim incremental improvement in portions of the Commonwealth Corridor that currently do not have intercity passenger rail and/or require multiple bus transfers. Of note, while Amtrak Thruway Bus service exists between Charlottesville and Richmond, it is only available as a connection to train service once per day, and can only be purchased as part of a trip that includes a rail segment.

Updated and refined market analysis

An updated market analysis will be needed to establish the relationship between the amount of service provided and the resulting potential ridership market, as it was not possible for this high-level analysis to determine the relationship between the number of trains per day and resulting ridership. This could potentially include a benefit-cost analysis and an operational sensitivity analysis to determine a range of operating statistics and related parameters based on the desired service frequency. This analysis could also consider ridership impacts due to COVID-19 and incorporate updated Amtrak ridership data post-pandemic.

Identify funding sources for capital and O&M costs

A distinct and reliable funding source will need to be identified to support the Commonwealth Corridor. As part of the project advancement process, DRPT/VPRA can work with local and regional stakeholders to identify champions to further support the project. In addition to coordination with the Class Is, this would also involve coordination with FRA to determine the corridor's eligibility for intercity passenger rail programs and funding.

Preparation of key planning and environmental documents

Environmental document preparation including updated ridership estimates and service planning will be required to advance the project. The level of environmental approval will determine the subsequent project schedule for implementation. This documentation can support additional funding opportunities for the project.