VDOT
Virginia Department of Transportation

Shenandoah Valley Rail-With-Trail Assessment

March, 2025

TABLE OF CONTENTS

SHENANDOAH VALLEY RAIL-WITH-TRAIL ASSESSMENT

Executive Summary

This report is an assessment of the constraints and considerations for constructing a trail along the Norfolk-Southern-owned rail right of way in Rockingham, Shenandoah, and Warren Counties. This particular assessment examines a rail-with-trail option as an alternative to the previously studied rail-to-trail option in the Feasibility Study for a Linear Park in the Shenandoah Valley (DCR, 2021). This assessment documents the first of three phases regarding the rail right of way, which include:

- Phase 1: Alternatives Analysis – To evaluate and identify typical sections that could accommodate a rail-with-trail alternative.
- Phase 2: Corridor Assessment – To conduct field evaluations of track and structure conditions.
- Phase 3: Assessment Findings – To develop cost estimates and documentation of assessment outcomes.

The purpose of a rail-with-trail in this corridor would be to facilitate connectivity between Broadway, Timberville, Mt. Jackson, Edinburg, Woodstock, Toms Brook, Strasburg, and Front Royal and provide rail operators, local businesses, cyclists, and pedestrians access to various destinations such as schools, businesses, residential areas, agricultural lands, commercial districts, industrial zones, warehouse/storage facilities, places of worship, and cultural sites including historic battlefields and districts.

Key Findings

The following bullet points summarize the key findings found within the report:

- The rail-with-trail was designed within a narrow 33 ft setback from the centerline of the rail. This kept the majority of the rail-with-trail within the existing Norfolk-Southern right-of-way, thereby limiting the anticipated need for land disturbance or acquisition. However, VDOT will require temporary easements during the construction of the trail.
- The typical segments included in this report were designed according to the Virginia Road Design Manual (RDM). However, the detailed designs for the trail will consider other applicable standards and best practices from FHWA, AASHTO or other trail affiliated organizations for comparable trails.
- Rail operators see potential for freight and tourist opportunities with FRA Class II track standards, which allow operating speeds up to 25 miles per hour for freight trains and 30 miles per hour for passenger trains.
- The majority of Town Managers, County Administrators, and locality staff support the construction of a bicycle and pedestrian trail but noted that the local business community has shown little interest in freight rail service.
- Cantilevered trail structures on existing bridges would likely require significant retrofitting and present ownership, maintenance, and trail user safety concerns. These items will be further explored in subsequent phases of the study.

Document Contents

This assessment includes engineering, operations, and maintenance considerations. VDOT and the project consultants (the study team) worked with stakeholders and potential rail operators to determine the level of interest in resuming rail operations in the corridor. The stakeholders also provided input for concerns, experience and best practices, and general feedback. The project team designed the stakeholder engagement process to help align the local community's vision and goals. Engineers on the project team examined conditions in the right of way and developed several sections to accommodate multiple trail conditions. The engineers determined the viability of cantilevered trails. All design considerations were based on applicable regulatory and safety guidelines and may be refined in future planning. The project team also compiled a review of existing rail-with-trail projects in the United States.

This report provides the necessary background information to assess a rail-with-trail option in the corridor, complementing the previous rail-to-trail assessment. Included in this report are several detailed appendices

which document the project team's assumptions, designs, research, and recommendations. The table below describes the contents of each appendix.

Letter	Appendix Title	Description	Page
A	Basis of Design	Provides the source of dimensions and other foundational assumptions used to create the typical sections.	12
B	Typical Sections	Provides typical sections for flat terrain, constrained areas, double rail portions, steep slopes, portions adjacent to roadways, and environmentally sensitive areas.	14
C	Typical Section Application by Typology	Provides the estimated mileage of each section (plus bridge sections and unique circumstance sections) for each of the six study segments.	33
D	Risk Register	Provides a table of risks and challenges rated by their probability and level of impact.	35
E	Crossing Types	Provides typical crossing exhibits for signalized intersections, mid-block crossings, dedicated pedestrian traffic signals, enhanced/driveway crossings, mid-block crossings with limited sight distance, and mid-block crossings on high-speed roads with limited sight distance.	39
F	Stakeholder Interview Summary	Provides the results of engagement with key stakeholders, including potential rail operators.	46
G	Cantilevered Trail Structure Viability	Provides a live load, ownership, maintenance, and safety considerations for attaching cantilevered trails onto existing rail bridges.	51
H	Review of Existing Materials	Provides summaries for relevant reports included those directly related to this project, federal regulations, rail inspection reports, rail-with-trail guidance, economic impact and funding reports, and property valuation reports.	63
I	Review of Rails-with-Trails with Reduced Separation	Provides examples of rails-with-trails where there is less than 11 feet of separation between rail and trail.	89

Introduction

This report is an assessment of the Norfolk-Southern owned rail right of way that traverses the Shenandoah Valley between the Town of Broadway in Rockingham County and the Town of Front Royal in Warren County. The goal of this study is to provide an assessment of the scope, cost, constraints, and other considerations of a rail-to-trail alternative and a rail-with-trail alternative. The study factors in an adjacent trail that meets all safety and design standards for shared use paths as specified in the VDOT Road Design Manual, FHWA Rail-with-Trail report, and other relevant state and federal guidance related to rails-with-trails. Further analysis in subsequent phases of this study will consider other applicable standards for trails of this nature that may be more appropriate and cost effective.

This report documents an initial alternatives analysis that evaluates and identifies typical sections that could accommodate a rail-with-rail alternative. This is Phase 1 of a three-phase effort. The remaining two phases are a corridor assessment (Phase 2) and an assessment of costs and outcomes (Phase 3). Phase 1 of the project does not include an economic impact analysis, engineering survey/design drawings, or a recommendation on which type (rail-to-trail versus rail-with-trail) of trail will advance to construction.

The Shenandoah Valley Rail-with-Trail Assessment uses the same study area and segmentation evaluated in the Feasibility Study for a Linear Park in the Shenandoah Valley (DCR, 2021). The study area covers the rail corridor and its immediate environs in the northern end of Rockingham County, Shenandoah County, and the central part of Warren County (See Figure 1). The study area is 49 miles in length. Between Broadway and Front Royal, the inactive rail line passes through the towns of Broadway, Timberville, Mt. Jackson, Edinburg, Woodstock, Toms Brook, Strasburg, and Front Royal.

This report addresses the work conducted under the initial Alternatives Analysis component of the Rail-with-Trail Assessment and outlines key aspects of the project including the development of section types for the corridor, assessment of existing conditions, design considerations based on assumed current regulatory and safety guidelines, and stakeholder interactions aimed at gathering feedback and ensuring project alignment with community vision and goals.

Project Purpose and Need

This assessment is an unbiased review by VDOT to support decision making on the use of the $35M trail allocation. Both a rail-to-trail alternative and a rail-with-trail alternative should fulfil the project's purpose and need. The purpose of this project is to facilitate connectivity between these nine municipalities. This will satisfy several local needs including:

- The need to improve non-motorized transportation: this project would create a separate-from-road connector between the nine jurisdictions, enabling safe bicycle and pedestrian travel between them, as well as local connections to schools, businesses, residential areas, agricultural lands, commercial districts, industrial zones, warehouse/storage facilities, places of worship, and cultural sites including historic battlefields and districts.
- The need to create recreational opportunities: this project would create a long distance bicycle and pedestrian amenity connecting to several population centers. This would offer local, regional, and tourist populations new, high-quality recreational opportunities.
- The need to enhance the regional economy: this project could potentially enhance local economies by providing an amenity that draws new customers and potential markets to the area.

Establishing Design Criteria

Determining the class of track is crucial during this component of the assessment as it sets the engineering standards, safety requirements, and infrastructure specifications needed to meet the expected operational demands. The Federal Railroad Administration (FRA) typically designates five classes of track standards: Class I, Class II, Class III, Class IV, and Class V. FRA's Track Safety Standards establish track structure and track

geometry requirements with maximum speeds designated for each class. Railroads indicate the class to which each track belongs. Once the designation is made, the railroads are held responsible for maintaining each track to specified tolerances for its designated class. A railroad becomes liable for civil penalties if it fails to maintain a track to proper standards, or if it operates trains at speeds in excess of the limits of the designated class. These classes, used by all freight railroads, ensure operating speeds, and the highest safety and efficiency for long-distance goods transportation.

[IN MILES PER HOUR]

Over track that meets all of the requirements prescribed in this part for—	The maximum allowable operating speed for freight trains is—	The maximum allowable operating speed for passenger trains is—
Excepted track	10	N/A
Class 1 track	10	15
Class 2 track	25	30
Class 3 track	40	60
Class 4 track	60	80
Class 5 track	80	90

FIGURE 1.1A - CODE OF FEDERAL REGULATIONS: FRA TRACK SAFETY STANDARDS: 49 CFR PART 213, SECTION 213.9

For this rail-with-trail assessment, the rail line class and type were selected based on the interests and anticipated usage of potential rail operators. Interviews revealed that operators who saw potential in both freight and tourist opportunities along this corridor favored FRA Class II track standards for competitive connections between Norfolk Southern and CSX. FRA-designated Class II tracks allow operating speeds up to 25 MPH for Freight and 30 MPH for Passenger. Potential users emphasized the importance of connections to Surface Transportation Board (STB) designated Class I Freight railroads to ensure competitive shipment costs.

This assessment, when comparing rails-with-trail alternative to a rail-to-trail alternative assumes that the typical section for rails-to-trails is the same as in the 2021 study completed for DHR. This assumption may be revisited in subsequent phases of this study.

Typical Section Development

To develop a comprehensive schematic for the entire corridor, a series of typical sections has been created for use throughout the corridor. This approach allows for determining the rough percentage of each section type used in individual segments and the entire corridor. In establishing the applicable design criteria for the shared use path, the determination of the railroad class confirms the appropriateness of using practiced VDOT standards. By using these sections, the corridor has been broadly analyzed for likely design solutions before developing site specific details, which helps to understand, the most suitable typical section throughout the corridor under this rail-with-trail alternative. As previously stated, other applicable standards may be recommended and utilized in subsequent efforts.

The broad analysis of existing conditions along the corridor was foundational to determining the most probable locations for these sections. This analysis builds upon previous analysis performed for a rail-to-trail alternative for the same corridor, ensuring consistency and comparability. The inventory includes datasets from county-provided GIS open data, site visits, railroad valuation maps containing survey level information about the railway and the land around them, and GIS modeling to determine geographic characteristics. The available land owned by the railroad was determined using the valuation maps, which state a minimum 33 ft offset from either side of the railroad centerline as shown in Figure 1.1. The evaluation for the rail-with-trail alternative therefore seeks to maintain the shared use path's footprint within this 33 ft zone.

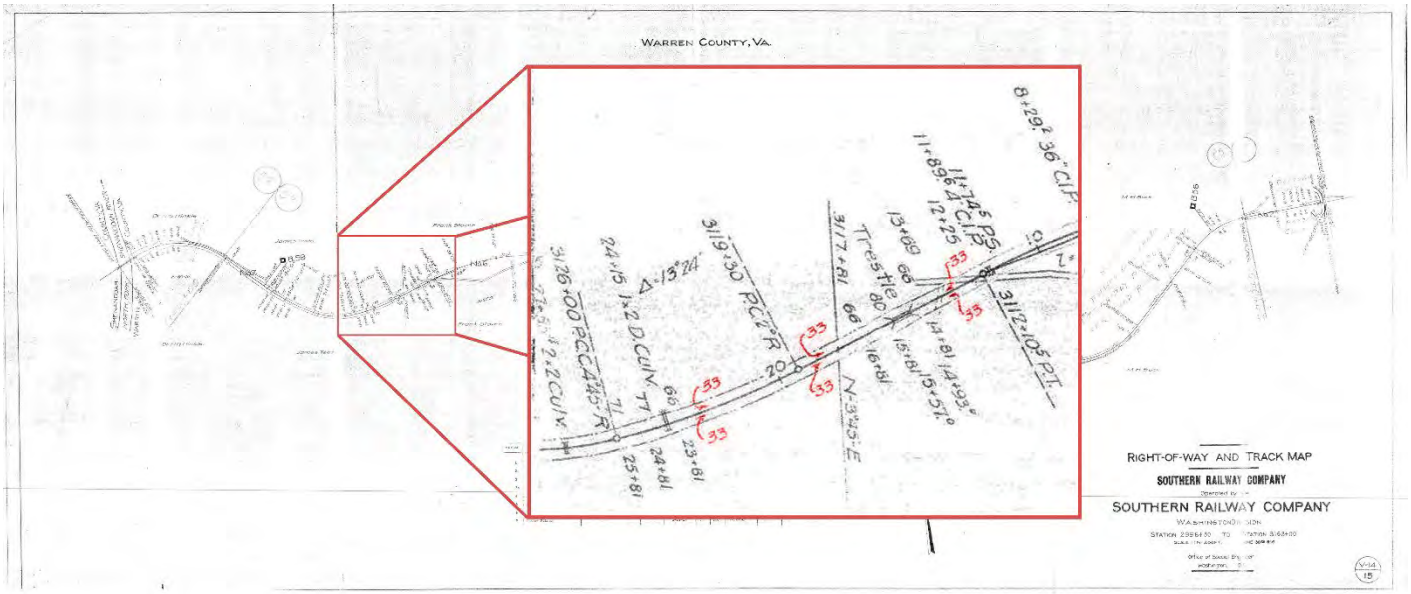


FIGURE 1.1 - NORFOLK SOUTHERN RAILROAD VALUATION MAP (33 FT OFFSET HIGHLIGHTED)

The Shenandoah Valley Rail-with-Trail project is assumed to be a transportation facility primarily designed for pedestrians and bicyclists, with equestrians as a secondary intended user. The corridor is assumed to be purchased by VDOT and owned by the Commonwealth, and for this analysis the Virginia Road Design Manual (RDM) has been used for guidance on corridor design. The RDM provides a series of standards that offer clear, consistent, and proven guidance on design for transportation infrastructure. These design standards focus on public safety and serve as the authoritative source for infrastructure design decisions within Virginia. However, further analysis may identify more appropriate standards and best practices from other sources that will provide a more cost-effective solution.

Definitive guidance is challenging to find in other documents, which often provide suggestions with widely varying dimensions or state that the lack of comprehensive standards is a challenge in rail-with-trail projects. During the assessment review, the consultant team referenced the US DOT's "Rails With Trails Lessons Learned" (2002 and 2021 versions), AASHTO's "Guide for the Development of Bicycle Facilities," and the American Railway Engineering and Maintenance-of-Way Association's (AREMA) "Manual for Railway Engineering" (MRE) for information on alternative clearances and separation suggestions. For the purpose of this analysis for phase 1 of the study,, the typical sections shown in this report adhere to the current RDM standards where applicable. Additional guidance from VDOT State Trails Office (STO) and other applicable sources will also be incorporated into proposed trail design including, but not limited to, the STO Trail Surface Guide (anticipated publication: Summer 2025). While trail surface and subsurface design have not been finalized, it is anticipated that the trail surface will be constructed with pervious material, crushed stone, or material other than asphalt throughout the corridor.

The design of the shared use path was developed assuming a 33 ft setback from the centerline of the railroad tracks. This setback is based on the minimum distance to the rail corridor's property line shown in the railroad's Valuation Maps (Val Maps). By adhering to this narrow footprint, the goal is to limit land disturbance to property currently owned by Norfolk Southern, thereby avoiding or minimizing land acquisition along the 49-mile corridor. By purchasing the land and leasing the railways to an operator, the Commonwealth can establish its standards for the corridor to provide both an active rail line and a safe shared use path.

Appendix A: Basis of Design consolidates various sources to establish separation / setbacks suitable for this phase of the assessment. The fundamental separation upon which different dimensions are compared is from VDOT's 'Road Design Manual' which specifies that for low volume/low speed trains, a 25 ft separation from face of rail to edge of trail improvements is desired, with an 11 ft minimum in constrained areas with physical

barriers[1]. As such, and to support compact development goals, the Basis of Design assumes 11 ft as a typical separation, encompassing the distance between the outer rail edge and the nearest object, whether fence, shared use path / trail or vegetative buffer. This separation measurement, consistent with the RDM, corresponds to approximately 13.5 ft from the rail centerline, aligning with the precedent studies below.

In the USDOT's 'Rails with Trails: Best Practices and Lessons Learned' setbacks range from 10 to 25 ft (in constrained areas) from the rail centerline to the shared use path edge.[2] USDOT finds an average setback of 32 ft calculated from a sample size of 78 rails-with-trails. These best practices are an update from 'Rails-With-Trails: Lesson Learned - Literature Review, Current Practices, Conclusions' which have similar findings albeit averaging 33 ft setback from center of rail to shared use path.[3]

There is a more nuanced analysis of setbacks within this publication. For example, it is noted that "...minimal setbacks without physical separation raise significant daily trespassing and safety concerns among train engineers"[4]. Trespassing deterrence is a crucial point for the stakeholder group in this corridor, including VDOT, who want to reduce potential liability for the Commonwealth. Additionally, the document states "Due to the lack of consensus on acceptable setback distances, the appropriate distance must be determined on a case-by-case basis, ranging from 10 to 100 ft in Figure 5.10. In many cases, adequate setback widths, typically 7.6 m (25 ft) or higher, can be achieved along the majority of a corridor. However, certain constrained areas will not allow for the desired setback width." Additionally, USDOT's recommendation is a 6 ft tall chain link fence separating the trail from the track.[5]

'America's Rails-With-Trails: A Resource for Planners, Agencies, and Advocates on Trails Along Active Railroad Corridors' summarizes multiple railroads' enforced setback requirements for trails identifying that over 60% of trails are within 11 to 50 ft setbacks. [6] Chapter 28 of AREMA's "Manual for Railway Engineering" specifies setback clearance requirements from the rail centerline, which vary by state.[7] In Table 28-3-3: Legal Clearance Requirements by State (English Units), most states specify setbacks ranging from 8 to 12 ft, with 8.5 ft being a common reference. However, Virginia does not specify a clearance regulation. In this case, the responsibility for establishing setback specifications falls to the railway owner. Currently, the railway corridor is owned by Norfolk Southern (NS) which prohibits pathways that allow parallel movement with trains on NS right of way. However, as Norfolk Southern is not anticipated to remain as the owner, it is not feasible to use the current railroad owner / operator as guidance on permissible separation or setbacks.

Finally, the RDM establishes a clear requirement for two-way shared use paths to have a minimum 10 ft width, as specified in Figure A(1)-7 Cross Section of Two-Way Shared Use Path. This width aligns with the broader community's preference, as all twelve locality leaders interviewed for this assessment expressed support for a 10 ft wide shared use path. Notwithstanding this, the final design may include a different alternative. This dimension accommodates various user groups who may travel at different speeds and ensures safety for all users. This

[1] VDOT Road Design Manual – Appendix A(1) - VDOT Complete Streets: Bicycle and Pedestrian Facility Guidelines, Bus Stop Design and Parking Guidelines (Rev. 10/2020) - Figure A(1)-15 Separation Between Active Rail Lines and Paths (RWT) and Table A-5-12, Page A(1)-48

[2] U.S. Department of Transportation. (2021). Rails With Trails Best Practices and Lessons Learned (pp. 47-50). Rails-to-Trails Conservancy.

[3] U.S. Department of Transportation. (2002). *Rails-With-Trails: Lesson Learned - Literature Review, Current Practices, Conclusions* (pp. 62-65)

[4] U.S. Department of Transportation. (2021). Rails With Trails Best Practices and Lessons Learned (pp. 47-50). Rails-to-Trails Conservancy.

[5] U.S. Department of Transportation. (2002). *Rails-With-Trails: Lesson Learned - Literature Review, Current Practices, (*pp. 3, 8,14).

[6] 'America's Rails-With-Trails: A Resource for Planners, Agencies, and Advocates on Trails Along Active Railroad Corridors' by the Rails-to-Trails Conservancy

[7] American Railway Engineering and Maintenance-of-Way Association. (2024). Chapter 28: Clearances - Methods and Procedures. In Manual for Railway Engineering. (PP. 28-3-30 to 28-3-39)

standard not only follows VDOT recommendations (as a minimum) but also aligns with FHWA and AASHTO guidelines.[8]

In evaluating setback requirements, the **Basis of Design spreadsheet (Appendix A)** provides a framework for determining appropriate distances between the trail and the rail line. This evaluation includes separation distances and setbacks, ensuring they align with applicable regulatory standards and safety guidelines. Additionally, a series of interviews were conducted with potential operators to understand their specific separation needs. The feedback obtained from these interviews revealed a notable disparity in the preferred separation distances, ranging from as narrow as four ft to as wide as 35 ft. In the analysis of each area within the corridor, each section is prioritized hierarchically, such that if multiple section criteria are present in one area, the most constrained section is chosen. For instance, if a steep slope occurs in an area with a parking lot within the right of way, a section focusing on the constrained condition would be selected over a section focused on the steep slope. The restrictive component is determined by cost, coordination efforts, environmental, social, and other impacts, with intent to limit or avoid potential impacts to neighboring properties and property owners.

Each section described below can be seen in the Typical Section Graphics (Appendix B). Within these graphics are three sections, with one depicting the existing conditions of the railway area, and two proposed alternatives - one is the rail-with-trail alternative of which this memorandum is assessing, and the other for the rails-to-trails alternative as presented in the previously completed *Feasibility Study for a Linear Park in the Shenandoah Valley*. The graphics also show example photographs of relevant current conditions as well as how frequently that section is proposed, first within the six segments of the corridor, then as a percentage of the whole. These percentages are determined through the **Typical Section Application by Typology Spreadsheet (Appendix C)** which catalogues the expected section along each station of the corridor, with general notes and the anticipated side of the rail line the shared use path would be located on - south to north / west to east.

The location of the shared use path relative to the rail had a direct and critical correlation to the required railroad crossings along the corridor. The decision to reduce railway crossings in a rail-with-trail scenario stems from various critical considerations. Firstly, it enhances safety by minimizing potential conflicts between shared use path users and railway operations, ensuring a safer environment for pedestrians, bicyclists, and equestrians. This approach also proves to be cost-effective as it reduces the need for infrastructure modifications and safety enhancements at these crossings. Moreover, concentrating the shared use path predominantly on one side of the railway optimizes design space utilization, avoiding complex configurations that may arise from frequent crossings and facilitating smoother shared use path integration.

Furthermore, strategically choosing existing rail crossings, such as roadways or private drives, for railway intersections helps manage traffic effectively by leveraging existing infrastructure and traffic control measures. Each railway crossing necessitates site-specific engineering solutions to address pedestrian visibility, accommodate diverse traffic types (including trains, vehicles, bicycles, pedestrians, and equestrians), and meet applicable safety standards. By using existing crossings, the shared use path design balances safety, cost-efficiency, design space optimization, infrastructure complexity management, and streamlined traffic management.

The dimensions provided in the typical sections are meant to be representative for the majority of the corridor and are primarily used for planning and cost estimation purposes. Typical section dimensions may adjust as needed due to environmental or physical constraints. Site-specific conditions may necessitate deviations from the typical sections to address unique challenges or requirements. As previously noted, the design standards for trails vary based on type and location. VDOT will continue to consider other appropriate design standards and best practices in addition to the RDM to determine the most applicable and cost-effective solution. Sound engineering judgment will be applied to ensure the appropriate design for this specific application to provide a safe and functional trail facility.

[8] AASHTO Task Force on Geometric Design. "AASHTO Guide for the Development of Bicycle Facilities." American Association of State Highway and Transportation Officials, Washington, DC. 2012 (pp.5-3 to 5-4)

Typical Section Typologies

Section A – Flat Terrain Section

This section applies to areas with adjacent slopes that are relatively flat. It assumes no adjacent slopes greater than 3:1, no constraining issues within the 33 ft zone, and no structural, geological, or administrative limitations. Section A is the least restrictive and used mainly without other limiting factors. In the context of our site inventory, Section A was deemed appropriate in the following conditions:

- No constraining elements which would potentially restrict the space available within the 33ft zone as determined by the valuation maps
- No parallel tracks that can be converted into shared use path
- No steep slope on at least one side of the rail, considering which side of the rail the proposed shared use path could run with the highest probability at this point in our analysis.
- No parallel VDOT owned roadway which could be used as public right of way to ease restrictive design dimensions
- Not within any environmentally sensitive or designated wetland areas
- Not atop of an existing bridge or culvert
- Not within unique conditions requiring specific engineering design

Section B – Constrained Section

This section applies to areas restricted mostly by nearby privately owned built structures or other structures in urbanized areas but may also apply to areas of significant constraints such as geological areas with near vertical slopes. In these cases, the shared use path would need to drop below minimum standard dimensions for short segments. A design waiver or exception would be used to reduce the required shared use path width from a 16 ft condition with a ten ft shared use path and two (2) three ft clear areas on either side, to a 12 ft condition with a ten ft shared use path and two (2) one ft clear areas adjacent. An option of an eight ft shared use path and two (2) two ft clear areas may be considered on a case-by-case basis. An option of an eight ft shared use path and one ft clear areas is not recommended as both widths are absolute minimums in the AASHTO guidelines. Combining absolute minimums for both is not recommended because it compromises the safety and usability of the shared use path, reduces maneuvering space, results in inadequate clearance and comfort for users, and increases the likelihood of conflicts and accidents.

Section B was used in areas where adjacent features limited the ability of the shared use path to be constructed within the minimum dimensions as specified within the basis of design. These structures are often built on rail adjacent properties including commercial, industrial, agricultural and residential facilities. These range from small structures such as sheds and fences, to larger structures such as parking lots and primary building facilities. In these cases, it is often less costly to constrain the typical section to avoid obstacles rather than move the shared use path to the other side of the rail.

Section C – Double Track Section

This section applies to areas with parallel tracks along the baseline where the parallel rail can be transformed into a shared use path. In these areas, the secondary track can often be removed and replaced with a shared use path with limited impact to the surrounding area. Grading changes/adjustments and stormwater impacts are minor if existent at all. These areas of track were determined through a combination of site reconnaissance, aerial photography and GIS data. Often, they are in areas where a building footprint imposes on the right of way of the rail. However, because of the terrain conditions, it is often expected that these areas do not fall within a constrained type of section.

Section D – Steep Slope Section

This section applies to areas where the track runs adjacent to land with slopes currently greater than 3:1. It requires physical barriers to protect pedestrians from steep slopes and may necessitate retaining walls where there is insufficient Right of way or physical space to achieve the minimum 5 ft shoulder required beside steep slopes. To determine these areas of greater than 3:1 slope, a heat map was generated from existing topography

models and superimposed onto a map along the rail corridor. In instances where the shared use path runs atop of one of these steep slopes, it was assumed that to meet grade, that slope would need to be adjusted outward to an extent yet to be determined. Though this section is relatively common along the corridor and comprises 37% of the total corridor length (see Appendix C: Typical Section Application by Typology), it was not used in instances where other options were clearly required, such as constrained areas, double track conditions and sections adjacent to VDOT right of way. These conditions mitigate the need to modify the slope in a way which impacts private landowners (through temporary construction easements, permanent easements or land acquisition) or is insignificant in comparison to the cost of other critical elements in this area.

Section E – Adjacent to Roadway Right of Way Section

This section applies to areas where greater separation between the shared use path and railway is afforded by an adjacent roadway. This is because in these instances, VDOT owned right of way can be combined with railway property to increase the amount of land available for the shared use path. There are typically two types of situations in which this occurs:

The railway aligns to a major route with higher vehicular usage and limited pedestrian accommodations; or
A smaller access road runs parallel to the railway for a smaller group of residential properties.

Section F – Environmentally Sensitive Section

This section applies to areas that cross environmentally sensitive habitats, including riparian areas, wetlands, floodplains, wildlife corridors, forested areas, erosion-prone areas, and culturally significant areas among others that may emerge. This section will be studied in more detail in the forthcoming Corridor Assessment component of this assessment.

Miscellaneous Typical Section Typologies

Bridges and Culverts

This condition applies to areas that cross existing bridges or culverts. This condition will be studied in more detail in the forthcoming Corridor Assessment component of this assessment.

Unique Conditions

These conditions apply to unique circumstances and special conditions that require further detailed engineering to determine an appropriate design in these areas. A poster showing photos of various unique conditions is shown in the Typical Section Posters (Appendix B) with notes describing design issues. These unique conditions occur when a clear path is not possible on either side of the track and further investigation is needed. These issues are too broad and specific to model as a typical section. In the interest of saving resources to analyze each area with equal consideration, these conditions are identified as an indication that a more detailed assessment will be needed.

In general, the conditions included are:

- Environmental considerations, such as proximate to large geological outcroppings or near vertical cliff faces on both sides.
- Human-made considerations such as historic sites, districts, or buildings; such as cemeteries.
- Conditions where the railroad traverses a property and divides it in half, such as where a reactivated railroad AND a shared use path would create safety and operational concerns for the property owner.
- Conditions where there is insufficient width for a shared-use path due to a roadway parallel to the railroad, in which case on-road accommodations may need to be considered.

Additional Considerations

Additional analyses will be undertaken in the Corridor Assessment component of this study. These include structural assessments of existing bridges and culverts, stormwater analysis, and environmental analysis. By

categorizing and analyzing the corridor in this manner, we ensure a systematic and efficient approach to the rail-with-trail assessment, accommodating a variety of conditions while maintaining safety and functionality.

The attachment of the shared use path to existing structures such as bridges and culverts will be evaluated in the Corridor Assessment as well. A comprehensive structural analysis will be conducted, including a robust inspection of three structures representative of the design types encountered along the corridor. These inspections will guide broader assumptions about the remaining bridges and culverts, informing potential redevelopment or rehabilitation strategies suitable for accommodating a rail-with-trail alternative. The feasibility and optimal integration methods for the shared use path with existing infrastructure will be assessed to ensure a safe and efficient design solution.

Using rail-capable maintenance vehicles to access the trail for maintenance is a strategic choice that enhances operational efficiency and minimizes environmental impact by reducing the need for additional access roads for maintenance vehicles. This approach streamlines maintenance operations, ensuring prompt response times and minimizing disruptions to surrounding areas. Detailed protocols and coordination with rail operators or maintenance personnel can be established in design phases following the results of the assessment as required.

Relative to the risks identified for the rail-to-trail concept, the rail-with-trail alternative introduces numerous unknown design factors and associated risks. Risks represent uncertain events, activities, or conditions that could negatively impact project goals in terms of scope, schedule, cost, and quality. Success or failure depends on effective risk management throughout the project's lifecycle. A Risk Register (Appendix D) was developed to assess risks, challenges, and mitigations. This matrix categorizes risks based on likelihood, consequence severity, and concern levels across key phases like Land Acquisition, Stakeholder Engagement, Design, Construction, and Maintenance.

The following tables are used to assess each identified risk - Figure 1 for Risk Likelihood, Figure 2 for Risk Consequence, and Figure 3 for Risk Level of Concern.

Figure 1 - Risk Likelihood,

Almost Certain	Chance of expecting risk – 100% to 76%
Likely	Chance of expecting risk – 75% to 51%
Possible	Chance of expecting risk – 50% to 26%
Unlikely	Chance of expecting risk – 25% to 0%

Figure 2 - Risk Consequence

Catastrophic	End of the project
Major	Significant impact to schedule, increase in cost, or compromise connectivity
Serious	Potential impact to schedule, increase in cost, or compromise connectivity
Important	Issues has minimal impact to schedule, increase in cost, or compromise connectivity

Figure 3 - Risk Level of Concern.

Extreme	Must be addressed with a detailed management plan
High	Requires consistent task focused management
Moderate	Resolved by project specific management
Low	Managed by routine procedures

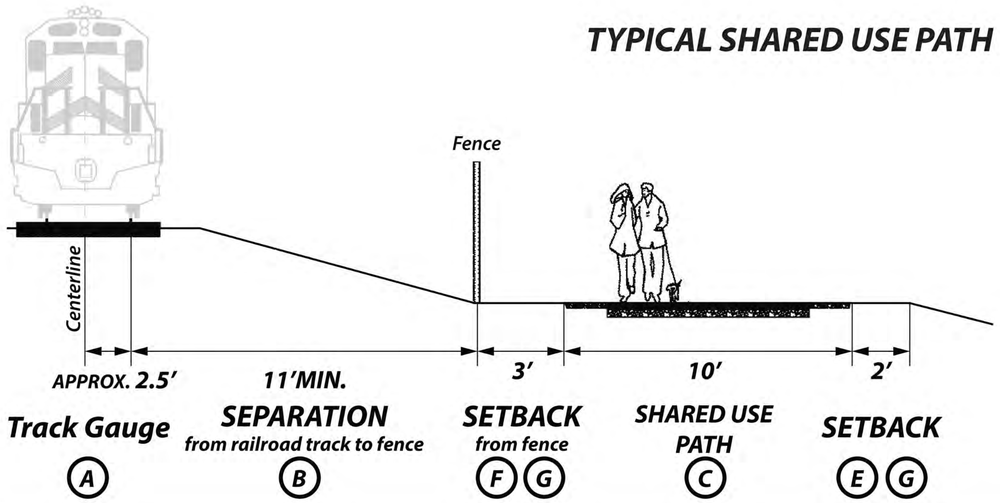
Each risk is described, evaluated for its impact on project parameters, provided with a mitigation strategy and responsible party, and reassessed post-mitigation.

The typical sections will be refined in the forthcoming Corridor Assessment component following input from community stakeholders. During the engagement process, the public will be informed about the project and feedback will be solicited. Through the Alternatives Analysis component there have been a series of stakeholder meetings captured in The Interview Summary (Appendix F).

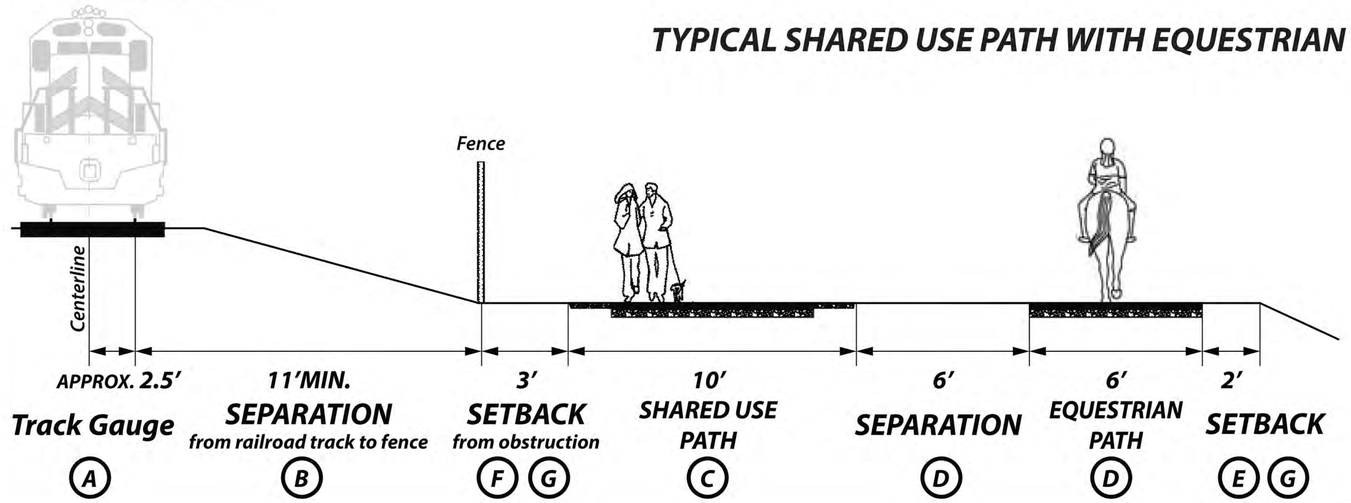
APPENDIX A: BASIS OF DESIGN

SCENARIOS

TYPICAL SHARED USE PATH



TYPICAL SHARED USE PATH WITH EQUESTRIAN

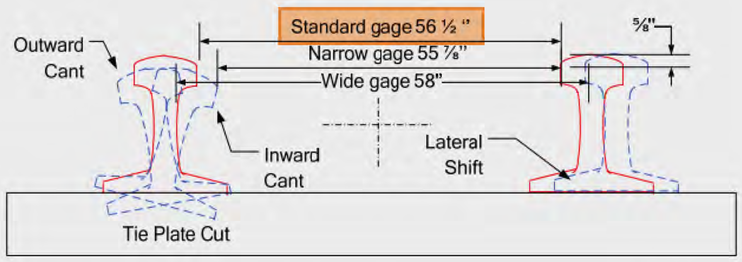


SOURCE OF DIMENSIONS

A U.S. Department of Transportation Federal Railroad Administration

Federal Railroad Administration, Track Safety Standards Compliance Manual, 2008
Section 213.53, pg. 5.24

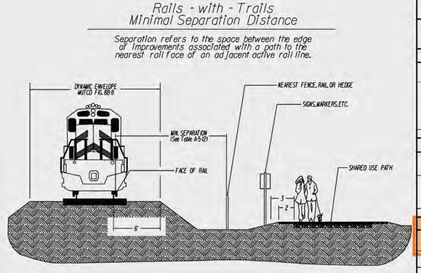
Track Gauge - Approx. 2.5' from centerline to rail



B VDOT Virginia Department of Transportation

VDOT Road Design Manual Appendix A(1)
Page A (1)-48 and 49

Separation (distance only) - 11' minimun



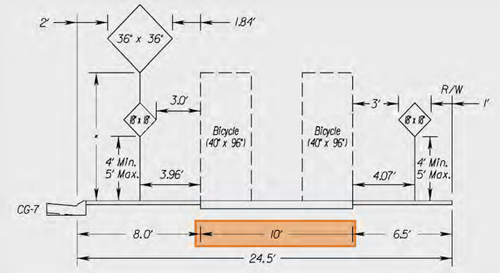
Recommended Separation between Active Rail Lines and Paths (RWT)

Type of Rail Operation	Setting Characteristic	Recommended Minimum Separation
High Volume/High Speed		
11 trains or more per day Max speed over 45 mph	Typical Conditions	25 feet with fence 15 feet with a solid barrier
	Constrained Areas (cut/fill, bridges, etc.)	15 feet with fence or another physical barrier
	Vertical Separation of at least 10 feet	20 feet
Medium Volume/Medium Speed		
Fewer than 11 trains per day Max speed 45 mph	Typical Conditions	25 feet 15 feet with physical barrier
	Constrained Areas	11 feet with physical barrier
	High Trespassing Areas	11 feet with physical barrier
Low Volume/Low Speed		
Fewer than 11 trains per day Max speed 45 mph	Typical Conditions	25 feet desired 11 feet minimum
	Constrained Areas	11 feet with physical barrier

C VDOT Virginia Department of Transportation

VDOT Road Design Manual Appendix A(1)
Page A (1)-25 Typical section of shared use path

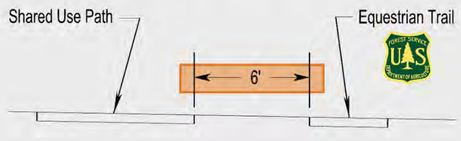
Shared Use Path - 10'



D VDOT Virginia Department of Transportation

VDOT Road Design Manual Appendix A(1)
Page A (1)-26 Separation between shared use path and equestrian trail

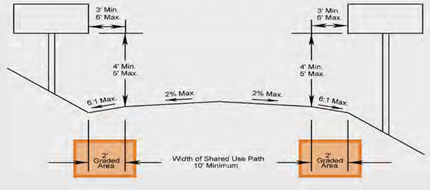
Separation - 6'
Equestrian Path - Double Track 8 - 12' / Single Track 6'



E VDOT Virginia Department of Transportation

VDOT Road Design Manual Appendix A(1)
Page A (1)-27 Cross Section with Two-way Shared Use Path

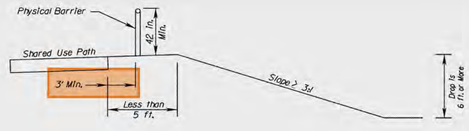
Setback - 2'



F VDOT Virginia Department of Transportation

VDOT Road Design Manual Appendix A(1)
Page A (1)-29 Physical barriers for shared use path

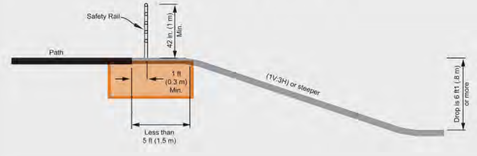
Setback - 3' from fence or railing



G AASHTO

AASHTO - Guide for the Development of Bicycle Facilities - 2012 - 4th Editions
Page: Chapter 5-7 Safety Rail between Path and Adjacent slope

Setback - 1' from fence or railing
for constrained areas only



BASIS OF DESIGN

Shenandoah Valley Railroad Corridor - Alternatives Analysis

VDOT Virginia Department of Transportation | Michael Baker INTERNATIONAL | VOLKERT

APPENDIX B: TYPICAL SECTIONS

B1. Typical Section Dimension Assumptions and Sources

Each section within the corridor is based on a 66-foot Right of Way (ROW) as delineated by the Railroad Valuation Maps provided by the Shenandoah Valley Battlefields National Historic District (SVBF). This 66-foot ROW serves as the foundation for converting the existing rail into a rail-with-trail configuration. The dimensions and sources of each section are detailed below. The shared use path placement beside the rail line is for illustrative purposes only, and the exact location of the shared use path on one side of the rail versus the other has not been determined at this stage.

SECTION A – FLAT TERRAIN TYPICAL SECTION

- 11' minimum separation from face of outer rail to chainlink fence
  per VDOT Road Design Manual - Appendix A(1) - Figure A(1)-15 Separation Between Active Rail Lines and Paths (RWT)
- 3' minimum setback from chainlink fence (barrier) to shared use path
  per VDOT Road Design Manual – Appendix A(1) – Figure A(1)-7 Cross Section of Two-Way Shared Use Path
- 10' shared use path
  per VDOT Road Design Manual – Appendix A(1) – Figure A(1)-7 Cross Section of Two-Way Shared Use Path
- 2' minimum setback from edge of shared use path to cut / fill slope <3:1
  per VDOT Road Design Manual – Appendix A(1) – Figure A(1)-7 Cross Section of Two-Way Shared Use Path
- Earthwork tie to existing grade, width varies

SECTION B – CONSTRAINED AREAS TYPICAL SECTION

- 11' minimum separation from face of outer rail to chainlink fence
  per VDOT Road Design Manual - Appendix A(1) - Figure A(1)-15 Separation Between Active Rail Lines and Paths (RWT)
- 1' minimum setback from safety rail to edge of shared use path
  per AASHTO - Guide for the Development of Bicycle Facilities – Figure 5.3 Safety Rail Between Path and Adjacent Slope
- 10' shared use path
  per VDOT Road Design Manual – Appendix A(1) – Figure A(1)-7 Cross Section of Two-Way Shared Use Path
- 1' minimum setback from edge of shared use path to safety rail
  per AASHTO - Guide for the Development of Bicycle Facilities – Figure 5.3 Safety Rail Between Path and Adjacent Slope
- Earthwork tie to existing grade, width varies

SECTION C – DOUBLE RAIL TYPICAL SECTION

- 11' minimum separation from face of outer rail to chainlink fence
  per VDOT Road Design Manual - Appendix A(1) - Figure A(1)-15 Separation Between Active Rail Lines and Paths (RWT)
- 3' minimum setback from chainlink fence (barrier) to edge of shared use path
  per VDOT Road Design Manual – Appendix A(1) – Figure A(1)-7 Cross Section of Two-Way Shared Use Path
- 10' shared use path
  per VDOT Road Design Manual – Appendix A(1) – Figure A(1)-7 Cross Section of Two-Way Shared Use Path
- 2' minimum setback from edge of shared use path to cut / fill slope <3:1
  per VDOT Road Design Manual – Appendix A(1) – Figure A(1)-7 Cross Section of Two-Way Shared Use Path
- Earthwork tie to existing grade, width varies

SECTION D – STEEP SLOPES TYPICAL SECTION

- 11’ minimum separation from face of outer rail to chainlink fence
  per VDOT Road Design Manual - Appendix A(1) - Figure A(1)-15 Separation Between Active Rail Lines and Paths (RWT)
- 3’ minimum setback from chainlink fence (barrier) to shared use path
  per VDOT Road Design Manual – Appendix A(1) – Figure A(1)-8 Physical Barrier for Shared Use Path
- 10’ shared use path
  per VDOT Road Design Manual – Appendix A(1) – Figure A(1)-7 Cross Section of Two-Way Shared Use Path
- 3’ minimum setback from edge of shared use path to physical barrier ≥3:1
  per VDOT Road Design Manual – Appendix A(1) – Figure A(1)-8 Physical Barrier for Shared Use Path
- EITHER
  - 2’ maximum setback from physical barrier of shared use path to cut / fill slope ≥3:1
    per VDOT Road Design Manual – Appendix A(1) – Figure A(1)-8 Physical Barrier for Shared Use Path
  - Retaining wall with drop > 1’
    per VDOT Road Design Manual – Appendix A(1) – Figure A(1)-8 Physical Barrier for Shared Use Path
- Earthwork tie to existing grade, width varies

SECTION E – ADJACENT TO ROADWAY RIGHT OF WAY TYPICAL SECTION

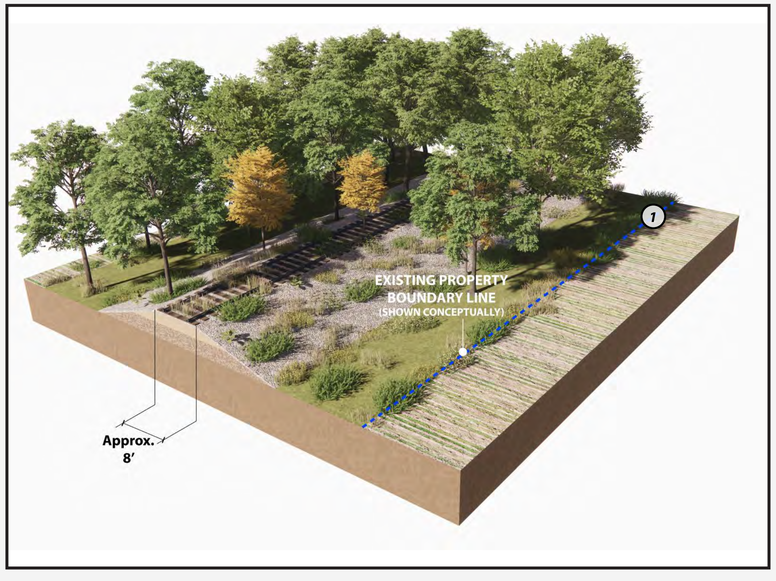
- 11’ minimum separation from face of outer rail to nearest fence, rail or hedge
  per VDOT Road Design Manual - Appendix A(1) - Figure A(1)-15 Separation Between Active Rail Lines and Paths (RWT)
- Buffer space – condition and width vary
- 2’ minimum graded area (max 6:1 slope) to edge of shared use path
  per VDOT Road Design Manual – Appendix A(1) – Figure A(1)-7 Cross Section of Two-Way Shared Use Path
- 10’ shared use path
  per VDOT Road Design Manual – Appendix A(1) – Figure A(1)-7 Cross Section of Two-Way Shared Use Path
- 2’ minimum graded area (max 6:1 slope) from edge of shared use path
  per VDOT Road Design Manual – Appendix A(1) – Figure A(1)-7 Cross Section of Two-Way Shared Use Path
- Buffer space, condition and width varies

SECTION F – ENVIRONMENTALLY SENSITIVE AREA TYPICAL SECTION

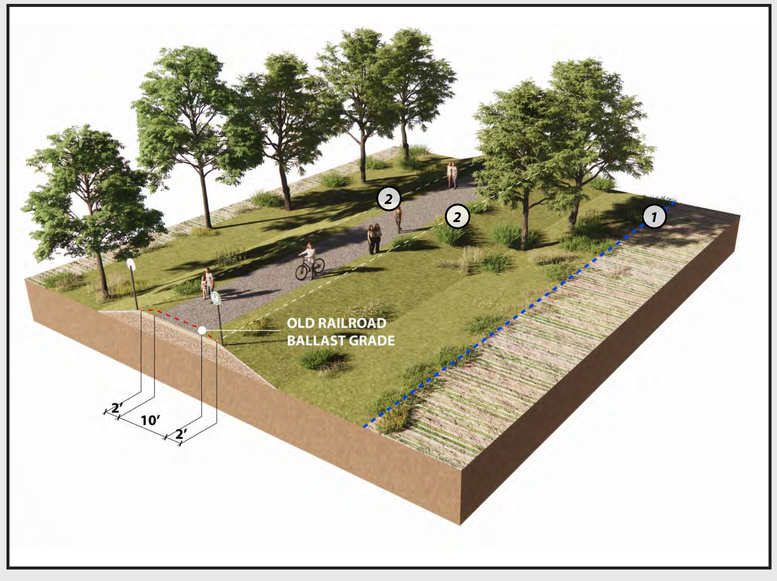
- 11’ minimum separation from face of outer rail to chainlink fence
  per VDOT Road Design Manual - Appendix A(1) - Figure A(1)-15 Separation Between Active Rail Lines and Paths (RWT)
- 14’ Boardwalk Structure
  per Rails With Trails Best Practices and Lessons Learned (US DOT, Federal Rail Administration, Federal Highway Administration) – Figure 34: Rail-with-Trail Track Overcrossing

B2. Typical Sections

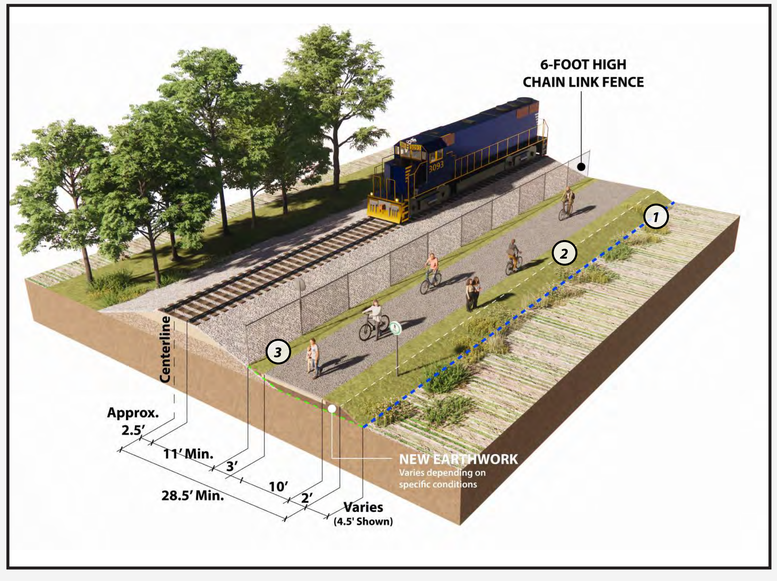
EXISTING CONDITIONS



RAIL-TO-TRAIL



RAIL-WITH-TRAIL

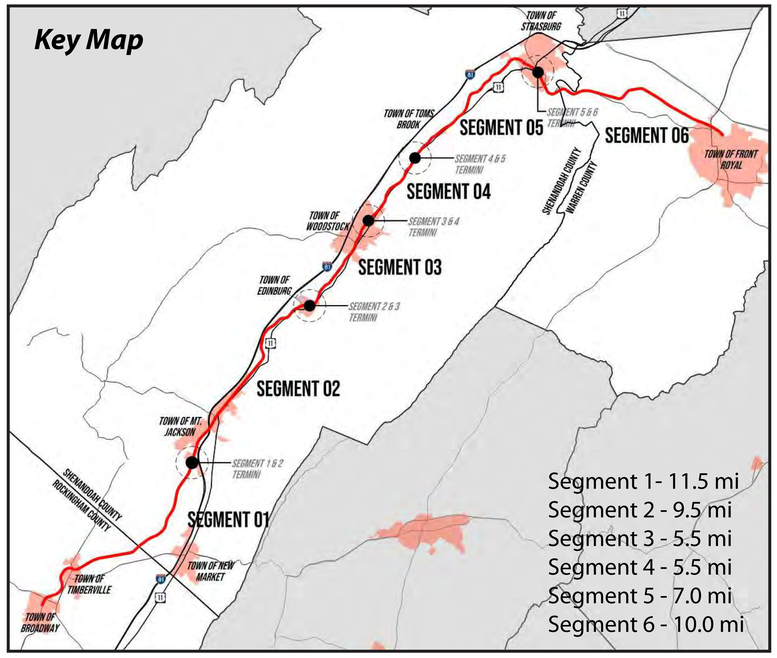


1 *A 33' distance from centerline to property boundary is the minimum width shown in available Valuation (VAL) Maps provided by the Railroad.*

2 *A 42" high wood railing with a 3' clear zone will be installed along the SUP to avoid adjacent hazards when necessary.*

3 *Use a 3' setback when physical barriers are installed along the SUP to avoid an adjacent hazard.*

** Photographs of existing conditions taken between 2021 and 2024.*



Frequency of "Flat Terrain" Typical Section Along the Corridor

	Length of Section A (mi)	*Section A Percentage*
Segment 1 (11.5mi)	3.1 of 11.5	27%
Segment 2 (9.5mi)	4.1 of 9.5	42%
Segment 3 (5.5mi)	2.1 of 5.5	39%
Segment 4 (5.5mi)	1.7 of 5.5	30%
Segment 5 (7.0mi)	0.6 of 7.0	10%
Segment 6 (10.0mi)	1.3 of 10.0	12%
Total Corridor (49.0mi)	**12.9** of 49.0	**26%**

** The total length and percentages shown on this table will be further evaluated in Corridor Assessment.*

The typical section dimensions shown are based on design criteria in the Virginia Department of Transportation (VDOT) Road Design Manual and are compatible with American Association of State Highway and Transportation Officials (AASHTO), Federal Highway Administration (FHWA) and Federal Railroad Administration (FRA) Rails with Trails Best Practices, Vermont Agency of Transportation (VTRANS) and Rails To Trails Conservancy (RTT) guidelines specific to rail-with-trail, and other documents with rail-with-trail guidance.

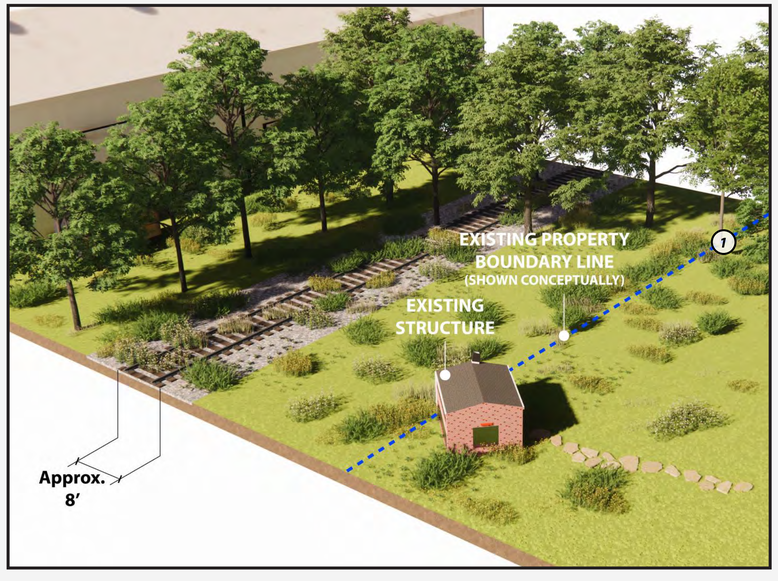
SECTION A

FLAT TERRAIN TYPICAL SECTION

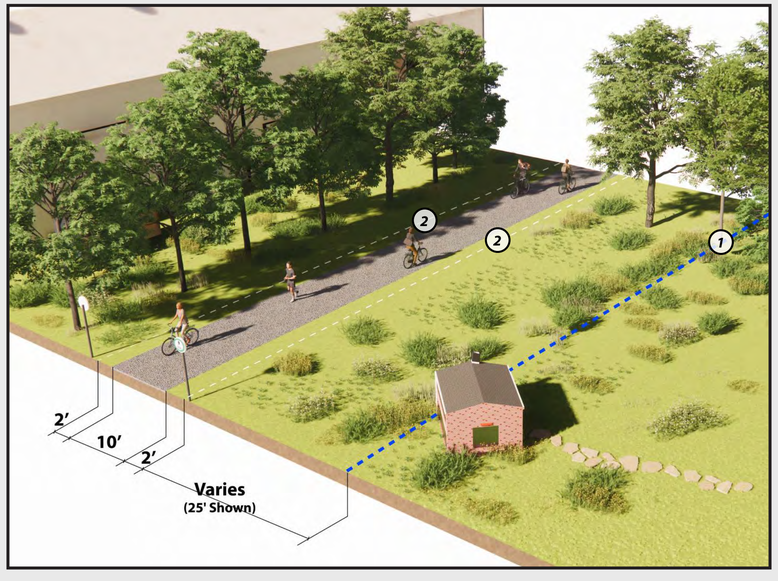
Shenandoah Valley Railroad Corridor - Alternatives Analysis

VDOT Virginia Department of Transportation

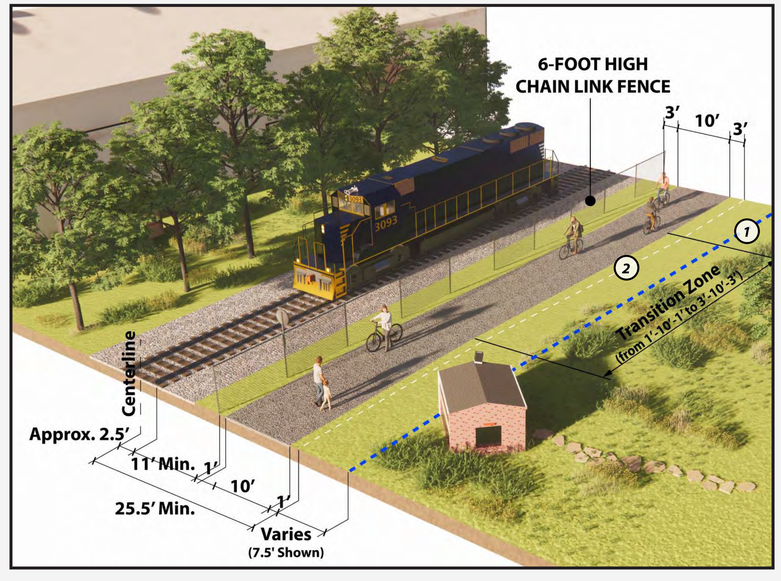
EXISTING CONDITIONS



RAIL-TO-TRAIL



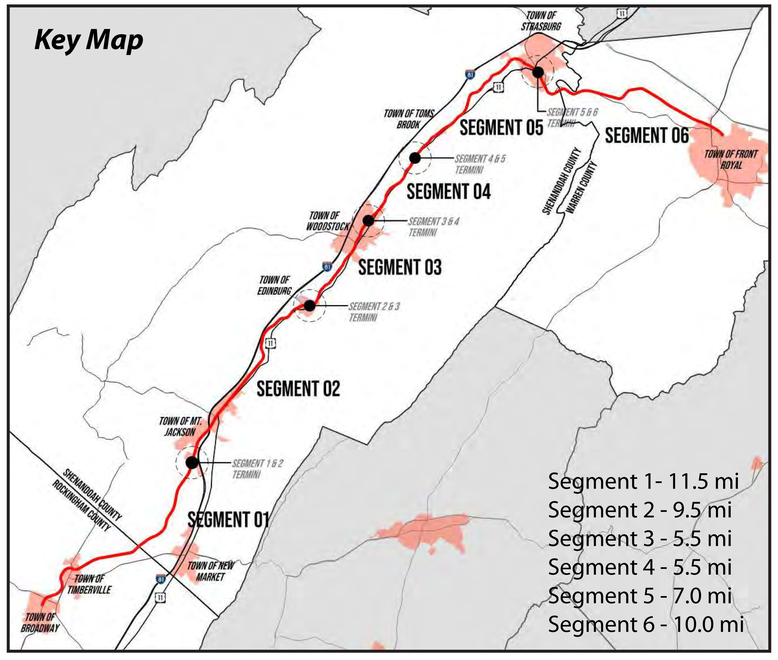
RAIL-WITH-TRAIL



① *A 33′ distance from centerline to property boundary is the minimum width shown in available Valuation (VAL) Maps provided by the Railroad.*

② *A 42″ high wood railing with a 3′ clear zone will be installed along the SUP to avoid adjacent hazards when necessary.*

** Photographs of existing conditions taken between 2021 and 2024.*



Frequency of "Constrained" Typical Section Along the Corridor

	Length of Section B (mi)	*Section B Percentage*
Segment 1 (11.5mi)	0.3 of 11.5	2%
Segment 2 (9.5mi)	0.0 of 9.5	0%
Segment 3 (5.5mi)	0.5 of 5.5	9%
Segment 4 (5.5mi)	0.5 of 5.5	10%
Segment 5 (7.0mi)	1.0 of 7.0	15%
Segment 6 (10.0mi)	<0.1 of 10.0	<1%
Total Corridor (49.0mi)	**2.4** of 49.0	**5%**

** The total length and percentages shown on this table will be further evaluated in Corridor Assessment.*

The typical section dimensions shown are based on design criteria in the Virginia Department of Transportation (VDOT) Road Design Manual and are compatible with American Association of State Highway and Transportation Officials (AASHTO), Federal Highway Administration (FHWA) and Federal Railroad Administration (FRA) Rails with Trails Best Practices, Vermont Agency of Transportation (VTRANS) and Rails To Trails Conservancy (RTT) guidelines specific to rail-with-trail, and other documents with rail-with-trail guidance.

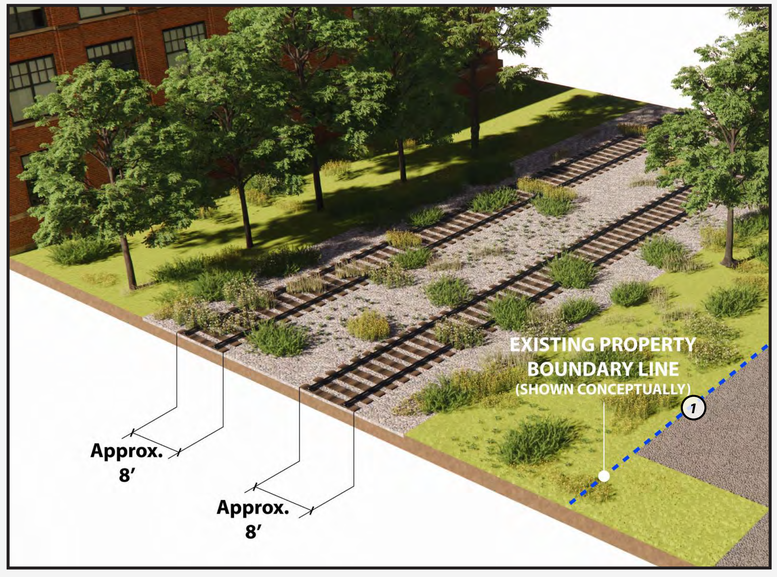
SECTION B

CONSTRAINED TYPICAL SECTION

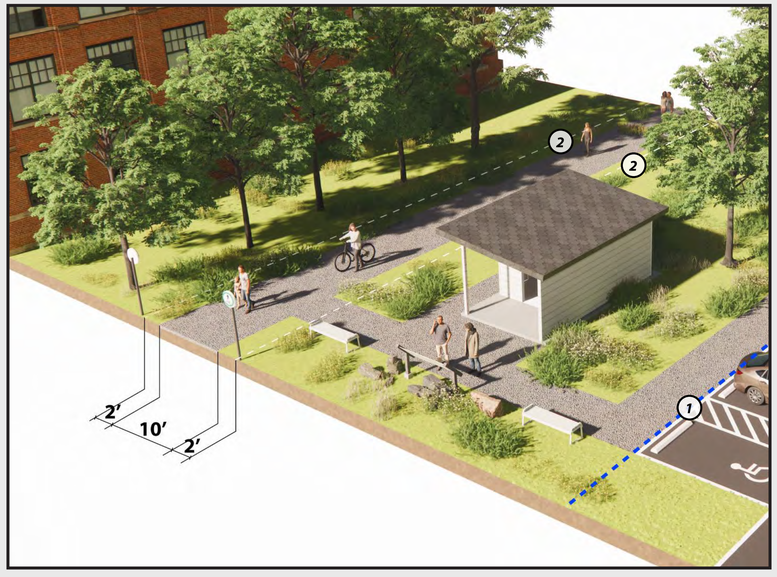
Shenandoah Valley Railroad Corridor - Alternatives Analysis

VDOT Virginia Department of Transportation

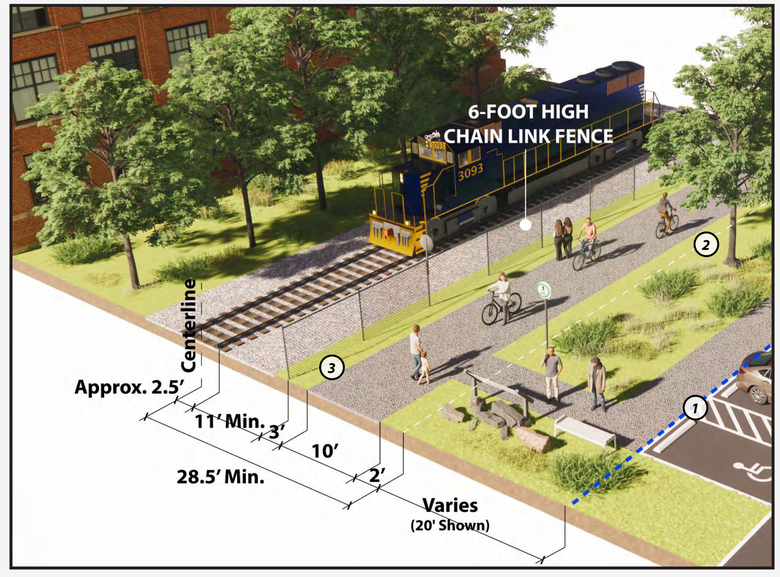
EXISTING CONDITIONS



RAIL-TO-TRAIL



RAIL-WITH-TRAIL

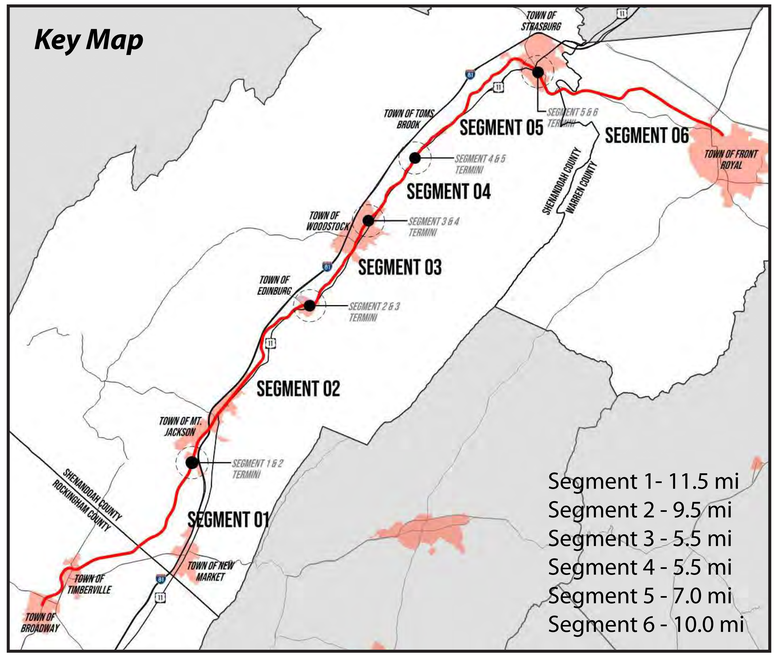


① *It is assumed that the railroad property is wider than 66' in areas where there are more than one track.*

② *A 42" high wood railing with a 3' clear zone will be installed along the SUP to avoid adjacent hazards when necessary.*

③ *Use a 3' setback when physical barriers are installed along the SUP to avoid an adjacent hazard.*

** Photographs of existing conditions taken between 2021 and 2024.*



Frequency of "Double Track" Typical Section Along the Corridor

	Length of Section C (mi)	*Section C Percentage*
Segment 1 (11.5mi)	0.2 of 11.5	2%
Segment 2 (9.5mi)	0.4 of 9.5	4%
Segment 3 (5.5mi)	0.0 of 5.5	0%
Segment 4 (5.5mi)	0.1 of 5.5	2%
Segment 5 (7.0mi)	0.5 of 7.0	7%
Segment 6 (10.0mi)	0.9 of 10.0	9%
Total Corridor (49.0mi)	**2.2** of 49.0	**4%**

** The total length and percentages shown on this table will be further evaluated in Corridor Assessment.*

The typical section dimensions shown are based on design criteria in the Virginia Department of Transportation (VDOT) Road Design Manual and are compatible with American Association of State Highway and Transportation Officials (AASHTO), Federal Highway Administration (FHWA) and Federal Railroad Administration (FRA) Rails with Trails Best Practices, Vermont Agency of Transportation (VTRANS) and Rails To Trails Conservancy (RTT) guidelines specific to rail-with-trail, and other documents with rail-with-trail guidance.

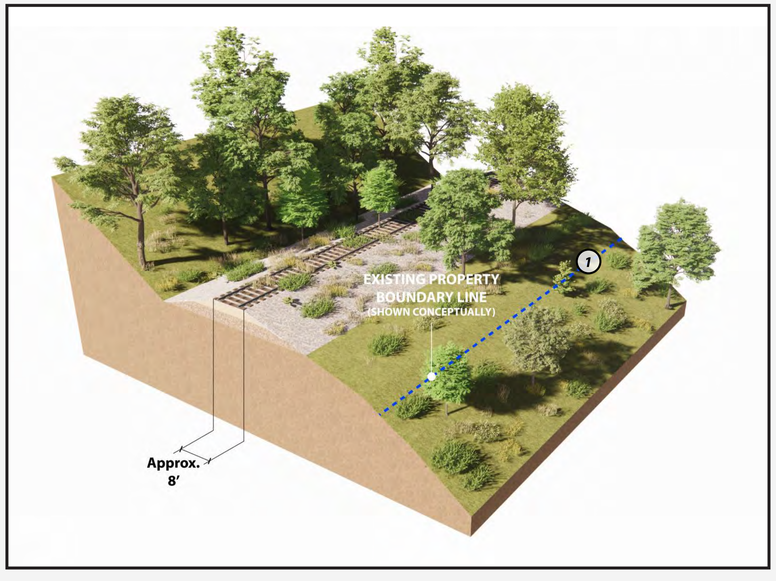
SECTION C

DOUBLE TRACK TYPICAL SECTION

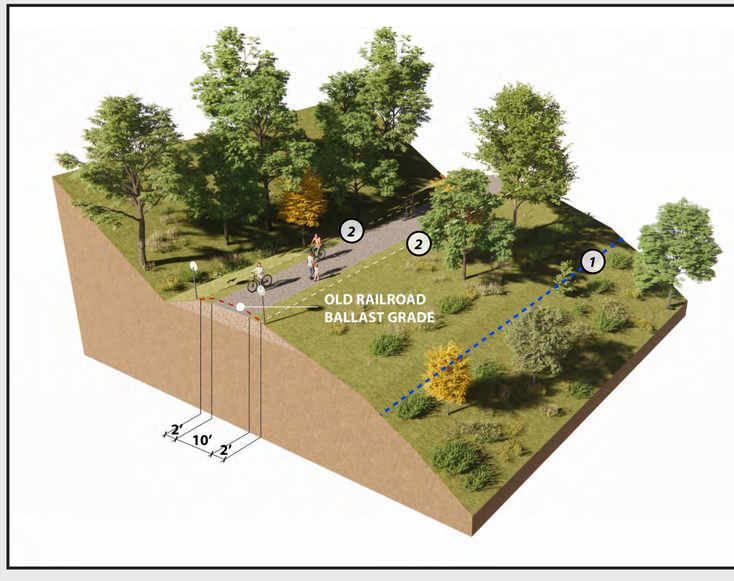
Shenandoah Valley Railroad Corridor - Alternatives Analysis

VDOT Virginia Department of Transportation

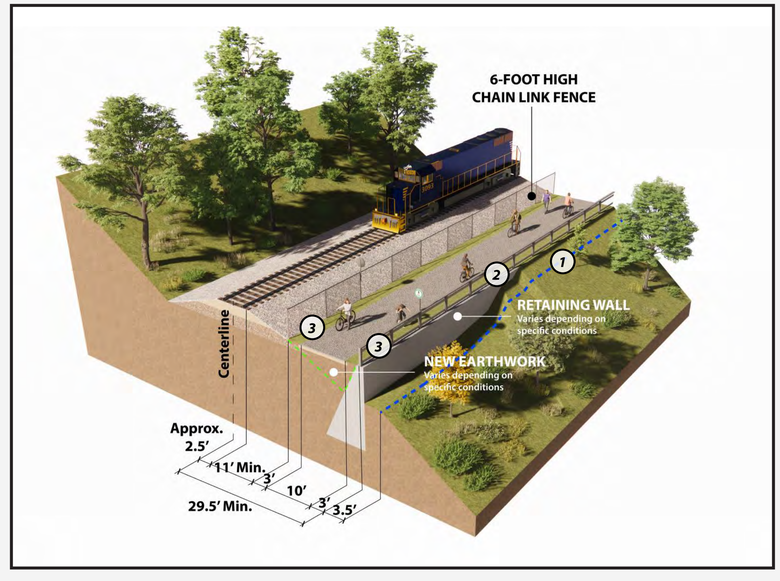
EXISTING CONDITIONS



RAIL-TO-TRAIL



RAIL-WITH-TRAIL

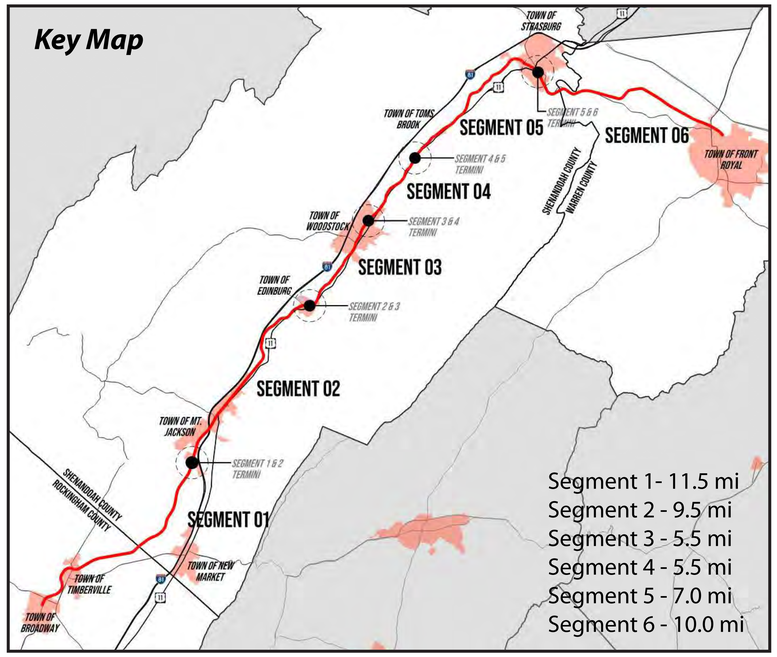


① *A 33' distance from centerline to property boundary is the minimum width shown in available Valuation (VAL) Maps provided by the Railroad.*

② *A 42" high wood railing with a 3' clear zone will be installed along the SUP to avoid adjacent hazards when necessary.*

③ *Use a 3' setback when physical barriers are installed along the SUP to avoid an adjacent hazard.*

** Photographs of existing conditions taken between 2021 and 2024.*



Frequency of "Steep Slopes" Typical Section Along the Corridor

	Length of Section D (mi)	*Section D Percentage*
Segment 1 (11.5mi)	4.0 of 11.5	36%
Segment 2 (9.5mi)	3.0 of 9.5	31%
Segment 3 (5.5mi)	2.1 of 5.5	38%
Segment 4 (5.5mi)	2.2 of 5.5	41%
Segment 5 (7.0mi)	3.6 of 7.0	54%
Segment 6 (10.0mi)	4.7 of 10.0	43%
Total Corridor (49.0mi)	**19.8** of 49.0	**40%**

** The total length and percentages shown on this table will be further evaluated in Corridor Assessment.*

The typical section dimensions shown are based on design criteria in the Virginia Department of Transportation (VDOT) Road Design Manual and are compatible with American Association of State Highway and Transportation Officials (AASHTO), Federal Highway Administration (FHWA) and Federal Railroad Administration (FRA) Rails with Trails Best Practices, Vermont Agency of Transportation (VTRANS) and Rails To Trails Conservancy (RTT) guidelines specific to rail-with-trail, and other documents with rail-with-trail guidance.

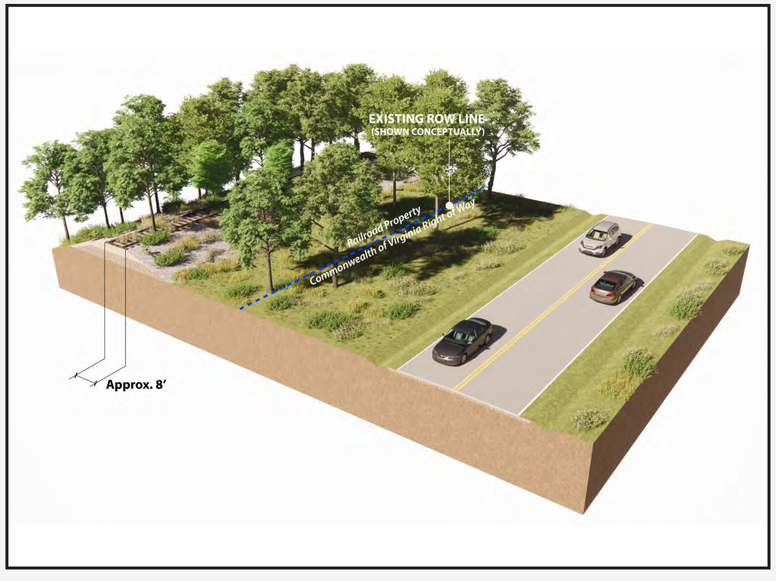
SECTION D

STEEP SLOPES TYPICAL SECTION

Shenandoah Valley Railroad Corridor - Alternatives Analysis

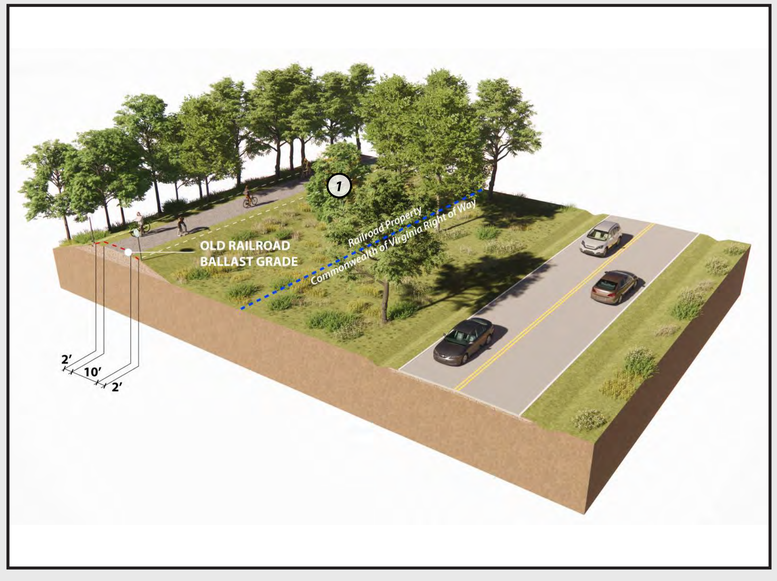
VDOT Virginia Department of Transportation

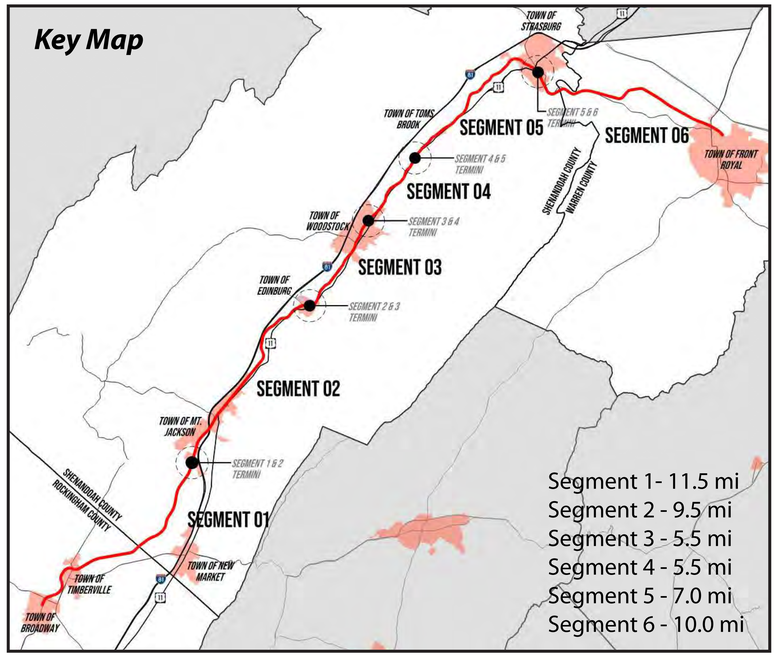
EXISTING CONDITIONS



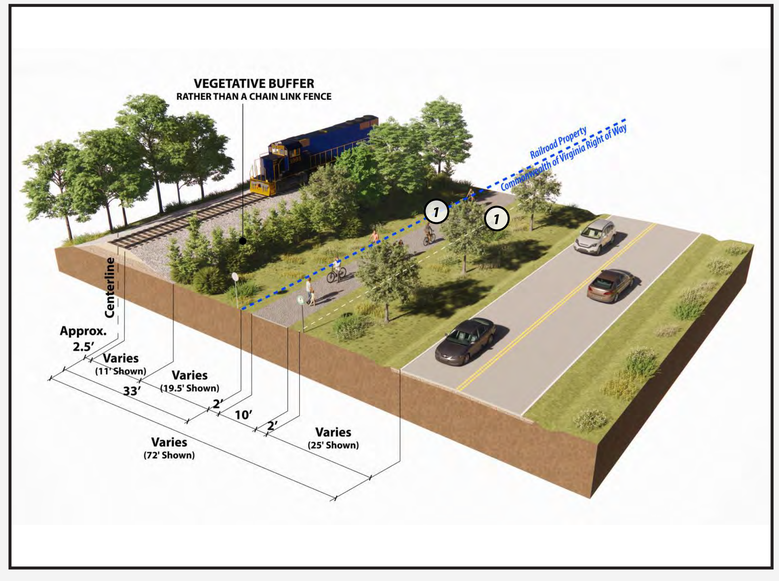
** Photographs of existing conditions taken between 2021 and 2024.*

RAIL-TO-TRAIL





RAIL-WITH-TRAIL



① *A 42" high wood railing with a 3' clear zone will be installed along the SUP to avoid adjacent hazards when necessary.*

Frequency of "Adjacent to Roadway Right of Way" Typical Section Along the Corridor

	Length of Section E (mi)	*Section E Percentage*
Segment 1 (11.5mi)	1.5 of 11.5	13%
Segment 2 (9.5mi)	1.9 of 9.5	19%
Segment 3 (5.5mi)	0.6 of 5.5	11%
Segment 4 (5.5mi)	0.7 of 5.5	13%
Segment 5 (7.0mi)	0.4 of 7.0	5%
Segment 6 (10.0mi)	2.3 of 10.0	22%
Total Corridor (49.0mi)	**7.4** of 49.0	**15%**

** The total length and percentages shown on this table will be further evaluated in Corridor Assessment.*

The typical section dimensions shown are based on design criteria in the Virginia Department of Transportation (VDOT) Road Design Manual and are compatible with American Association of State Highway and Transportation Officials (AASHTO), Federal Highway Administration (FHWA) and Federal Railroad Administration (FRA) Rails with Trails Best Practices, Vermont Agency of Transportation (VTRANS) and Rails To Trails Conservancy (RTT) guidelines specific to rail-with-trail, and other documents with rail-with-trail guidance.

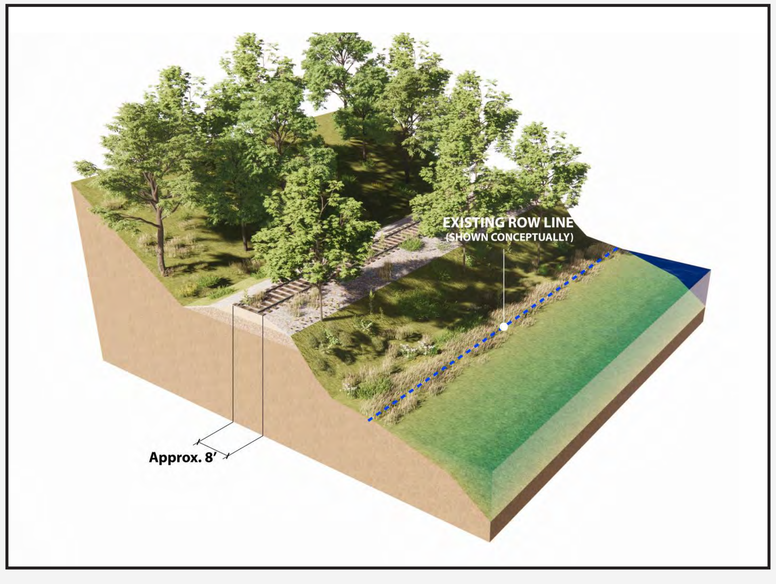
SECTION E

ADJACENT TO ROADWAY RIGHT OF WAY TYPICAL SECTION

Shenandoah Valley Railroad Corridor - Alternatives Analysis

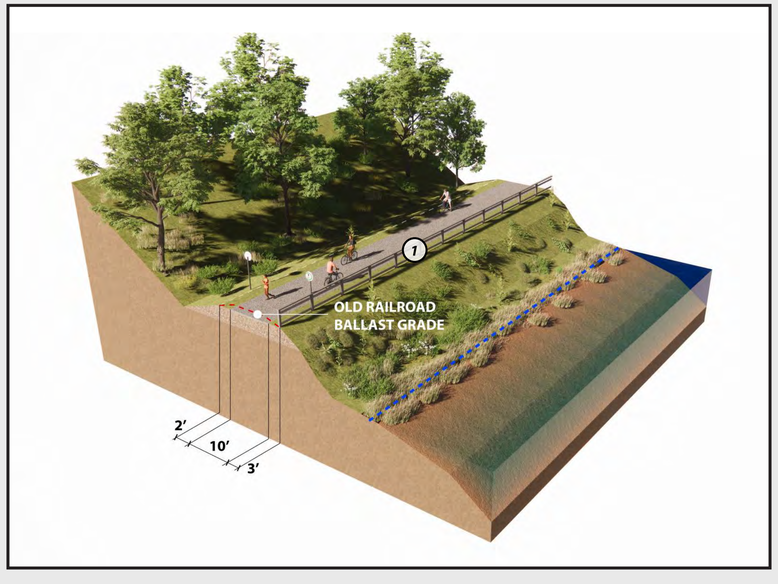
VDOT Virginia Department of Transportation

EXISTING CONDITIONS

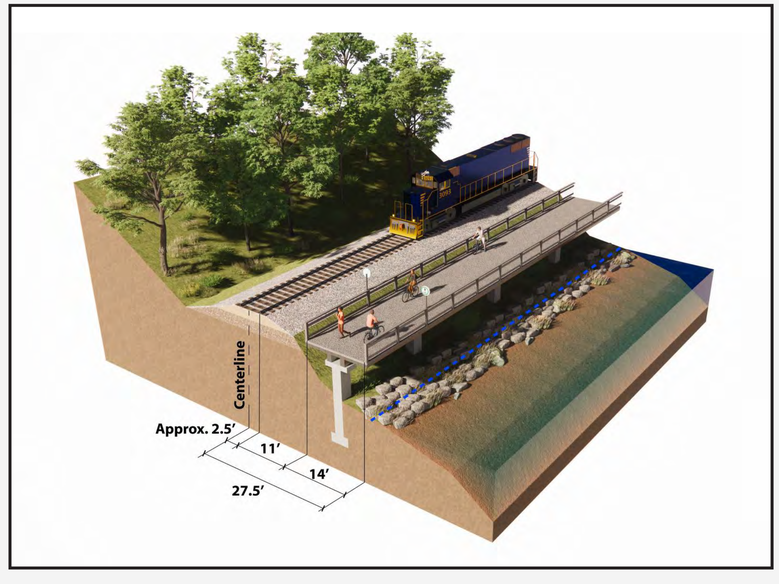


** Photographs of existing conditions taken between 2021 and 2024.*

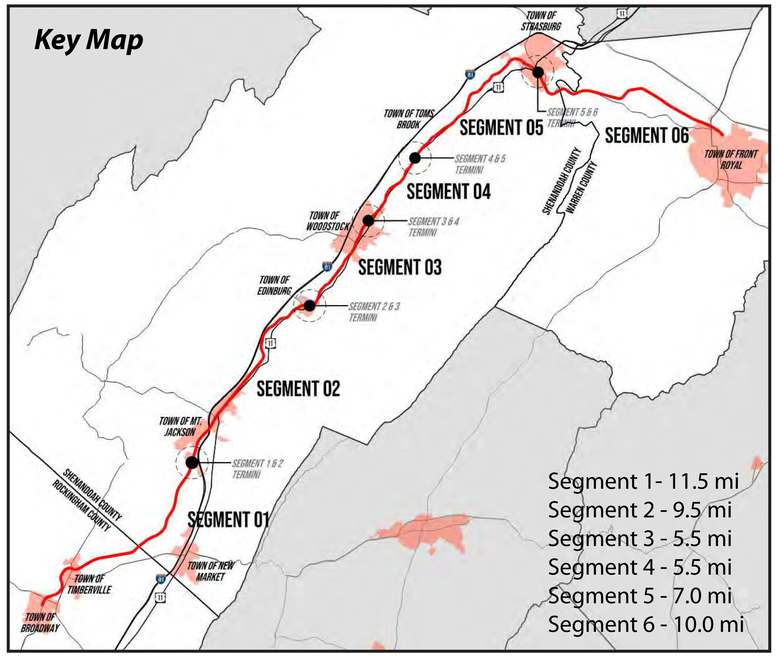
RAIL-TO-TRAIL



RAIL-WITH-TRAIL



① *Use a 3' setback when physical barriers are installed along the SUP to avoid an adjacent hazard.*



Frequency of "Environmentally Sensitive Area" Typical Section Along the Corridor

	Length of Section F (mi)	*Section F Percentage*
Segment 1 (11.5mi)	1.6 of 11.5	15%
Segment 2 (9.5mi)	0.1 of 9.5	<1%
Segment 3 (5.5mi)	0.0 of 5.5	0%
Segment 4 (5.5mi)	0.0 of 5.5	0%
Segment 5 (7.0mi)	0.1 of 7.0	2%
Segment 6 (10.0mi)	0.4 of 10.0	4%
Total Corridor (49.0mi)	**2.3** of 49.0	**5%**

** The total length and percentages shown on this table will be further evaluated in Corridor Assessment.*

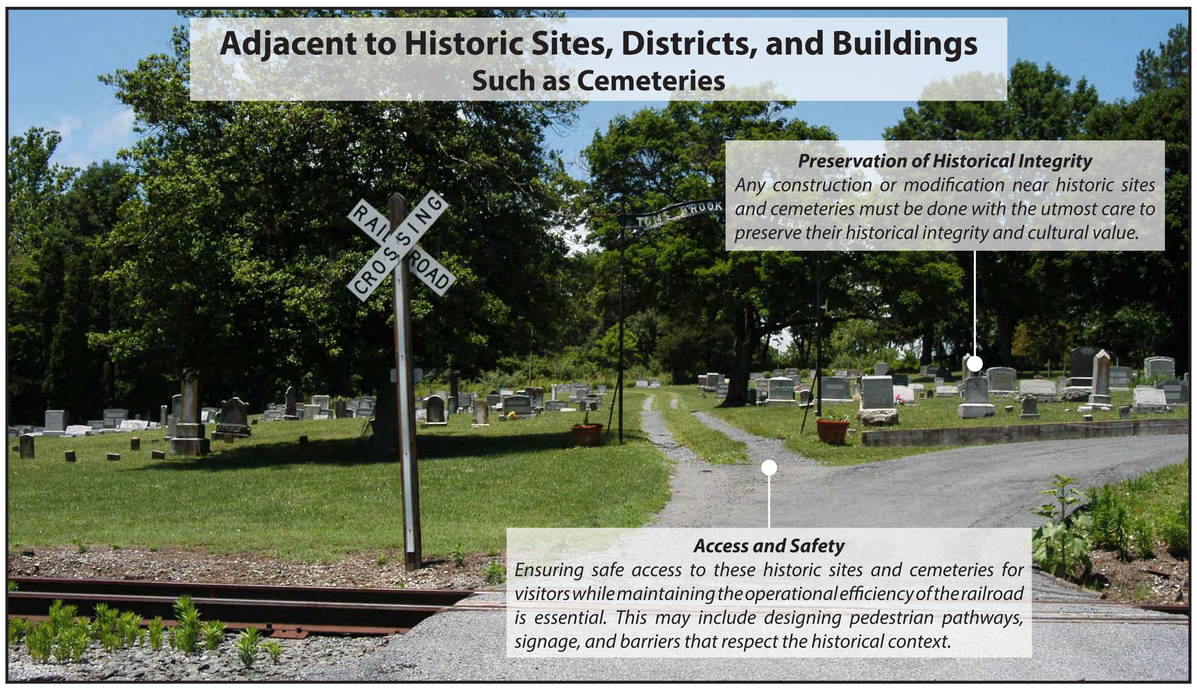
The typical section dimensions shown are based on design criteria in the Virginia Department of Transportation (VDOT) Road Design Manual and are compatible with American Association of State Highway and Transportation Officials (AASHTO), Federal Highway Administration (FHWA) and Federal Railroad Administration (FRA) Rails with Trails Best Practices, Vermont Agency of Transportation (VTRANS) and Rails To Trails Conservancy (RTT) guidelines specific to rail-with-trail, and other documents with rail-with-trail guidance.

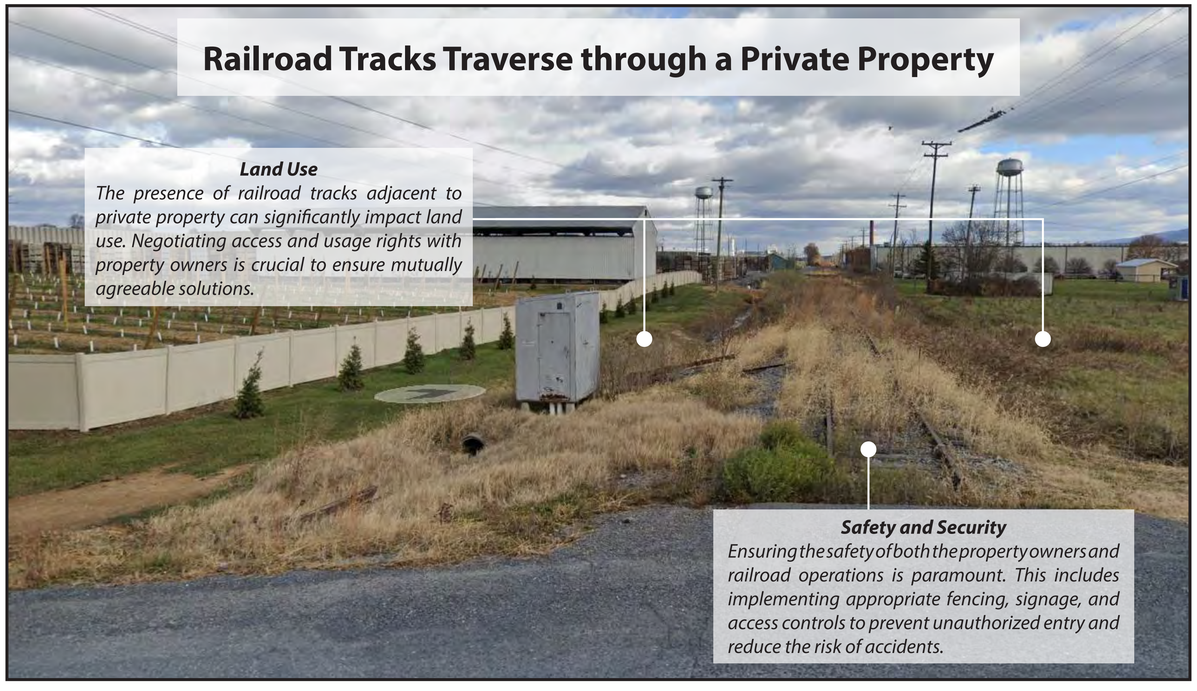
SECTION F

ENVIRONMENTALLY SENSITIVE AREA TYPICAL SECTION

Shenandoah Valley Railroad Corridor - Alternatives Analysis

VDOT Virginia Department of Transportation



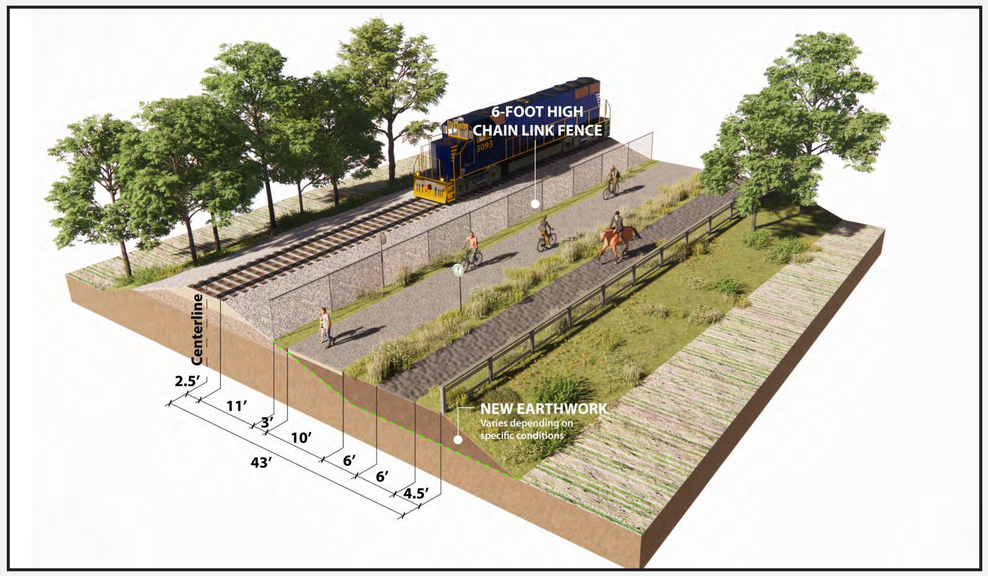


UNIQUE CONDITIONS

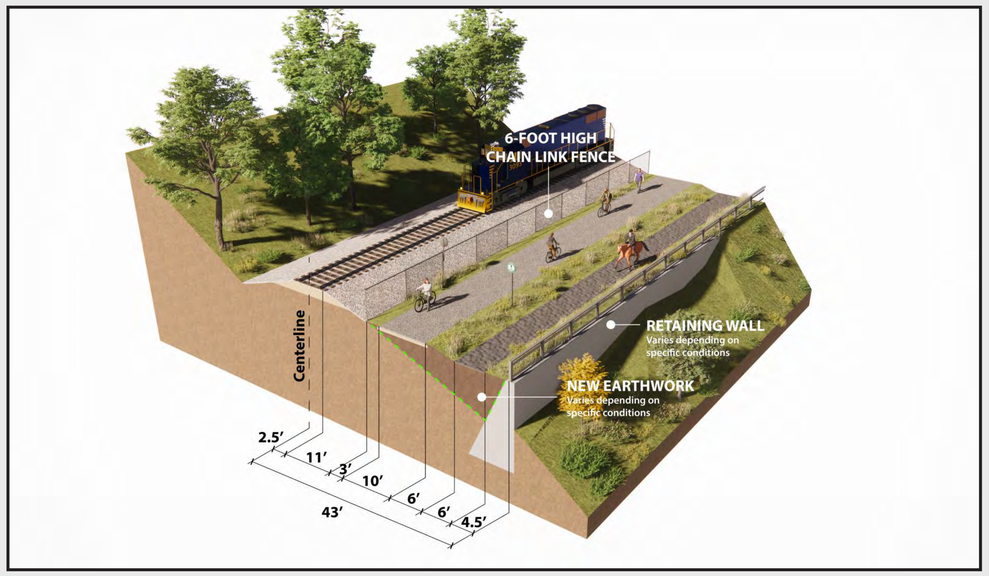
Shenandoah Valley Railroad Corridor - Alternatives Analysis

VDOT Virginia Department of Transportation

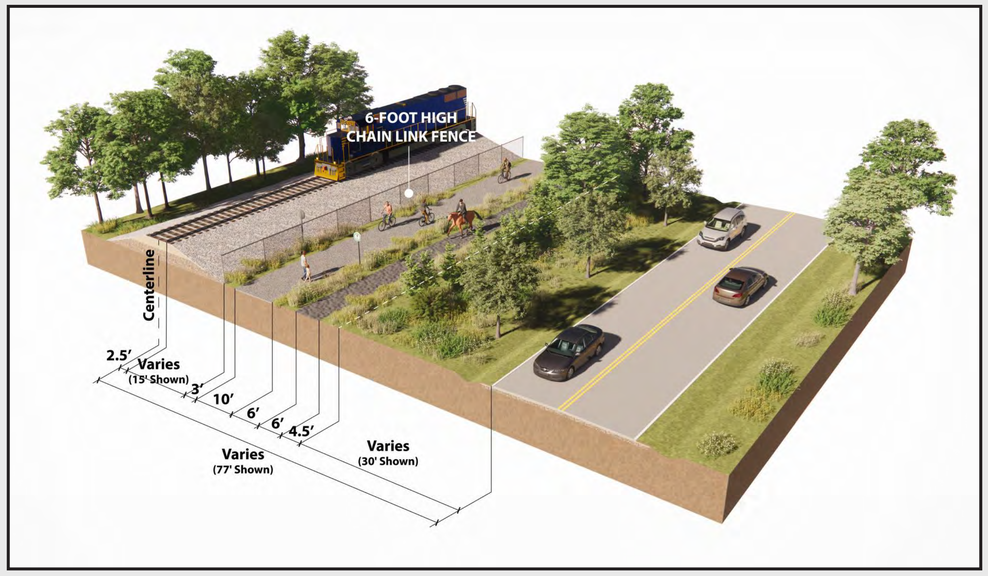
FLAT TERRAIN



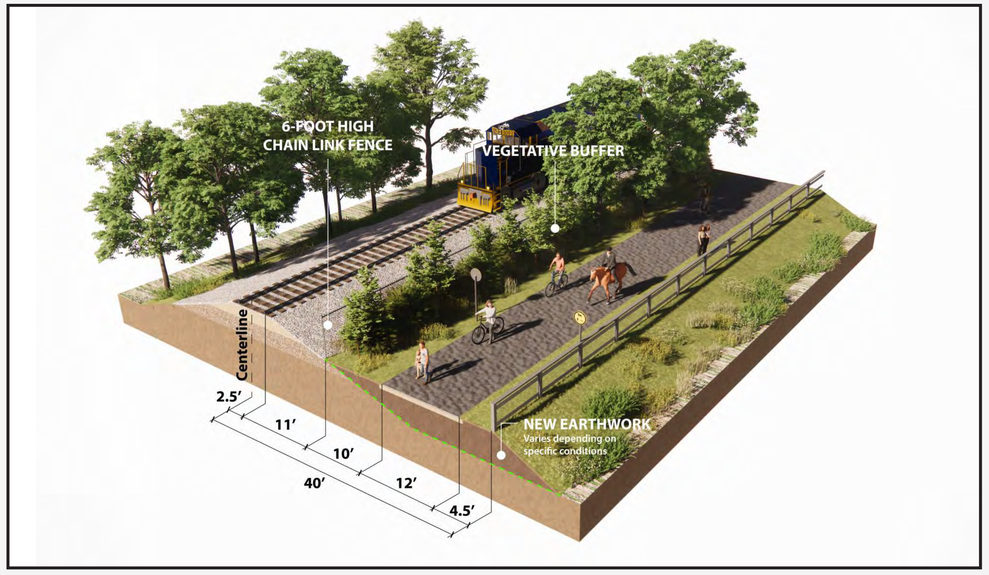
STEEP SLOPES



ADJACENT ROADWAY RIGHT OF WAY



COMBINED SHARED USE PATH AND EQUESTRIAN TRAIL

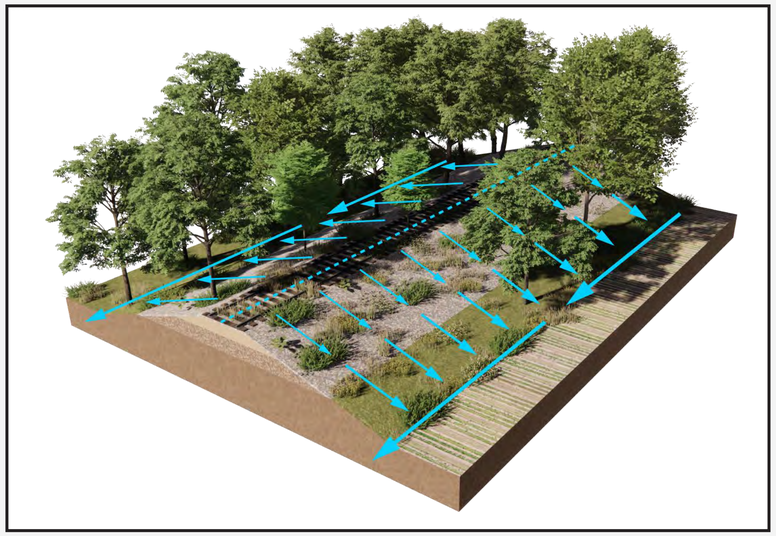


EQUESTRIAN SCENARIOS

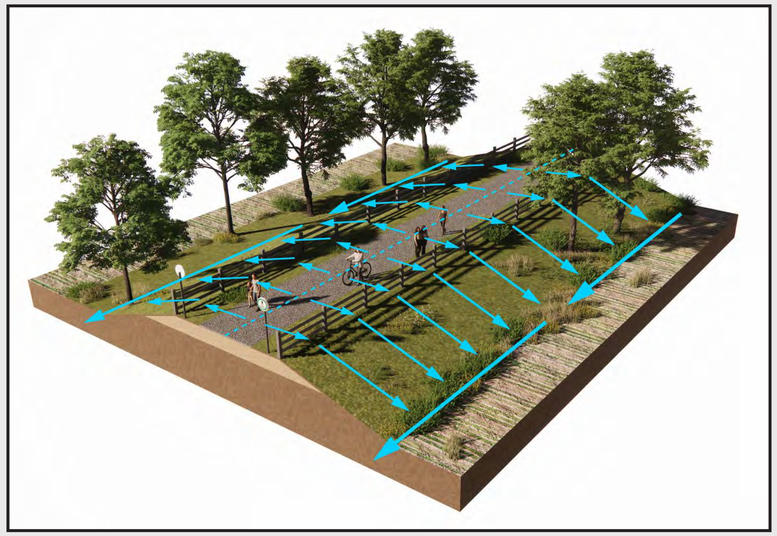
Shenandoah Valley Railroad Corridor - Alternatives Analysis

VDOT
Virginia Department of Transportation

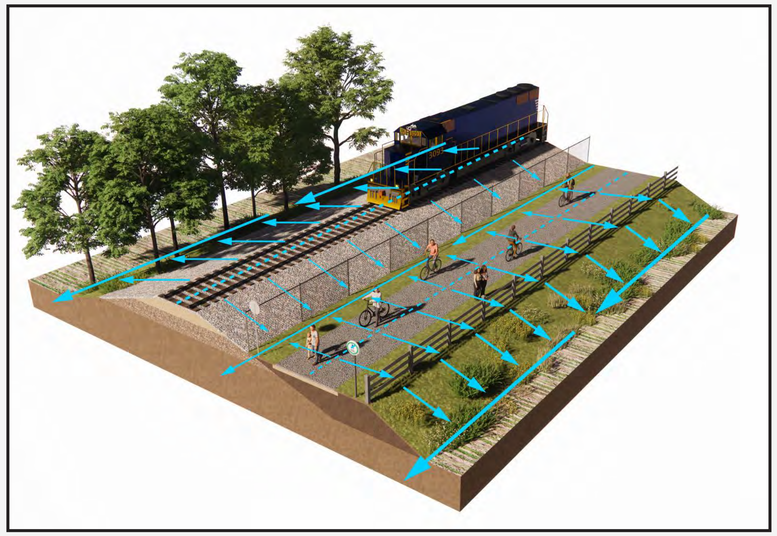
EXISTING CONDITIONS



RAIL-TO-TRAIL



RAIL-WITH-TRAIL



EXISTING DRAINAGE CONDITIONS

Along the Railroad Corridor

PROPOSED DRAINAGE TREATMENT

Drainage and Stormwater Strategies


Photo Credit - sddc.army.mil

Runoff Conveyance


Photo Credit - Low Impact Development Initiative


Photo Credit - resilienteast.com

Stormwater Treatment Facility

Potential Surface Material


Photo Credit - sportsbackers.org

Impervious Surface - Asphalt Trail


Photo Credit - trailfinder.info

Impervious Surface - Crushed Stone


Photo Credit - mmsd.com

Alternative Material - Porous Pavement

DRAINAGE AND STORMWATER MANAGEMENT

Shenandoah Valley Railroad Corridor - Alternatives Analysis

VDOT Virginia Department of Transportation

B3. Typical Section Tables

LOCATION

- *Relatively flat adjacent areas.*
- *33-foot-wide railroad corridor from railroad centerline to edge of property.*
- *Typically in rural areas without physical obstructions.*

	EXISTING CONDITIONS	RAIL-TO-RAIL	RAIL-WITH-RAIL
GENERAL DESCRIPTION OF WORK	Risk of corridor being abandoned.	The corridor's railroad track is replaced with a shared use path through a railbanking process. Railroad infrastructure could be reinstalled in the future because of railbanking.	The corridor can provide railroad service and an adjacent shared use path.
PROPOSED CHANGES	No improvements are made to the corridor.	Remove railroad tracks, adjust ballast to accommodate new grading, and construct a shared use path with either a paved or crushed stone surface for bicycles and pedestrians. Improvements include amenities such as signage, fencing, lighting, as well as trailheads and wayfinding systems.	• Repair railroad tracks and necessary infrastructure to reactivate railroad service. • Rehabilitate railroad tracks to accommodate heavier and faster freight service. Currently there are three segments. The southern segment is 100 lbs/yard (approximately 16 miles), The center segment is 85 lbs/yard (approximately 20 miles). The northern segment is 132 lbs/yard (approximately 13 miles). • Construct a shared use path adjacent to the reactivated railroad track. Improvements include amenities such as signage, fencing, lighting, as well as trailheads and way finding systems.
POTENTIAL CHALLENGES	• Environmental concerns about pollutants caused by the railroad is neglected. • Unsightly conditions and depreciation of adjacent property values. • Likely trespassing on the inactive railroad corridor. • Uncertain property ownership once railroad is abandoned.	• Environmental remediation, and removal/disposal of all necessary railroad infrastructure. • Address adjacent property owner's concerns about livestock crossings and trespassing by shared use path users. • Cost of replacing railroad tracks with shared use path.	• Cost of repairing and/or rehabilitating the railroad corridor's infrastructure. • Address adjacent property owner's concerns about livestock crossings and trespassing by shared use path users. • Address safety concerns about shared use path users trespassing on to the active railroad corridor. • Cost of construction to build an adjacent shared use path. • Environmental remediation. • Avoid right of way acquisition.

SECTION A

FLAT TERRAIN TYPICAL SECTION

Shenandoah Valley Railroad Corridor - Alternatives Analysis

VDOT Virginia Department of Transportation · Michael Baker INTERNATIONAL · VOLKERT

LOCATION

- *In areas near physical obstructions, such as buildings, structures, or sensitive areas.*
- *33-foot-wide railroad corridor from railroad centerline to edge of property.*
- *Intended to be short segments to avoid disturbance to adjacent private property.*
- *Likely scenario in both rural and developed areas.*

	EXISTING CONDITIONS	RAIL-TO-RAIL	RAIL-WITH-RAIL
GENERAL DESCRIPTION OF WORK	Risk of corridor being abandoned.	The corridor's railroad track is replaced with a shared use path through a railbanking process. Railroad infrastructure could be reinstalled in the future because of railbanking.	The corridor can provide railroad service and an adjacent shared use path.
PROPOSED CHANGES	No improvements are made to the corridor.	Remove railroad tracks, adjust ballast to accommodate new grading, and construct a shared use path with either a paved or crushed stone surface for bicycles and pedestrians. Improvements include amenities such as signage, fencing, lighting, as well as trailheads and wayfinding systems.	• Repair railroad tracks and necessary infrastructure to reactivate railroad service. • Rehabilitate railroad tracks to accommodate heavier and faster freight service. Currently there are three segments. The southern segment is 100 lbs/yard (approximately 16 miles), The center segment is 85 lbs/yard (approximately 20 miles). The northern segment is 132 lbs/yard (approximately 13 miles). • Construct a shared use path adjacent to the reactivated railroad track. Improvements include amenities such as signage, fencing, lighting, as well as trailheads and way finding systems. • Provide a narrow shared use path segment to avoid disturbance to adjacent structures and opposition from the property owner.
POTENTIAL CHALLENGES	• Environmental concerns about pollutants caused by the railroad is neglected. • Unsightly conditions and depreciation of adjacent property values. • Likely trespassing on the inactive railroad corridor. • Uncertain property ownership once railroad is abandoned.	• Environmental remediation, and removal/disposal of all necessary railroad infrastructure. • Address adjacent property owner's concerns about livestock crossings and trespassing by shared use path users. • Cost of replacing railroad tracks with shared use path.	• Cost of repairing and/or rehabilitating the railroad corridor's infrastructure. • Address adjacent property owner's concerns about livestock crossings and trespassing by shared use path users. • Address safety concerns about Shared use path users trespassing on to the active railroad corridor. • Cost of construction to build an adjacent shared use path. • Environmental remediation. • Avoid right of way acquisition and disturbance to adjacent structures, even if these are built on railroad property or too close to the property line.

SECTION B

CONSTRAINED TYPICAL SECTION

Shenandoah Valley Railroad Corridor - Alternatives Analysis

VDOT Virginia Department of Transportation · Michael Baker INTERNATIONAL · VOLKERT

LOCATION

- *Relatively flat adjacent areas.*
- *Wide ballast to accommodate double tracks.*
- *Typical in developed areas such as residential and industrial zones.*

	EXISTING CONDITIONS	RAIL-TO-RAIL	RAIL-WITH-RAIL
GENERAL DESCRIPTION OF WORK	Risk of corridor being abandoned.	The corridor's railroad track is replaced with a shared use path through a railbanking process. Railroad infrastructure could be reinstalled in the future because of railbanking.	The corridor can provide railroad service and an adjacent shared use path.
PROPOSED CHANGES	No improvements are made to the corridor.	Remove railroad tracks, adjust ballast to accommodate new grading, and construct a shared use path with either a paved or crushed stone surface for bicycles and pedestrians. Improvements include amenities such as signage, fencing, lighting. Due to the extra width of the second track, enhanced trailheads with bathroom facilities, minor visitor centers, or main way finding stations can be accommodated.	• Repair railroad tracks and necessary infrastructure to reactivate railroad service. • Rehabilitate railroad tracks to accommodate heavier and faster freight service. Currently there are three segments. The southern segment is 100 lbs/yard (approximately 16 miles), The center segment is 85 lbs/yard (approximately 20 miles). The northern segment is 132 lbs/yard (approximately 13 miles). • Construct a shared use path adjacent to the reactivated railroad track. Improvements include amenities such as signage, fencing, lighting; as well as trailheads and way finding systems.
POTENTIAL CHALLENGES	• Environmental concerns about pollutants caused by the railroad is neglected. • Unsightly conditions and depreciation of adjacent property values. • Likely trespassing on the inactive railroad corridor. • Uncertain property ownership once railroad is abandoned.	• Environmental remediation, and removal/disposal of all necessary railroad infrastructure. • Address adjacent property owner's concerns about livestock crossings and trespassing by shared use path users. • Cost of replacing railroad tracks with shared use path.	• Cost of repairing and/or rehabilitating the railroad corridor's infrastructure. • Address adjacent property owner's concerns about trespassing by shared use path users. • Address safety concerns about shared use path users trespassing on to the active railroad corridor. • Cost of construction to build an adjacent shared use path. • Environmental remediation. • Avoid right of way acquisition.

LOCATION

- *Areas with steep adjacent slopes.*
- *33-foot-wide railroad corridor from railroad centerline to edge of property.*
- *Typically in rural areas without physical obstructions.*

	EXISTING CONDITIONS	RAIL-TO-RAIL	RAIL-WITH-RAIL
GENERAL DESCRIPTION OF WORK	Risk of corridor being abandoned.	The corridor's railroad track is replaced with a shared use path through a railbanking process. Railroad infrastructure could be reinstalled in the future because of railbanking.	The corridor can provide railroad service and an adjacent shared use path.
PROPOSED CHANGES	No improvements are made to the corridor.	Remove railroad tracks, adjust ballast to accommodate new grading, and construct a shared use path with either a paved or crushed stone surface for bicycles and pedestrians. Improvements include amenities such as signage, fencing, lighting, as well as trailheads and wayfinding systems.	• Repair railroad tracks and necessary infrastructure to reactivate railroad service. • Rehabilitate railroad tracks to accommodate heavier and faster freight service. Currently there are three segments. The southern segment is 100 lbs/yard (approximately 16 miles), The center segment is 85 lbs/yard (approximately 20 miles). The northern segment is 132 lbs/yard (approximately 13 miles). • Construct a shared use path adjacent to the reactivated railroad track. Improvements include amenities such as signage, fencing, lighting, as well as trailheads and way finding systems.
POTENTIAL CHALLENGES	• Environmental concerns about pollutants caused by the railroad is neglected. • Unsightly conditions and depreciation of adjacent property values. • Likely trespassing on the inactive railroad corridor. • Uncertain property ownership once railroad is abandoned. • Potential erosion if existing retaining walls or slopes are unstable.	• Environmental remediation, and removal/disposal of all necessary railroad infrastructure. • Address adjacent property owner's concerns about livestock crossings and trespassing by shared use path users. • Cost of replacing railroad tracks with shared use path.	• Cost of repairing and/or rehabilitating the railroad corridor's infrastructure. • Address adjacent property owner's concerns about trespassing by shared use path users. • Address safety concerns about shared use path users trespassing on to the active railroad corridor. • Cost of construction to build an adjacent shared use path and necessary retaining walls. • Environmental remediation. • Avoid right of way acquisition.

SECTION D

STEEP SLOPES TYPICAL SECTION

Shenandoah Valley Railroad Corridor - Alternatives Analysis

VDOT Virginia Department of Transportation · Michael Baker INTERNATIONAL · VOLKERT

LOCATION

- *Relatively flat adjacent areas.*
- *Areas adjacent to roadways without private property adjacent to railway.*
- *Typically in rural areas without physical obstructions.*

	EXISTING CONDITIONS	RAIL-TO-RAIL	RAIL-WITH-RAIL
GENERAL DESCRIPTION OF WORK	Risk of corridor being abandoned.	The corridor's railroad track is replaced with a shared use path through a railbanking process. Railroad infrastructure could be reinstalled in the future because of railbanking.	The corridor can provide railroad service and an adjacent shared use path.
PROPOSED CHANGES	No improvements are made to the corridor.	Remove railroad tracks, adjust ballast to accommodate new grading, and construct a shared use path with either a paved or crushed stone surface for bicycles and pedestrians. Improvements include amenities such as signage, fencing, lighting, as well as trailheads and wayfinding systems.	• Repair railroad tracks and necessary infrastructure to reactivate railroad service. • Rehabilitate railroad tracks to accommodate heavier and faster freight service. Currently there are three segments. The southern segment is 100 lbs/yard (approximately 16 miles), The center segment is 85 lbs/yard (approximately 20 miles). The northern segment is 132 lbs/yard (approximately 13 miles). • Construct a shared use path adjacent to the reactivated railroad track. Improvements include amenities such as signage, fencing, lighting, as well as trailheads and way finding systems.
POTENTIAL CHALLENGES	• Environmental concerns about pollutants caused by the railroad is neglected. • Unsightly conditions and depreciation of adjacent property values. • Likely trespassing on the inactive railroad corridor.	• Environmental remediation, and removal/disposal of all necessary railroad infrastructure. • Cost of replacing railroad tracks with shared use path.	• Cost of repairing and/or rehabilitating the railroad corridor's infrastructure. • Address safety concerns about shared use path users trespassing on to the active railroad corridor. • Cost of construction to build an adjacent shared use path. • Environmental remediation.

LOCATION
- *Adjacent to environmentally sensitive conditions.*
- *Typically in rural areas without physical obstructions.*

	EXISTING CONDITIONS	RAIL-TO-RAIL	RAIL-WITH-RAIL
GENERAL DESCRIPTION OF WORK	Risk of corridor being abandoned.	The corridor's railroad track is replaced with a shared use path through a railbanking process. Railroad infrastructure could be reinstalled in the future because of railbanking.	The corridor can provide railroad service and an adjacent shared use path.
PROPOSED CHANGES	No improvements are made to the corridor.	Remove railroad tracks, adjust ballast to accommodate new grading, and construct a shared use path with either a paved or crushed stone surface for bicycles and pedestrians. Improvements include amenities such as signage, fencing, lighting, as well as trailheads and wayfinding systems.	• Repair railroad tracks and necessary infrastructure to reactivate railroad service. • Rehabilitate railroad tracks to accommodate heavier and faster freight service. Currently there are three segments. The southern segment is 100 lbs/yard (approximately 16 miles), The center segment is 85 lbs/yard (approximately 20 miles). The northern segment is 132 lbs/yard (approximately 13 miles). • Construct a shared use path adjacent to the reactivated railroad track. Improvements include amenities such as signage, fencing, lighting, as well as trailheads and way finding systems.
POTENTIAL CHALLENGES	• Environmental concerns about pollutants caused by the railroad is neglected. • Unsightly conditions and depreciation of adjacent property values. • Likely trespassing on the inactive railroad corridor.	• Environmental remediation, and removal/disposal of all necessary railroad infrastructure. • Cost of replacing railroad tracks with shared use path. • Avoid or minimize environmental impacts.	• Cost of repairing and/or rehabilitating the railroad corridor's infrastructure. • Cost of construction to build an adjacent shared use path. • Environmental remediation. • Avoid or minimize environmental impacts.

APPENDIX C: TYPICAL SECTION APPLICATION BY TYPOLOGY

APPENDIX C - TYPICAL SECTION APPLICATION BY TYPOLOGY

		SEGMENT 01		SEGMENT 02		SEGMENT 03		SEGMENT 04		SEGMENT 05		SEGMENT 06		GRAND TOTAL	
	STARTING STATION	1000+00		1593+38		2109+75		2401+64		2693+00		3049+61		**1000+00**	
	ENDING STATION	1593+38		2109+75		2401+64		2693+00		3049+61		3610+65		**3610+65**	
	STATION POINTS	1000+00 to 1593+38		1593+38 to 2109+75		2109+75 to 2401+64		2401+64 to 2693+00		2693+00 to 3049+61		3049+61 to 3610+65		**3049+61 to 3610+65**	
	TOTAL LENGTH (ft)	59,338		51,637		29,189		29,136		35,661		56,104		**261,065**	
	CRITERIA	**LENGTH**	**%**	**LENGTH**	**%**	**LENGTH**	**%**	**LENGTH**	**%**	**LENGTH**	**%**	**LENGTH**	**%**	**LENGTH**	**%**
SECTION A: **FLAT TERRAIN TYPICAL SECTION**	The typical section throughout the corridor. Assumes no adjacent slopes greater than 3:1, no constraining right of way (<33'), no structural, geological or administrative limitations.	3.1 MI	28%	4.0 MI	41%	2.1 MI	39%	1.7 MI	30%	0.6 MI	10%	1.3 MI	12%	**12.8 MI**	**26%**
Cost															
SECTION B: **CONSTRAINED TYPICAL SECTION**	Areas restricted by factors such as geological features, nearer to vertical slopes, built structures, (urban conditions). There is a potential where we may need to drop below minimum dimensions briefly.	0.3 MI	2%	0.0 MI	0%	0.5 MI	9%	0.5 MI	10%	1.0 MI	15%	0.1 MI	1% *	**2.4 MI**	**5%**
Cost															
SECTION C: **DOUBLE TRACK TYPICAL SECTION**	Occurs in areas of parallel tracks along the baseline, areas where equestrian trails are possible within existing infrastructure or the parallel rail can be transformed to shared use path	1.5 MI	13%	0.4 MI	4%	0.0 MI	0%	0.1 MI	2%	0.5 MI	7%	0.9 MI	9%	**3.5 MI**	**7%**
Cost															
SECTION D: **STEEP SLOPES TYPICAL SECTION**	Occurs in areas where track runs adjacent to land with greater than 3:1 slopes. Requires physical barriers to protect pedestrians, may require retaining walls in areas with limited right of way	2.8 MI	25%	3.0 MI	31%	2.1 MI	38% **	2.2 MI	41%	3.6 MI	54%	4.7 MI	43% **	**18.5 MI**	**37%**
Cost															
SECTION E: **ADJACENT TO ROADWAY RIGHT OF WAY TYPICAL SECTION**	Greater separation between shared use path and railway afforded by adjacent roadway within right of way	1.5 MI	13%	2.0 MI	20%	0.6 MI	11%	0.7 MI	13%	0.4 MI	5%	2.3 MI	22%	**7.5 MI**	**15%**
Cost															
SECTION F: **ENVIRONMENTALLY SENSITIVE AREA TYPICAL SECTION**	Crossing environmentally sensitive habitats	1.6 MI	15% **	0.1 MI	1%	0.0 MI	0%	0.0 MI	0%	0.1 MI	2%	0.4 MI	4%	**2.3 MI**	**5%**
Cost															
SECTION G: **BRIDGE / CULVERT**	Crossing existing bridge or culvert	0.4 MI	3%	0.3 MI	3%	0.2 MI	3%	0.2 MI	4%	0.3 MI	5%	0.8 MI	8%	**2.2 MI**	**5%**
Cost															
SECTION I: **UNIQUE CIRCUMSTANCES**	Unique circumstances and special conditions that require special treatments / dedicated engineering solutions (conditions and photos documented within notes)	0.1 MI	1%	0.0 MI	0%	0.0 MI	0%	0.0 MI	0%	0.1 MI	2%	0.1 MI	1% *	**0.3 MI**	**1%**
Cost															

Note: All percentages and distances rounded to nearest whole number

* Denotes percentages that have been rounded up to show a value greater than 0%.

** Denotes percentages that have been rounded up or down to ensure the total adds up to 100%.

APPENDIX D: RISK REGISTER

RISK REGISTER

Risk and Challenge Assessment and Mitigation Strategies

Shenandoah Valley Rail-with-Trail Assessment

Date: 9/4/2024

Initial Risk and Challenges Assessment Key					
Risk Likelihood (Probability)		**Risk Consequence (Impact)**		**RISK SCORE**	
Almost Certain	4	Catastrophic	4	Extreme	**10-12**
Likely	3	Major	3	High	**7-9**
Possible	2	Serious	2	Moderate	**4-6**
Unlikely	1	Important	1	Low	**1-3**

Item Number	Category	Risks and Challenges	Initial Risk and Challenge Assessment						Mitigation Strategies	Mitigation Team Leaders
			Risk Likelihood		Risk Consequence		Risk Score			
A-1	Land Acquisition	Norfolk Southern has stated that they do not have interest in reactivating the railroad corridor. They will therefore submit an "Initial Notification for Abandonment". Once the railroad company submits an initial notification for abandonment, a series of steps with critical timelines is set in motion. Failure to act on each one of the steps within the appropriate timeframe could allow parts of the corridor to revert ownership back to previous property owners.	Likely	3	Catastrophic	4	**Extreme**	**12**	There needs to be a plan in place for land acquisition to respond to the abandonment process. Identify an owner for the corridor, such as VDOT, DCR, a corporation, or others	VDOT / Rail-with-Trail Coalition / Potential Rail Operator
A-2	Land Acquisition	Failure to act on the railbanking steps can result in losing the ability to maintain a continuous corridor.	Likely	3	Catastrophic	4	**Extreme**	**12**	Understand the process for railbanking and be prepared to submit a "Notice of Interim Use" when the railroad company submits "Initial Notification for Abandonment".	VDOT / Rail-with-Trail Coalition / Norfolk Southern
A-3	Land Acquisition	Potential problems in providing private landowner access across the trail where the alignment bisects a single owner's property	Possible	2	Serious	2	**Moderate**	**4**	Identify property that is bisected by the alignment and contact landowners to discuss crossing needs	Survey / Design Team / VDOT
A-4	Land Acquisition	Potential problems in securing right of way, easements or land acquisitions for road crossings, trailheads or access points	Likely	3	Serious	2	**Moderate**	**6**	Identify needed right of way early and begin talks with the land owners	Survey / Design Team / VDOT
A-5	Land Acquisition	Potential problems in obtaining easements to construct shared use path adjacent to railroad tracks	Likely	3	Catastrophic	4	**Extreme**	**12**	Implement clear and transparent communication with property owners, outlining design solutions, potential alternatives, and compensation strategies to advance project development cost-effectively while ensuring stakeholder engagement and support	VDOT / Rail-with-Trail Coalition
A-6	Land Acquisition	Encountering existing privately owned structures encroaching on to railroad property and impacting proposed trail alignment	Likely	3	Serious	2	**Moderate**	**6**	Adopt more constrained design approaches and utilize design waivers for limited sections where necessary. Restrict the use of such waivers to small segments only. During the design process, consider positioning the shared use path on the opposite side of the track, particularly in denser areas, to avoid impacting existing structures.	Survey / VDOT / Rail-with-Trail Coalition / Design Team
S-1	Stakeholder Engagement	Adjacent property owners receive misinformation about acquisition process or interpret information incorrectly leading to misunderstandings about ownership and liability	Possible	2	Serious	2	**Moderate**	**4**	Provide accurate and up to date public information of project progress that is easily accessible and/or distributed to key stakeholders and continuously solicit feedback to maintain support.	Local Government / Community Leaders / VDOT
S-2	Stakeholder Engagement	Stakeholders have unrealistic expectations, such as schedule, cost, and final product.	Possible	2	Important	1	**Low**	**2**	Identify potential stakeholders who can present a problem and be prepared to respond to people against the project	VDOT
S-3	Stakeholder Engagement	Opposition stakeholders may emerge at critical periods or new ideas with political support may emerge	Possible	2	Serious	2	**Moderate**	**4**	Have a plan in place for opposition groups including a communication plan, opportunities for input and engagement, monitoring support and maintaining flexibility during the planning and design phases	Local Government
S-4	Stakeholder Engagement	Opposition from adjacent land owners	Possible	2	Serious	2	**Moderate**	**4**	Communicate with land owners about specific concerns and develop responses for frequently asked questions, such as trail access, liability, deterring trespassing, etc.	Local Government
S-5	Stakeholder Engagement	Local interest towards the project is weaker in some segments along the corridor potentially leading to the construction of only parts of the corridor.	Possible	2	Serious	2	**Moderate**	**4**	Develop a plan to complete segments in phases, such as a prioritization plan	VDOT
S-6	Stakeholder Engagement	Impacts to cultural or historical sites	Likely	3	Serious	2	**Moderate**	**6**	Consult with historical societies and preservation boards early to identify potential impacts on cultural or historical sites. Conduct thorough cultural resource assessments and surveys. Modify designs to avoid or minimize impacts, possibly rerouting paths or adding buffer zones. Ensure compliance with preservation laws and implement archaeological monitoring during construction.	VDOT / Rail-with-Trail Coalition / Survey Team / Design Team / Local Historical or Cultural Societies
D-1	Design	Unexpected findings during the NEPA process delay project design	Likely	3	Serious	2	**Moderate**	**6**	Begin NEPA process as early as possible	VDOT
D-2	Design	Not meeting the water quality and quantity VSMP requirements for the project limits	Likely	3	Major	3	**High**	**9**	Start discussions with approving agencies and identify solutions early, such as maintaining small corridor segments as standalone project (UPC) and/or determining required SW facilities throughout project limits early.	VDOT
D-3	Design	SWM may require additional right of way for location and sizing of facilities	Likely	3	Serious	2	**Moderate**	**6**	Develop a strategy to minimize impacts land disturbance or determine potential land acquisition requirements	VDOT / Design Team
D-4	Design	Proposed improvements may impact regulate flood plains, potentially causing delay in schedule and/or increase in cost	Possible	2	Serious	2	**Moderate**	**4**	Identify impacts of proposed improvements on flood plain early. Minimize structural impacts within the flood plains.	VDOT
D-5	Design	In areas where the trail is physically constrained (i.e. due to terrain), the trail's design will require waivers or exceptions.	Almost Certain	4	Important	1	**Moderate**	**4**	Develop engineering solutions without compromising safety and the character of the surrounding landscape	VDOT / Design Team

RISK REGISTER

Risk and Challenge Assessment and Mitigation Strategies

Shenandoah Valley Rail-with-Trail Assessment

Date: 9/4/2024

Initial Risk and Challenges Assessment Key

Risk Likelihood (Probability)		Risk Consequence (Impact)		RISK SCORE	
Almost Certain	4	Catastrophic	4	Extreme	10-12
Likely	3	Major	3	High	7-9
Possible	2	Serious	2	Moderate	4-6
Unlikely	1	Important	1	Low	1-3

Item Number	Category	Risks and Challenges	Initial Risk and Challenge Assessment						Mitigation Strategies	Mitigation Team Leaders
			Risk Likelihood		Risk Consequence		Risk Score			
D-6	Design	Inspectors will not be able to access portions of the existing structures due to deteriorated decking or without access equipment. Rehabilitation costs may be higher than "topside" inspections will indicate.	Almost Certain	4	Important	1	Moderate	4	Prioritize future "hands-on" inspections to account for such deterioration.	VDOT / Bridge Inspectors / Design Team
D-7	Design	The current conditions of the corridor's bridges are unsuitable for new rail loading requirements	Likely	3	Major	3	High	9	Determine needs as early as possible. Prioritize structural analysis and rehabilitation design in future phases. Future designs to account for strengthening if required.	VDOT / Bridge Inspectors / Design Team
D-8	Design	Trail connectivity across existing bridges may require modification to existing bridges which may be unable to support the level of engineering required to safely accommodate this type of construction	Almost Certain	4	Major	3	Extreme	12	New bridge structures need to be added near existing bridges to solely accommodate these users.	Design Team / VDOT
D-9	Design	Land for additional equestrian trail (trail which bridges gaps between proposed and existing trail network) may not be acquired in time to be part of the project.	Likely	3	Serious	2	Moderate	6	Map equestrian trail network to determine areas along rail-with-trail to prioritize as equestrian connectivity gaps. Develop strategy to create hierarchical order of land to purchase in future agreements with adjacent landowners, or map alternative routes which deviate from trail and a strategy to be added over time.	VDOT / Design Team / Local Equestrian Groups
D-10	Design	Railroad crossings may require additional right of way or right of way that has been encroached within the railroad corridor	Possible	2	Important	1	Low	2	Identify potential problems early in the planning phase to determine required area or modifications to a design	VDOT / Local Communities
D-11	Design	Poor connectivity and accessibility to trail corridor from nearby communities	Possible	2	Important	1	Low	2	Coordinate with elected officials and/or local staff regarding other sidewalks enhancements, wayfinding strategies, or ways to expand this project to local destinations	Local Government and communities / VDOT
D-12	Design	Project cannot be delivered within original budget	Likely	3	Major	3	High	9	Regular check-in to maintain project on-budget or determine if additional costs should be expected. Cost estimates for subsequent phases should be updated in year of expenditure dollars on an annual basis.	VDOT / Design Team
D-13	Design	Project cannot be delivered within original schedule	Likely	3	Serious	2	Moderate	6	Regular check-in to keep project on-schedule or determine if delays should be expected.	VDOT / Design Team
D-14	Design	Project cannot be constructed according to design criteria	Possible	2	Serious	2	Moderate	4	Identify problems at concept level and preliminary engineering level to find resolution to design problems.	VDOT / Design Team
D-15	Design	Unexpected difficulties or delays in relocating overhead utilities along the corridor.	Unlikely	1	Serious	2	Low	2	Identify utilities within survey which pose the greatest challenge to relocate prior to construction, develop relocation plan in coordination with utility companies to reduce delays, conduct regular coordination meetings with utility companies to resolve conflicts as they arise	Design Team / VDOT / Contractor / Utility Companies
D-16	Design	Unstable soil conditions requiring extensive geotechnical mitigation.	Possible	2	Serious	2	Moderate	4	Conduct detailed soil assessments and geotechnical investigations, designing stabilization measures such as retaining walls or drainage systems. Implement effective drainage and foundation systems, establish ongoing monitoring and safety procedures, and coordinate with railway and preservation authorities to develop contingency plans.	Design Team / Rail Operator / VDOT
D-17	Design	Loss of habitat for certain species along the corridor.	Possible	2	Serious	2	Moderate	4	Conduct thorough habitat assessments, identify at-risk flora and fauna and designate protected areas, if needed. Implement habitat restoration and responsible vegetation management to enhance habitat quality and connectivity while minimizing disruption. Engage in public education and ensure regulatory compliance to promote biodiversity conservation	NEPA Team / Design Team / Rail-with-Trail Coalition / Local Environmental Groups
D-18	Design	Design complexity at railroad crossing (both existing and new).	Possible	2	Serious	2	Moderate	4	Minimize number of railroad crossings and design complexity s by prioritizing existing infrastructure to minimize new construction. Utilize standardized designs with cost-effective solutions such as signalization or grade separations. Develop comprehensive maintenance plans for long-term functionality and conduct regular risk assessments to address evolving conditions and ensure safety and operational efficiency.	Design Team / VDOT / Rail Operator / Local Community Leaders
D-19	Design	Maintaining ADA compliance throughout the entirety of the trail	Unlikely	1	Important	1	Low	1	Ensure ADA compliance by integrating universal design principles into the trail's features. Conduct regular inspections and maintenance, offer training on ADA requirements, and consistently assess and enhance accessibility in alignment with evolving guidelines and user feedback	Design Team / VDOT / Rail Operator / Local Community Leaders
C-1	Construction	Removal or replacement of steel rails and wood ties may be costly and time consuming	Possible	2	Important	1	Low	2	Identify a potential buyer for the steel. Take necessary steps to remove and dispose of the wooden rails safely.	Contractor / Potential Rail Operator / VDOT
C-2	Construction	Address contaminated soil or areas caused by railroad activities prior to construction of the trail.	Possible	2	Important	1	Low	2	Identify areas for remediation as part of an environmental assessment and resolve issues prior to start of construction	Contractor / Potential Rail Operator / VDOT

RISK REGISTER

Risk and Challenge Assessment and Mitigation Strategies

Shenandoah Valley Rail-with-Trail Assessment

Date: 9/4/2024

Initial Risk and Challenges Assessment Key					
Risk Likelihood (Probability)		**Risk Consequence (Impact)**		**RISK SCORE**	
Almost Certain	4	Catastrophic	4	Extreme	**10-12**
Likely	3	Major	3	High	**7-9**
Possible	2	Serious	2	Moderate	**4-6**
Unlikely	1	Important	1	Low	**1-3**

Item Number	Category	Risks and Challenges	Initial Risk and Challenge Assessment						Mitigation Strategies	Mitigation Team Leaders
			Risk Likelihood		Risk Consequence		Risk Score			
C-3	Construction	Access points to some structures for repair or rehabilitation may require easements on private property.	Possible	2	Important	1	**Low**	**2**	Identify construction/maintenance access needs early and begin discussions with adjacent property owners Account for increased costs due to remote locations and limited access.	Contractor / Potential Rail Operator / VDOT
C-4	Construction	Potential for environmental damage of tributaries crossing the corridor.	Possible	2	Important	1	**Low**	**2**	Determine methods to address potential erosion, contamination, and damage to environmental resources prior to construction	VDOT / Contractor and Subs
C-5	Construction	Shortages or delays in obtaining necessary construction materials.	Likely	3	Serious	2	**Moderate**	**6**	Diversify suppliers and procure critical materials in advance. Identify alternative material / design options, monitor the supply chain, develop contingency plans, and manage inventory levels. Source locally where possible.	Contractor and Subs / VDOT
M-1	Management	Lack of an organization qualified to manage and conduct regular maintenance for the trail corridor	Likely	3	Major	3	**High**	**9**	Determine who will be responsible for management of the corridor	VDOT / Rail Operator / Local Communities / Community Leaders
M-2	Management	Maintenance responsibility for stormwater management facilities	Likely	3	Important	1	**Low**	**3**	Incorporate low maintenance stormwater facilities. Determine who will be responsible for maintenance of stormwater facilities.	VDOT / Design Team / Rail Operator / Local Community Groups
M-3	Management	Local communities (residential, agricultural, small business, governmental, etc.) unable to agree on a management structure	Likely	3	Major	3	**High**	**9**	Clearly layout pros and cons of the management structure options and develop a clear decision making process early in the project.	Local Communities / Community Leaders
M-4	Management	Concerns from the farming community regarding trespassing and litter on farm fields, waterways, and other lands previously not impacted.	Likely	3	Serious	2	**Moderate**	**6**	Work with local groups (such as the Cooperative Extension) for coordination and communication. Incorporate signage and physical barriers into the design, as well as ongoing management and periodic communication with landowner/surveillance to maintain a clean facility and adjacent properties.	Landowners / Local Community / Community Leaders
M-5	Management	Lack of identified funding sources for ongoing trail maintenance	Likely	3	Major	3	**High**	**9**	Identify potential maintenance funding sources and/or potential of volunteer activities (i.e. local clean up events) along with pros and cons of each.	VDOT / Community leaders
M-6	Management	Security issues along the trail, such as trespassing on an active rail line.	Likely	3	Major	3	**High**	**9**	Access restriction using security fencing, clear signage to communicate safety rules, surveillance systems for monitoring, regular patrols to enforce regulations, and collaboration with railway authorities and law enforcement agencies to address security concerns in sensitive areas.	VDOT / Regional Law enforcement / Design Team / Community Engagement or Safety Monitoring Teams

APPENDIX E: CROSSING TYPES

Typical Crossing at Signalized Intersection

Shenandoah Rail WithTrail Exhibit

Virginia Department of Transportation

Project Location

TOWN OF BROADWAY, VA

North Arrow & Scale

SCALE
0 25' 50' 75' 100'

Legend

- EXISTING RAILROAD LINE TO REMAIN/UPDATE
- PROPOSED TRAIL

Michael Baker INTERNATIONAL

Typical Mid-Block Crossing
Shenandoah Rail WithTrail Exhibit

Virginia Department of Transportation

Project Location

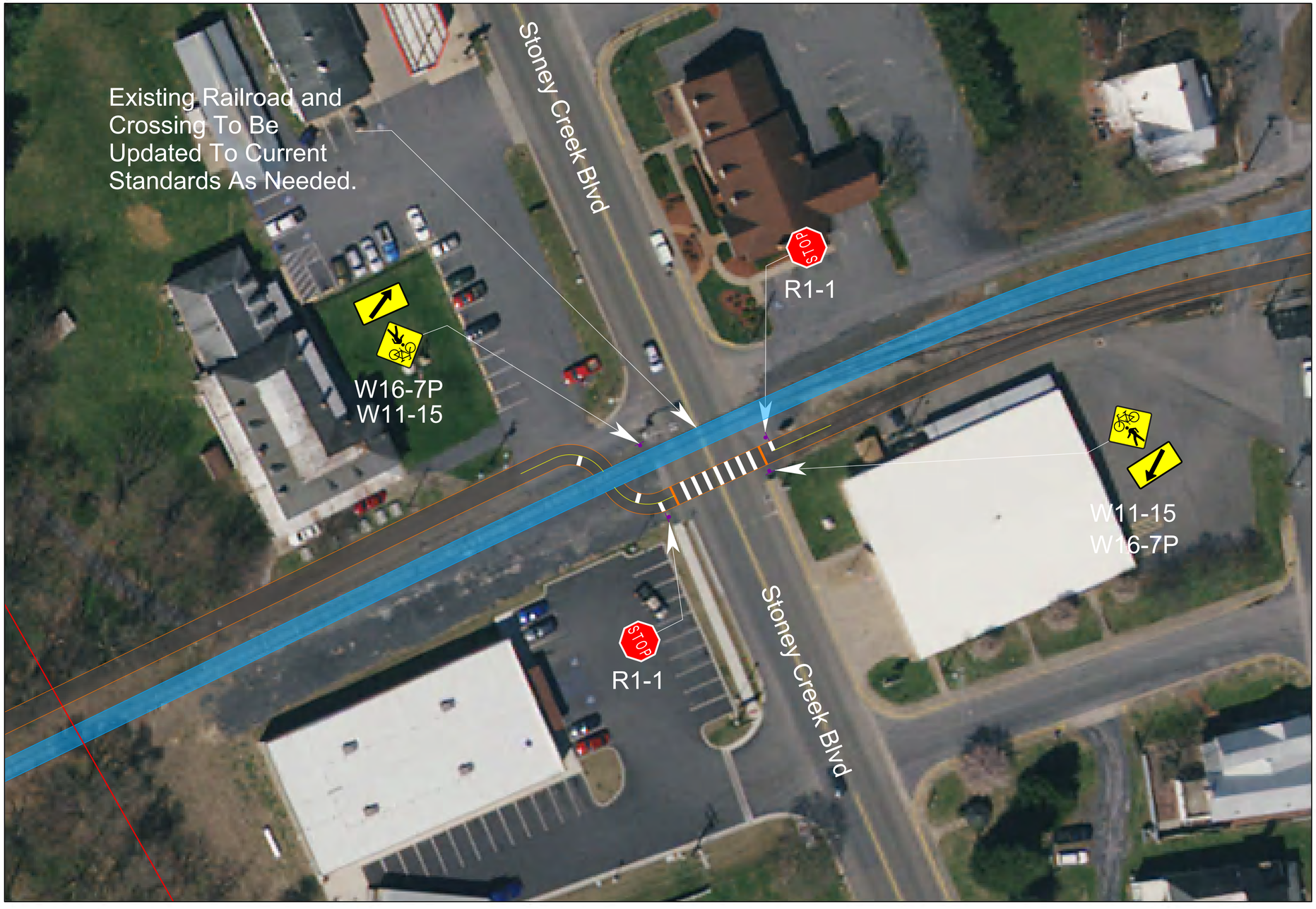
TOWN OF EDINBURG, VA

North Arrow & Scale

SCALE
0 25' 50' 75' 100'

Legend

- PROPOSED TRAIL
- EXISTING RAILROAD LINE TO REMAIN/UPDATE



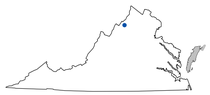
Michael Baker INTERNATIONAL

Virginia Department of Transportation

Dedicated Pedestrian Traffic Signal

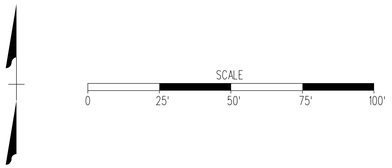
Shenandoah Rail-Trail Study

Project Location



TOWN OF WOODSTOCK, VA

North Arrow & Scale



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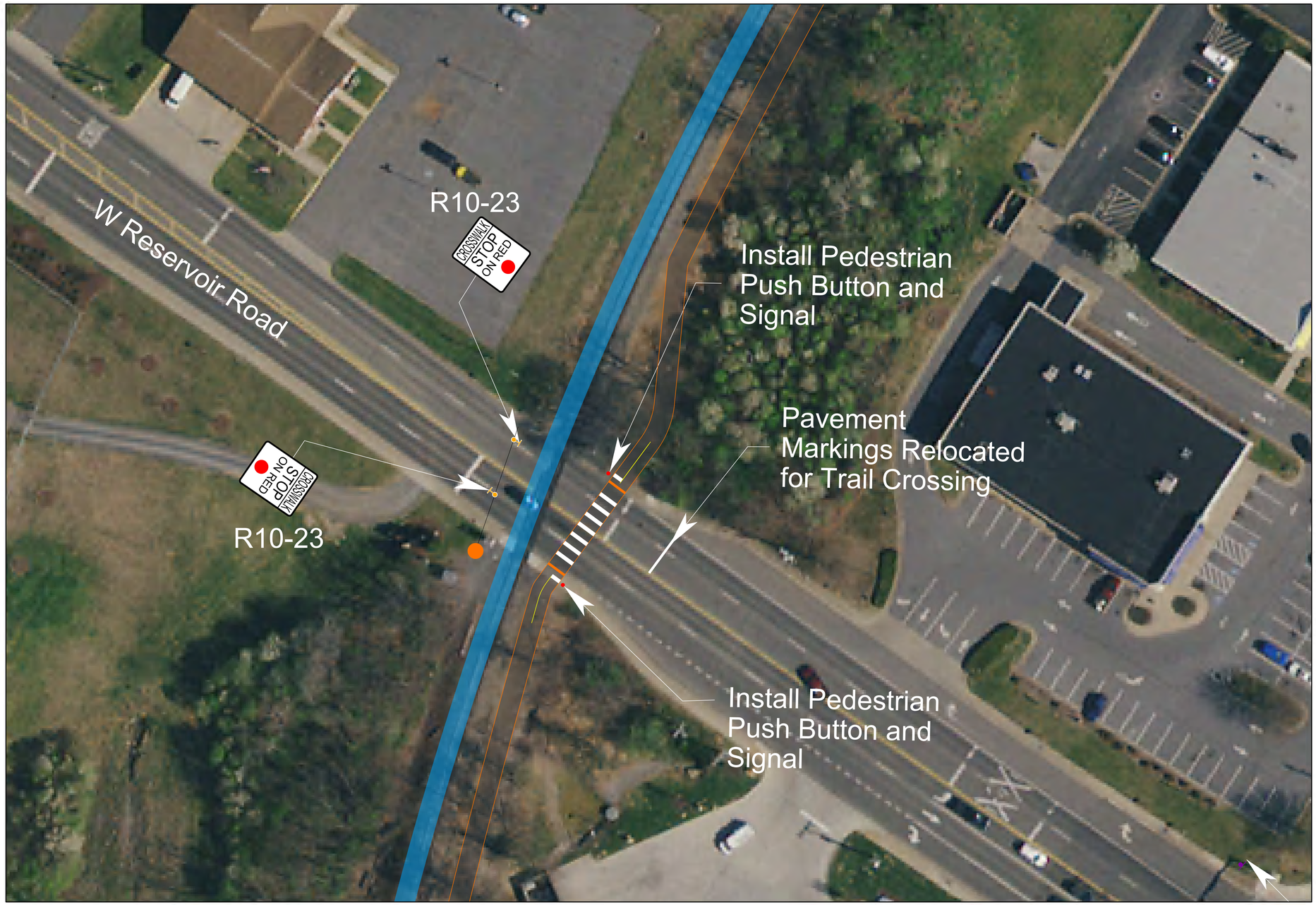
- EXISTING RAILROAD LINE TO REMAIN/UPDATE
- PROPOSED TRAIL

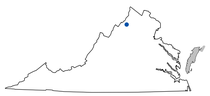


Michael Baker INTERNATIONAL

Typical Entrance/Driveway Crossing
Shenandoah Rail-Trail Study

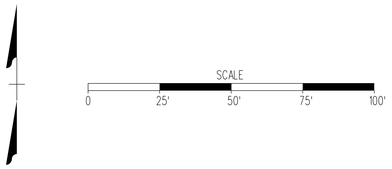
Virginia Department of Transportation

Project Location



TOWN OF WOODSTUCK, VA

North Arrow & Scale



Legend

- EXISTING RAILROAD LINE TO REMAIN/UPDATE
- PROPOSED TRAIL

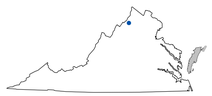
Michael Baker INTERNATIONAL

Virginia Department of Transportation

Typical Mid-Block Crossing with Limited Sight Distance

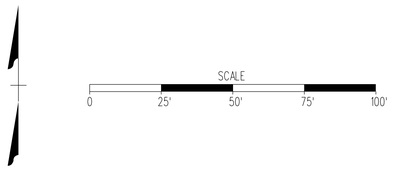
Shenandoah Rail-Trail Study

Project Location



TOWN OF MAURERTOWN, VA

North Arrow & Scale



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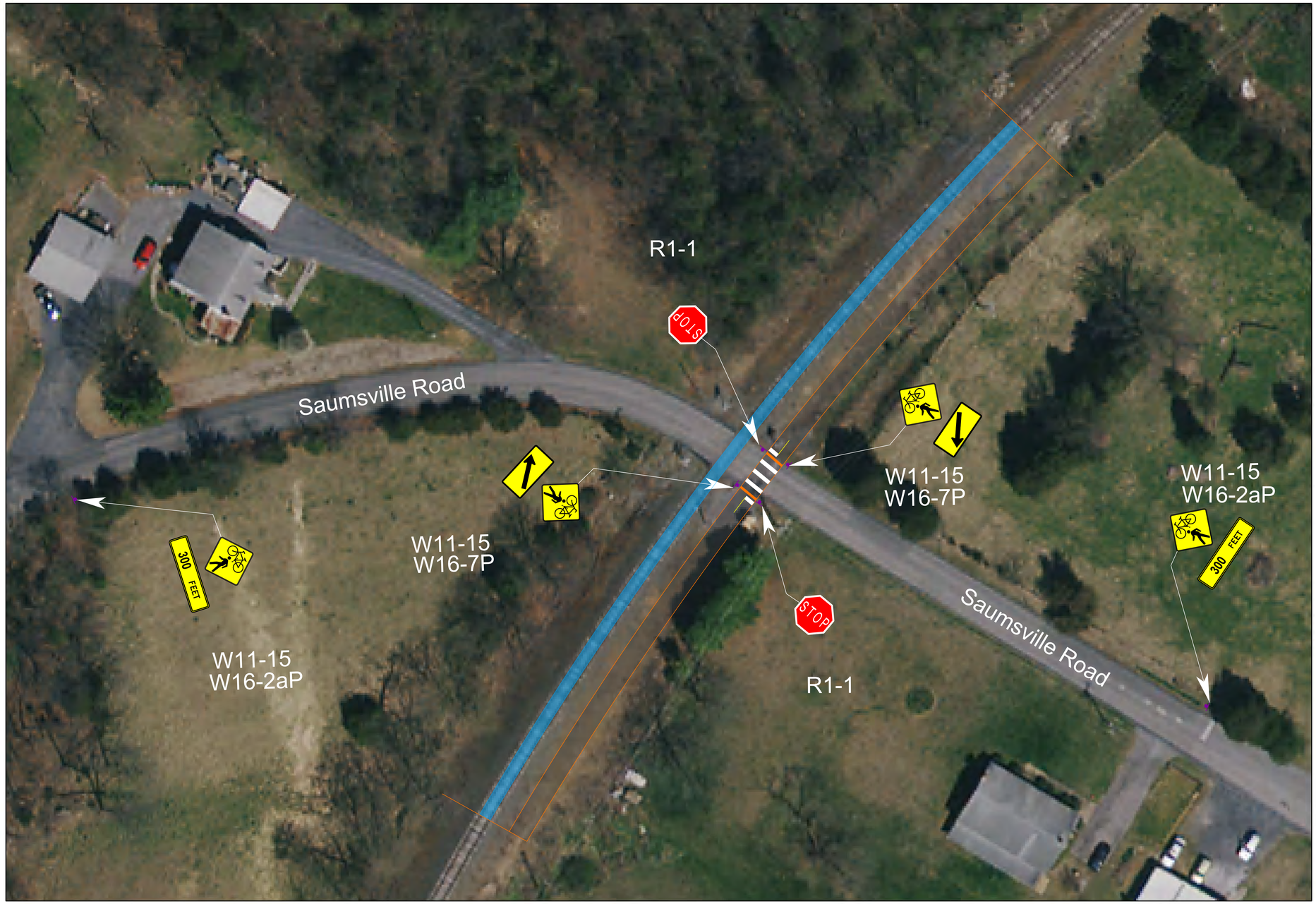
- PROPOSED TRAIL



Michael Baker INTERNATIONAL

Virginia Department of Transportation

Typical Mid-Block High-Speed Crossing with Limited Sight Distance
Shenandoah Rail-Trail Study

Project Location

North Arrow & Scale

Legend

- EXISTING RAILROAD LINE TO REMAIN/UPDATE
- PROPOSED TRAIL

Michael Baker INTERNATIONAL

APPENDIX F: STAKEHOLDER INTERVIEW SUMMARY

VDOT and the consultant team conducted interviews with a number of stakeholders to identify potential uses of the rail line, inform the development of the typical section, and understand potential opportunities and challenges. Various agencies and organizations were interviewed, including:

- State agencies: DRPT, VPRA, DHR, DCR
- VDOT Divisions: Environmental, Location & Design
- Advocacy and non-profit organizations
- Shenandoah Valley Battlefields Foundation
- Stone Consulting
- Stiffler McGraw
- Potential rail operators
- Select businesses adjacent to rail corridor (potential rail customers)
- Virginia Farm Bureau/Virginia Cooperative Extension
- The Conservation Fund
- Virginia Capital Trail project leads
- Shenandoah Valley Partnership
- Locality Economic Development directors

Rail Service Restoration

Interviewees commenting on the restoration of active rail service highlighted rehabilitation of the corridor as the primary barrier. Most interviewees agreed on a common figure for financial viability of the line, requiring an estimated 100 carloads per mile per year.

Potential Rail Operator interest in the corridor varied from no interest in the line to actively investigating business viability. Those not interested cited a lack of customers, competition from other railroads, and the investment needed to rehabilitate the line. Those interested saw potential in both freight and tourist train opportunities. In general, potential freight operators would want a FRA Class 2 Short Line railroad connected to the north and south to achieve competing rates between Norfolk Southern and CSX.

Potential Rail User/Customer interest also varied. Some had long abandoned the idea of using rail and instead use trucks for their freight needs. Some have an interest in seeing the rail revived to cut costs on their shipping needs. Area economic development officials noted that many business sites along the corridor would require additional infrastructure upgrades to accommodate a business desiring rail service. Potential freight rail users for this corridor desire connections to the Class I railroads (CSX, NSRR) on each end of the corridor for competitive shipment costs.

Separation / Clear Zone

The stated recommendations for the separation of the track and trail also varied per interviewee. Based on findings from the interviews, it is recommended that the typical sections from the VDOT Road Design Manual for 25 mph operation would be suitable for most operators and would accommodate FRA Class 2 railroad operating speed. The minimum separation in the VDOT standard is 11 ft “between the edge of improvements associated with a path to the nearest rail face of an adjacent active rail line” and requires a physical barrier.

Trail Concerns

Safety was often cited as a concern. Rail operators had concerns over the safety of users of the trail next to an active train. Representatives of property owners cited concerns about users going off trail into adjacent private property and the need for fencing.

Property Concerns

Interviewees stated access issues with farmland and the importance of fencing as key points. In general, constituents of the Virginia Farm Bureau and the Virginia Cooperative Extension did not have issues about rail activity but were concerned about a trail. They noted that where farmers have fields on both sides of the tracks, concessions to preserve access will need to be in place. Fencing was noted as a deterrent to trail users trespassing on farmland and damaging crops, harassing livestock, leaving trash or food that could harm livestock, or using farmland as a restroom. Additional comments concerned trail users being exposed to farming activities such as spraying, fertilizing and odors which could lead to complaints regarding such activities. Finally, it was noted to try to limit, if any, taking of additional farmland.

Environmental and Cultural Considerations

The interviews with the Department of Conservation and Recreation (DCR) and Department of Historic Resources (DHR) noted considerations including the need for federal processes with regard to historic projects, adherence to NEPA processes and stormwater management. DCR noted that if federal funding is used, NEPA processes will need to be followed. With regard to stormwater management, DCR indicated that for linear parks the designers need to know where they are sending the water as well as considerations for how adjacent landowners may be impacted. BMPs are avoided where possible as they often require land acquisition. Requirements for stormwater management are driven by the amount of impervious surface being added or changed.

DHR indicated that sections of the Manassas Gap Railroad are eligible for listing in the National Register due to role in Civil War and economic development of the valley. The corridor itself would be historically significant, and preservation of the alignment is key. It is unlikely that rail and ties are original and would require preservation. Bridges and culverts would be considered assets contributing to historic character and modification would need to be closely examined as an adverse effect. With regard to the existing ballast, maintaining as much material as possible is preferred, however removing those materials would not make the right of way ineligible for the National Register. DHR noted that both alternatives are possible in the corridor, however a rail-with-trail has a greater potential for archaeological impacts due to a wider project footprint.

Lessons Learned on Virginia Trails

Representatives from the Department of Historic Resources shared lessons learned from the High Bridge Trail and the Flax Mill Creek Trail and perspectives were also provided by representatives of the Virginia Capital Trail. It was noted that if federal funds are used, the project will need to follow the NEPA process. Compliance with federal requirements increased the construction costs on previous projects. Permitting for historic resources required minimal effort on High Bridge Trail where most of the work was within the existing rail corridor. It was noted that time for Section 106 determination should be included in the schedule. The Virginia Capital Trail reported that they budget $1M annually for maintenance and that trespassing and crime have been minimal.

Right of Way Acquisition/Ownership

DCR noted that sometimes purchase of additional land is needed to provide BMPs, and to construct trailheads and trail amenities. Schematic-level design (at a minimum) is needed to determine whether more land is purchased. DCR has not completed construction projects on land that is not owned by DCR. Also, DCR has no previous management agreement on a rail-with-trail facility and therefore has no familiarity with this operation. Maintenance and safety concerns would have to be considered. The line is not identified in DRPT's 2022 Virginia Statewide Rail Plan as a future passenger rail corridor and there are no programmed freight rail investments. As such, there are no plans by the Commonwealth to preserve the corridor for freight rail or passenger rail operation. The Conservation Fund indicated they would not remain engaged in the acquisition process if a rail-with-trail alternative is pursued.

Locality Feedback

Interviews were conducted with Town Managers and County Administrators for the 12 localities along the rail corridor. All 12 of the localities indicated that their staff, elected leaders, and citizenry are in majority support of installing a trail on the corridor to realize various benefits, including a safe alternative transportation corridor

within and between towns, tourism and/or other economic development, and recreation. All of the localities interviewed indicated the trailheads identified in the Feasibility Study for a Linear Park in the Shenandoah Valley remain viable options. No localities indicated a strong interest from the business community for freight rail service.

Economic Development

Input regarding economic development associated with the study corridor was gathered from the interviews with the 12 localities along the rail corridor and representatives from the Shenandoah Valley Partnership, the Shenandoah County Economic Development Department, and the Rockingham County Economic Development Department. The general consensus was that there had not been any inquiries from businesses considering locating in the Shenandoah Valley requesting or requiring rail service. Furthermore, the sites available that could accommodate a business of a magnitude that would support rail distribution all require additional infrastructure upgrades such as electrical, sewer, or natural gas. While it was noted that two existing businesses have shown interest in using rail, other industries such as food processing have indicated that rail does not fit their business model. Several economic development offices had received inquiries from businesses who perceive the ability to increase their customer base from trail users.

APPENDIX G: CANTILEVERED TRAIL STRUCTURE VIABILITY

1The Shenandoah Valley Rail-with-Trail Assessment Report completed by Stiffler McGraw considers the makeup and condition of 25 bridges and provides recommendations for modifying the existing bridges to accommodate a track and a trail. Of the 25 bridges assessed, 17 are designated to use the existing unused structure width to accommodate the track and trail, or build a new separate superstructure width for the new trail. Eight (8) bridges are recommended to support a cantilevered trail structure from the existing steel superstructure. All of these eight bridges are noted to require a new deck that will be comprised of timber or FRP. They are all comprised of two girders with open timber decks and minimal cross bracing.

While two-girder, open timber deck bridges are common rail bridge superstructures, they often do not include a walkway and when they do it is narrow and for the purpose of railroad workers to access a train or parts of the bridge for maintenance and operations. Those walkways are typically lightweight metal grating with support built integrally with the deck ties or by brackets attached to the girder and the loading is located roughly 6-to-8-ft from the centerline of track (and centerline between the two girders). This often puts part of the walkway space within the AREMA Clearance Diagram, so anyone using the walkway could be within that clearance diagram and there is no railing between the track and the walkway. Freight Rail carriers would not allow pedestrians or cyclists within the clearance diagram, therefore any cantilevered structure to support a pedestrian/bike path would need to be located fully outside of the clearance diagram. See the marked-up sketch from the Stiffler McGraw report illustrating the closest location where this cantilevered structure could potentially be located.

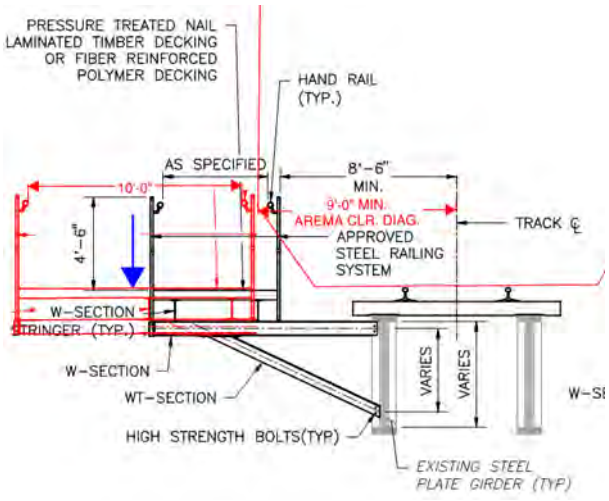


Figure 2: Marked-up Sketch of Cantilevered Trail Structure

This would effectively double the moment arm for the loading applied to this two-girder structure from a typical walkway, significantly magnifying the applied torsional moment on those girders. Additionally, the path structure will likely have a solid deck that would increase the dead load of the pedestrian structure, and the pedestrian design live load is higher than what AREMA requires for walkway live loads. The current cross frames are likely made of very light steel, often with small angles having 3/8" thick legs, and likely could not support such torsional loading. Significant retrofits to the cross bracing, girders and bearings would likely be necessary to support this loading.

Additional considerations are the live load deflections and vibrations of this type of superstructure under freight loading. The open deck imparts a larger impact on the structure than a ballasted deck, resulting in large live load and larger live load deflections. The AREMA live load deflection limitation is L/640, whereas the AASHTO-specified limitation for deflection for bridges supporting vehicular and pedestrian loads is L/1000. This type of railroad superstructure is also typically more flexible in the transverse direction, resulting in both vertical and horizontal deflections. The rider comfort and walker/runner comfort level would very likely be exceeded for those present on such a cantilevered structure while a freight rail live load is also moving on the structure.

If a pedestrian structure were to be cantilevered from an active freight rail structure, ownership and maintenance agreements would need to be seriously considered. Whether the operating railroad needs to complete maintenance on the structure and would impede use of the pedestrian trail, or vice versa and work on the pedestrian trail would impede rail operations, both scenarios need to be delineated in agreements.

Finally, safety is a major concern in the rail industry and this proposed structure type would raise many safety concerns. The railroads are always trying to keep people away from trains to avoid the potential for injury or worse. Proposal of a structure that is located so close to and integral with the rail bridge will raise serious safety concerns for any freight rail operator. Often when a trail is proposed near a track, the rail operator/owner will require large chain link fence to separate the two. The shown 4'-6" handrail would very likely not be approved.

APPENDIX H: REVIEW OF EXISTING MATERIALS

Introduction

The Virginia Department of Transportation is assessing the Norfolk-Southern rail right of way in the Shenandoah Valley between the Town of Broadway in Rockingham County and the Town of Front Royal in Warren County. The concept being assessed is the re-activation of the corridor for rail use for tourism and transportation while including a trail alongside the rail line. Maintenance and safety checks must be conducted for the rail line to be cleared for use. To begin the process of rehabilitating the abandoned rail, all the elements along the proposed alignment must be inspected. The assessment team reviewed existing documentation related to the study area and resources related to rails with trails' best practices and standards. The various documents included in the review have been summarized below and grouped into categories.

Public Outreach

MetroQuest Survey Results - Shenandoah Valley Rail-Trail Feasibility Study

Department of Conservation and Recreation, 2021

The Shenandoah Valley Rail-Trail Feasibility Study process provided many opportunities for the public to provide feedback on the proposed linear park. The study team developed an English and Spanish MetroQuest survey that were launched from May 17th to June 25, 2021. The two surveys had over 9,200 participants from residents within and outside Virginia. Most of the participants shared they would use the trail if built and are active users of other trails in the area. Most of the participants also reported using other trails in Virginia. Participants ranked 'Safer Places to Walk/Bike' as the highest perceived benefit of the rail-trail development. Participants also identified 21,793 locations for the study team to consider in the analysis as part of an interactive exercise including parking locations, amenities, and destinations of interest.

Public Comment - Shenandoah Valley Rail-Trail Feasibility Study

Department of Conservation and Recreation, 2021

The project team hosted a Shenandoah Valley Rail Trail webinar that received 47 written comments. Many of the comments (49%) were in support of the trail. Ten participants asked various questions pertaining to cost, ROW acquisition, trail maintenance and ownership, funding, and if Norfolk Southern is interested in selling the rail line at all. Six adjacent property owners expressed their concerns of privacy, increased noise, crime, and property encroachment. Five participants asked if they could be kept abreast of the study/project's progression. One participant suggested revitalizing the existing rail into a scenic attraction with a short-line train showing the picturesque views along the tracks. Another participant felt as though the funds for this project would be better served elsewhere, such as improving the roadway conditions in the Town of Broadway.

Resolutions of Support - Shenandoah Valley Rail-Trail Feasibility Study

Department of Conservation and Recreation, 2021

This document is a combination of all the resolutions and letters of support from various localities and organizations in the region that the project team received. These documents of support were all provided to support the conversion of the segment of abandoned railroad included in the Shenandoah Valley Rail-Trail Feasibility Study and were included as an appendix item in the final report.

The feedback received from the outreach efforts were used in various sections of the feasibility report including the subsections 'Potential Uses for the Trail' and 'Active Transportation'. The complete results of the MetroQuest surveys, the comments from the webinar, and all the documents of support are included in Section X, the Appendix of the report.

Federal Regulations

FRA Bridge Inspection Report Request FAQ

The Federal Railroad Administration (FRA) plays a crucial role in ensuring the structural integrity of the nation's railroad bridges, which is vital for commerce, safety of railroad employees, passengers, and the public. The FRA

conducts regular audits of rail carriers' bridge management programs, evaluating inspection and maintenance practices, and identifying potential safety weaknesses. The FRA has established policies and amendments to ensure the structural integrity of railroad bridges, including the Essential Elements of Railroad Bridge Management Programs. In 2010, the FRA released the Bridge Safety Standards Final Rule, requiring railroad track owners to adopt specific procedures to protect the safety of their bridges, strengthen federal oversight of railroad bridge programs, conduct annual and special inspections, maintain an inventory of all bridges and their safe load capacities, document all repairs, modifications, and inspections, ensure minimum qualifications for bridge engineers, inspectors, and supervisors, and conduct internal audits of bridge management programs and inspections.

CFR, Title 49, Part 237

Code of Federal Regulations, 2024

The Fixing America's Surface Transportation Act (FAST Act), Section 11405, "Bridge Inspection Reports" allows State DOTs to request bridge inspection reports from railroad companies. These requests should be filed through the Secretary of Transportation with the Federal Railroad Administrations (FRA) being held responsible for upholding the request. The Bridge Safety Standards used to inspect the bridges are described in part 237 of the FRA's Code of Federal regulations which is separated into seven subsections. The inspection regulations include General Information, Rail Bridge Safety Assurance, Qualifications and Designations of Responsible Persons, Capacity of Bridges, Bridge Inspection, Repair and Modification of Bridges, and the Documentation, Records, and Audits of Bridge Management Programs. Part 237 concludes with an appendix containing information on Supplemental Statement of Agency Policy on the Safety of Railroad Bridges. The regulations included were last amended on February 20, 2024.

Railroad Track and Right of Way Inspections

Northern Shenandoah Valley Transportation Preservation Corporation Rails with Trails Analysis

Stone Consulting Incorporated, 2024

This report develops a series of projections and actions under the assumption that the abandoned rail could be rehabilitated and operated. The analysis outlines multiple benefits for the local economy should private operators take interest in the line. One of the most significant benefits would be on the local industrial economy, which is already situated in close proximity to the rail line. The document holds that the rail would stimulate this industrial economy and also create new opportunities for the tourism economy.

The report has several detailed analysis regarding tourism, local industry, freight traffic, operations, general economic impacts, and trail and crossing considerations. The report accurately identifies a lack of standards regarding rails with trails, particularly on the distance needed between the rail and the trail. To compensate for this lack of guidance, the report provides multiple examples of other rails with trails and builds those designs into its analyses.

Finally, the report develops a five-year plan, starting from the opening day of the rail. This assumes rehabilitation starting from the north end and south end before meeting in the middle over time. The first few years would be focused on building the tourism industry and building a shipping customer base. The report stresses the responsibility on the tourism and shipping operators to advertise their services if they want the five-year plan to succeed.

Shenandoah Vally Rail Corridor Bridge Evaluation

Stiffler McGraw & Associates, 2023

The Shenandoah Valley Rail Corridor Bridge Report inspected 25 of the 49 bridges along the proposed corridor. The report provided descriptions for each bridge inspected, the observed condition and defects, recommended maintenance, and capital improvements, and gave an estimate of probable costs for these items. It recommended a two phased approach for achieving a rail-with-trail facility with phase one including all necessary work to place the line back into service for rail operation. Phase two would construct an adjacent trail at each bridge to accommodate a rails-with-trails pedestrian and bicycle trail.

The report noted that the 24 bridges excluded from the report were in service as recently as 2021 and may require little to no work to be put back in service. It was recommended that the most recent bridge inspection report be obtained from Norfolk Southern (NS) to know the state of the bridges excluded from the report. The 25 bridges included in the inspections were generally in fair to satisfactory condition. With minimal reconstruction, the report stated they could be able to carry frequent railroad traffic using freight cars up to 286 kips. Some issues that would prevent immediate active railroad traffic included timber deck tie conditions, erosion along approach tracks, and tree and brush growth.

The report appendices include various items supporting the report's findings including location maps with the 25 bridge locations identified, a bridge inventory table, a Summary Classification Report, diagrams of the three proposed typical sections, cost estimates to repair the various bridge and construct cantilevered or adjacent trail structures, full inspection reports, and photos taken during the inspections. According to the report, the total engineering and construction cost for Phases 1 & 2 of repairing the existing bridges such that railroad service can be returned and a pedestrian trail be constructed adjacent to the track would cost $66,352,008. The report notes that the estimate used 2023 construction costs as a baseline with an escalation of 5% per year applied over 5 years.

Northern Shenandoah Vally Transportation Preservation Corp. Track Inspection Report

Stone Consulting Incorporated, 2023

The Shenandoah Track Inspection Report, completed in March 2023, assessed the existing rail infrastructure along a proposed trail alignment, noting a stark contrast in rail conditions over the 50-mile corridor. The report estimated a phased track rehabilitation cost of $4 million to $18 million. It found 65% of the rail, including 36% of 132# welded rail and 29% 100# welded rail, to be in fair condition and ready for immediate service. The remaining 35%, primarily from Mount Jackson to Woodstock, required significant rehabilitation, including a heavy tie replacement program or an alternative approach using the industry minimum standard 115# rail on new ties. The report excluded grade crossings and bridges, which were to be inspected in future reports.

Grade Crossing - Northen Shenandoah Rail + Trail Feasibility Analysis Draft Report

Stone Consulting Incorporated, 2023

The Grade Crossing Program report, completed in March 2023, detailed the restoration and full operations of a railroad with 131 grade crossings, 65 public and 66 private. These crossings, in varying conditions, may require significant rehabilitation for railroad use. Some closed crossings need state DOT authority action for reopening, while the 66 private crossings under contractual agreements for maintenance can be reinstated with landowner cooperation, without state approval or eligibility for Railway-Highway Crossings (Section 130) funding. The FRA maintains grade crossing records, but municipalities may need to restore any removed or paved-over crossings without railroad permission. All grade crossings require signage, irrespective of gates or lights. The padlocked signal cabinets, assumed unserviceable, couldn't be inspected.

For the rail to become fully operational, the report suggested a phased rebuild, with track and facility conditions dictating which portions can be reopened first for excursion and limited freight services. The rehabilitation of crossings should be broken into three distinct zones, reflecting the reverse action of Norfolk Southern removing portions of the line from service. The restoration of crossings would be subject to an additional phased approach, focusing on paved-over, closed, and out-of-service locations first.

- Proposed Phase 1 consists of immediate operations and includes 37 public crossings, of which 1 is closed. Proposed Phase 1 section 1 is 17.8 miles from Riverton (Front Royal) to Toms Brook. Proposed Phase 1 section 2 is 14.2 miles from Vally Fertilizer site south to Broadway. The report provided the following estimated costs by Phase for public crossings only.
- Proposed Phase 2 is 8.4 miles long and plans to restore service to the ex-Johns Mansville plant beginning at Toms Brook. This phase has 18 crossings, of which 2 are currently closed.
- Proposed Phase 3 is 8.9 miles long with the goal of reconnecting the middle section of railroad from the Johns Mansville plant to Valley Fertilizer. This phase has 10 crossings, of which 3 are currently closed.

The report provided the following estimated costs by Phase for public crossings only.

PUBLIC CROSSING TOTALS
Initial repair and replacement costs

By Zone	Xbucks	Lights	Gates	Resurface Cost	Signal Cost	Total
Phase 1	17	14	6	$1,155,003	$2,036,500	$3,191,503
Phase 2	12	3	3	$1,329,003	$914,000	$2,243,003
Phase 3	4	4	2	$864,002	$973,500	$1,837,502
Total 65	33	21	11	$3,348,008	$3,924,000	$7,272,008

Figure 1 – Estimated Restoration Costs for Public Crossings

Each crossing on the railroad was verified via Google Earth, geo-tagged for location in a .KMZ file, and measured for surface length. The report concluded with a discussion of the procedures and regulations for handling malfunctioning warning systems at railroad crossings. An overview of the previously mentioned Section 130 grade crossing funding was also included.

Brush Cutting - Northen Shenandoah Rail + Trail Feasibility Analysis Draft Report

Stone Consulting Incorporated, 2023

The brush cutting recommendation mentions that two thirds of the rail line had minor weed growth and the middle third needed heavy tree/brush removal. It stated that the brush and foliage growth in the tracks was congruent with the amount of time the track had spent out-of-service. The trees that had grown within the rail alignment were small enough for a hydraulic brush cutter. Regional tree species were rot resistant and do not require the typical full root removal. Stump removal may hinder the trail construction, but not as much for railroad rehab and use.

At Grade Crossing Review - Shenandoah Valley Rail-Trail Feasibility Study

Department of Conservation and Recreation, 2021

The Document titled SD10 At Grade Crossing Review is a table of all the railroad crossings along the abandoned alignment. It includes each crossings ID number, general area description, the crossing type, whether curves along the roadway cause sight distance issues, if a signal is nearby, the posted roadway speed, the roadways annual average daily traffic count, and general notes of each crossing.

At-Grade Field Conditions Survey - Shenandoah Valley Rail-Trail Feasibility Study

Department of Conservation and Recreation, 2021

A second field survey was conducted by Micheal Baker International in September 2023 to verify the additional crossing issues identified in the initial investigation. Documentation during the inspection was taken at every Norfolk Southern milepost along the proposed alignment. Field photos can be found on a web-based map titled, ArcGIS - Shenandoah Valley Rail Trail - Field Visit Photo. At each location, the survey documents the presence of overgrowth, buffer widths and side slopes, adjacent land use, and other notes.

The survey results mentioned that most of the alignment is 9-10 ftwide where tracks are present with a 6:1 side slope. The section between Front Royal and Strasburg is mostly at-grade with natural ground, it has little to no overgrowth, and has primary interactions with residential and agricultural land-uses. The section between where the railroad crosses under I-81 and intersects with Battlefield Road in Strasburg is heavily overgrown with trees, bushes, and tall grass. Land uses are primarily agriculture and residential based with segments in towns that are heavy residential and commercial. The section between Broadway and I-81 varies between alignments above grade and sections where one-side has slopes greater than 6:1. There is little to no overgrowth, has primary interactions with residential and agricultural land-uses, and has frequent industrial land-uses especially at roadway crossings.

Rail-with-Trail Guides

HB2088 Rail-with-Trails/Pedestrian Crossing Project Initiation, Coordination, and Review Report

Department of Conservation and Recreation, Department of Rail and Public Transportation, 2009

The Rails with Trails/Pedestrian Crossing Project Initiation, Coordination and Review was a response to House Bill 2088 from the 2009 Session of the General Assembly. The House Bill mandated the development of a process to coordinate and evaluate public recreational access and safety issues to new railroad projects funded by the Commonwealth due to the trend of rail-with-trail projects becoming more prominent. The guidelines were a joint venture between The Virginia Department of Rail and Public Transit (DRPT), the Virginia Department of Conservation and Recreation (DCR), and the Virginia Department of Game and Inland Fisheries (DGIF). Stakeholder meetings were held to help develop the guidelines with various participating organizations including CSX Transportation (CSX), Norfolk Southern (NS), and the Virginia Railroad Association (VRA). The report included project development and design considerations for Rails with Trails/Pedestrian Crossings (RWT/PC) along the active right of way of railroads. Recreational advocate groups believe that RWT/PCs and public access alongside or adjacent to active rail lines in the Commonwealth of Virginia could serve as a link to a growing interconnected system of trails.

Section one of the report introduced the purpose and those involved in its development. The second section outlined an action plan to develop and construct an RWT/PC and other types of recreational access facilities. Appendix A included potential design considerations for RWT/PC. The report notes that:

> "No specific ROW cross sections or typical sections are assumed, therefore design considerations offered in this report, trail setbacks for example, can only be provided as a range. Constraints along specific rail corridors — and the railroad company's policies towards RWT/PCs (if they exist) — could supersede any design considerations offered in this report. This report provides technical considerations and suggested practices to use as a starting point in the development of these types of facilities. The Commonwealth assumes no liability in the use or application of this information."

Rails with Trails Best Practices and Lessons Learned

U.S. Department of Transportation, 2021

Following the Rails with Trails/Pedestrian Crossings guidelines development, the U.S Department of Transportation (DOT) updated the Rails-with-Trials: Lesson Learned report in May 2021. The updated document stated that Rails-with-Trails are considered shared use paths or trails on or adjacent to active railroad transit corridors. They are different from "rails-to-trails," where all rail service has ceased, and the entire right of way is converted to a trail.

The report outlines railroad policies that stated four out of eight Class I railroads prohibit adjacent bicycle, pedestrian, or multiuse trails within their right of way. It noted that the other four Class I railroads do not have official policies but rarely allow parallel trails within their right of way. Private freight railroads generally do not permit trails within their right of way due to safety risks and liability concerns. Despite these policies, over 343 rails-with-trails totaling 917 miles exist across 47 states in the US as of 2018. Most rails-with-trails (68%) are along Class I, II, or III railroads With 34% along Class I freight rail lines and 26% along Class II or Class III freight rail lines. The report also notes that over half (58%) of the 81 rails-with-trails surveyed are either fully or partially located within the railroad right of way, while the remaining 42% are adjacent but outside of it. Since 2000, there has been an increase in the percentage of rails-with-trails built both within and outside of railroad rights-of-way compared to before 2000.

The report mentioned that existing rails-with-trails exhibit varying setbacks, ranging from 7 to 200 feet, with an average of approximately 32 feet. However, there is no clear correlation between setback and train speed or frequency. Guidelines for bicycle facilities and walkways are not directly applicable to rail-with-trails, and setback requirements lack consensus. Safety considerations include keeping trail users outside the "dynamic envelope" needed for train operation. This envelope accounts for train clearance during turns and potential debris from the railbed. Factors affecting minimum setback include train type, maintenance needs, track curvature, topography,

trespassing patterns, and separation methods (e.g., fences or vegetation). The report stated that among 106 rails-with-trails, 87 percent have some form of barrier between the trail and tracks. For rails-with-trails opened since 2000, the percentage with barriers increases to 96 percent. Fencing was noted as the most popular choice of barrier with 86 percent, vegetation was second at 28%, grade separation was used 16% of the time followed by a ditch (9%), a concrete wall (5%), or other unlisted options (2%).

Constrained areas such as narrow corridors, steep terrain, or areas with numerous bridges and trestles, were noted to be challenging for trail placement. With safety remaining paramount, additional right of way acquisition or physical separation was suggested to ensure rail and trail operations coexist safely.

Public transportation agencies recognize the value of rails-with-trails for communities and transit networks. Coordination with local communities was said to improve access between existing trails and transit systems. The report goes on to identify best practices for Rail-with-trail development, Risk Management, Design, and Construction, Operations, and Maintenance. It concludes with appendices that provide definitions for many different terms used throughout the report and a section of resource links to items such as rail safety information, trail design, state rail-with-trail guidelines, and funding.

Rails-Next-to-Trails: A Methodology for Selecting Appropriate Safety Treatments at Complex Multimodal Intersections

Transportation Research Record, 2018

The Rail-Next-to-Trails article was developed to address the lack of standards for rails-with-trails intersection treatments. The authors address intersection issues by organizing them into three groups: the built environment, lack of path user information, and lack of driver information. They take these categories and identify appropriate intersection treatments for heavy rail conditions. They conclude with sharing a worksheet used to identify these issues and treatments.

Trailheads Review - Shenandoah Valley Rail-Trail Feasibility Study

Department of Conservation and Recreation, 2021

The trailhead review is a table of attribute information describing the build requirements of the proposed trailhead locations along the trail alignment. The table included the locality, a brief description, estimated land and lot size, the type of required access to the trail, right of way assessment information, Low & High Lot construction and PE costs, and the total estimate cost range excluding right of way. The document concluded with two Opinion of Probable Project Cost breakdowns for 10 and for 30 estimated lots.

Funding Alternatives - Northern Shenandoah Rail + Trail Feasibility Analysis Draft Report

Stone Consulting Incorporated, 2023

The Funding Alternatives section of the Northern Shenandoah Rail Trail Feasibility Analysis listed various funding opportunities to construct the proposed rail-with-trail. The analysis assumed a for-profit system for the rail portion, while the trail portion was not necessarily expected to have a self-funding aspect.

The analysis lists alternatives including:

- **Private Investment** - Despite dwindling railroads and associated risks, shortline conglomerates expand by acquiring properties at high costs, but struggle to raise long-term investment capital due to risk aversion and tax law constraints.
- **Nonprofit Ownership** - IRS nonprofits provide a sustainable model for rail line ownership, balancing investment goals with liability control and grant access, and can coexist with for-profit entities, managing excursions and assets while circumventing political instability.
- **Grant Funding** - Grant funding for rail projects usually comes from different sources for freight/industrial and excursion/history/tourism projects, except in unique cases like New York, and while some federal grants seem state-administered, they follow federal rules and stem from Federal Highways funding.

- **Virginia's Rail Grant Programs** - Virginia provides two state-funded rail grant programs, the DRPT Freight Fund and the Rail Industrial Access (RIA) Program, for freight and industrial projects, with the latter publicizing eight siding construction grants in 2024.
- **Federal-State Grants** - The Intermodal Surface Transportation Efficiency Act (ISTEA) and its successors, like MAP-21, allocate federal funds for transportation enhancement, impacting trail creation and historic facility restoration, with the program's success depending on state DOTs' willingness to fund projects and often linked to the passage of the US Transportation bill.
- **Direct Federal Funding** - Congressional earmarks initiated direct funding for specific rail projects 25 years ago, bypassing state DOTs and tasking the Federal Railway Administration (FRA) with administration, which has since adapted to manage two major rail funding programs: the Railroad Rehabilitation & Improvement Financing (RRIF) and the Consolidated Rail Infrastructure and Safety Improvements (CRISI) program.
- **RRIF Program** - The Railroad Rehabilitation & Improvement Financing (RRIF) program, established by transportation acts, offers up to $35 billion in low-interest loans for railroad infrastructure with a unique reimbursement loan feature requiring collateral, and despite initial complexity and stringent requirements, it has funded significant projects and expanded its recipient range due to recent rule relaxations.
- **The TIGER (BUILD) Program** - The Transportation Investment Generating Economic Recovery (TIGER) grant program, active from 2009 to 2019, awarded over $112 million to rail projects, but its effectiveness was questioned due to a low award rate of less than 24%, indicating that many applied but few received funding.
- **The CRISI Program** - The Consolidated Rail Infrastructure and Safety Improvements Act (CRISI) program, managed by the FRA, has become a key federal grant program for rail projects, replacing TIGER and emphasizing rail safety and efficiency, but its effectiveness is hindered by structural and implementation challenges, as well as NEPA clearance requirements that complicate and delay the grant process.
- **Grade Crossing Safety** – The FRA Section 130 program, overseen by state DOTs, is designed to boost grade crossing safety via funding for enhanced devices and track-highway separation, and despite recent federal funding increases, changes under the IIJA, including full federal share for projects and a new $600 million annual Railroad Crossing Elimination Grant Program, its reactive approach often results in post-accident fund allocation and a rigorous historical data analysis-based grant process.
- **Shortline Tax Credit Program** - The Shortline Tax Credit Program provides a permanent, salable, and transferable tax credit for track maintenance to freight shortlines, offering potential cash value even for non-profitable lines, and the unique "45G" IRS tax provision enables organizations to get an effective rebate on maintenance costs without any mileage limit for freight service maintenance.
- **Foundation Grants** - Local and regional grants, managed by individual funding agencies and supported by national organizations like the Microsoft Foundation, are designed to aid historic rail operations and preservation, and are typically allocated to nonprofit or government entities that present clear project goals, measurable results, and publicly acknowledge the funding.
- **Sponsorships** - The Cuyahoga Valley Scenic Railroad (CVSR) exemplifies successful corporate sponsorship in nonprofit excursion railroads, securing substantial funding for projects like the ADA-accessible "Invacare" car and utilizing innovative fundraising methods, such as hosting private events in a 1940s Budd observation car, all while operating within a national park and showcasing the potential of nonprofit-corporate partnerships.

Alternative Abandoned Rail Line Uses

Railbike Potential - Northen Shenandoah Rail + Trail Feasibility Analysis Draft Report

Stone Consulting Incorporated, 2023

Railbiking could be seen as a low-cost adaptive reuse alternative for the rehabilitated rail line. The railbiking section of the NSRT feasibility analysis mentioned that Railbikes are human-powered pedal vehicles that were popular in the 1800s. In recent years, railbiking has seen a resurgence as a unique outdoor activity. It is self-

sufficient and provides a unique experience, attracts tourists, and could support the local economy all year long. Unlike heavy rail, railbikes require minimal maintenance and energy, making them environmentally friendly.

The report shared that a company called Rail Explorers developed these improved railbikes in the United States and provide railbiking tours in various locations across the county. The modern two-seat and four-seat options feature low recumbent designs, mudguards, and hydraulic braking systems. The all-steel vehicles are stable, heavy, and safe, minimizing derailment risks. It was mentioned that round-trip routes and longer trip options are preferred. Segments like Fishers Hill to Toms Brook and Woodstock to Edinburg have relatively flat terrain and scenic views which make them ideal railbiking locations. This activity could impact communities similarly to conventional excursion railroads.

Excursion Market - Northern Shenandoah Rail + Trail Feasibility Analysis Draft Report

Stone Consulting Incorporated, 2023

According to the Northern Shenandoah Rail + Trail Feasibility Analysis Draft Report, the rail excursion market has changed dramatically over the last 25 years, creating new opportunities for the Shenandoah region according to the report. The analysis shared that ridership estimates are based on a blend of factors, including the performance of established excursion railroads in the region. The introduction of themed events produced huge ridership numbers in diverse demographics. These themed events led to the development of an 'events model' for rail excursions, with every scheduled train typically having some kind of theme tied to it. The success of these events led to attempts to license other event-based theme trains, resulting in a wide range of themed events across the industry. The analysis stated that the rail event market tends to focus on families with small children, the retiree market, and upscale food and beverage events, rather than the typical local trail user for exercise. The impact of this shift in the market can be seen across the country. These events encouraged multiple-night stays in surrounding towns near the excursion train stations. Many railroads across the county have capitalized on this growing trend. The analysis also mentioned that excursion rail could balance a region's desire for increased tourism while preserving rural character.

Northern Shenandoah Rails with Trails Analysis

Stone Consulting Incorporated, 2024

Summary Briefing Memo

A one-page summary memo stated that this report shares the differences between types of trail designs and construction, such as accessible versus recreational trails. It addresses common misconceptions about Rails-With-Trails and provides examples. It notes that safety approaches in trail design are not federally standardized, leaving it to the discretion of the trail designer and the railroad. It also states that the cost of any trail depends on its design, size, designation, and other factors. The memo mentions that the document shares the relationship between rail and trail use varies with the seasons and it suggests examining nationwide examples of best RWT practices. It is suggested that the original document be obtained to better understand the content mentioned.

Rail and Trail Assumptions

The Shenandoah Corridor project, as outlined in the Northern Shenandoah Rails with Trails Analysis, aims to add a rail system alongside the existing trail, targeting different visitor demographics and providing transportation cost benefits to local businesses. Despite challenges such as resistance from owning railroads due to liability concerns, the project, which is part of the 343 rails-with-trails in the U.S., assumes adequate right of way width for both rail and trail, with the trail corridor on parallel and cantilevered bridge designs. The project's five-year plan includes restarting initial rail operations, constructing a locomotive storage and maintenance shop, and reaching a projected 'plateau' level of ridership, with its success beyond the fifth year dependent on macroeconomic events, overall tourism visitation, and potential revenue growth from the transload freight market. The report does not define minimum setbacks or typical sections. The report assumes a $1 million per mile cost estimate for constructing a parallel trail.

Tourism Visitation Assumptions

The report shared that the restoration of the rail corridor for tourism purposes is based on the assumption that a ridership base of 75 to 100,000 is achievable in the Virginia market with a skilled operator who can command the event-based market. The success of excursion railroads in the northeast during the fall foliage seasons, particularly October, does not coincide with peak trail activity, benefiting regional hospitality and small businesses. The 4th quarter, mostly family groups with children and not weather-dependent, increases hospitality demand in a typically declining quarter. A new excursion railroad operation experiences a 2–3-year period of rapid growth due to its novelty and rail enthusiasts' interest, with its impact determined by the ability to hold overnight visitation and develop evening events.

The Freight and Resulting Business Impact

The NSRT analysis highlighted the significant impact of reintroducing rail freight services to the valley, noting the region's strategic location and excellent transload and warehousing opportunities poised to benefit. However, the complexity of the current freight market and the need for a multi-modal logistics approach make forecasting challenging. The growth of short line transload businesses nationwide indicates potential for local marketing and frequent service development. The report's conclusions regarding the business impact of rail restoration include:

1. Shenandoah County is expected to benefit from rail service redevelopment, enhancing local businesses' competitiveness due to increased trucking costs and declining competitive pricing in the trucking sector.
2. Despite Norfolk Southern's withdrawal from new opportunities, the potential for lower transportation and commodity prices, direct employment, and business stability are positive outcomes.
3. Redeveloping rail service also enhances the value of existing industrial property by subjecting all freight costs to rail competition, extending local companies' reach to compete in new areas.
4. The strong local need for inbound and agricultural commodities, coupled with a robust regional propane market, indicates growth opportunities.

Operational and Management Structure Alternatives

The analysis noted that historically, railroads were for-profit corporations that obtained state charters, raised capital, and built and operated their own railroads. Many were refinanced and absorbed into larger systems. Norfolk and Western merged with Southern Railway in 1982. This merger consolidated two previously competitive railroads under one umbrella. Norfolk Southern expanded significantly in 1998 with the acquisition of half of Conrail, leading to inflated book values due to overpayment. As a result, Norfolk Southern has often leased, rather than sold, excess routes and lines to avoid recognizing a real estate value loss. The key issue is that if Norfolk Southern retains any underlying control or ownership in a transaction, they remain in the liability path as an owner. This means they can dictate insurance terms and control negotiations over interchange rights, passenger use, rates, etc. If any trail or excursion activity is to result, Norfolk Southern must make a clear sale, not a lease, of the entire line, including real estate. The key in many cases is the need to preserve the railroad asset through local, rather than corporate control, and to contain the liability insurance costs and exposure so that excursion operations are financially feasible for community benefits. The analysis mentioned that the prosperity of short line freight and excursion railroads over shared trackage involves various organizational and operational strategies:

- **Direct purchase of the line for freight and excursion; for-profit basis:** Corporations can directly purchase a branch for freight and excursion, gaining control over real estate, insurance, and operations. This method offers transaction speed and property control but requires significant capital and continuous profitability to retire acquisition debt.
- **State agency purchase of line with direct operational control:** A state agency can purchase a railroad line, offering extensive funding for rehab and operations, and control over liability limits. However, this approach is subject to political budget reviews and continuous privatization scrutiny.
- **State agency purchase with leased operator(s):** A state agency can buy a railroad line and lease operational rights, providing extensive funding for rehab and operations. However, state law governs

contractual limits, requiring periodic contract rebidding and discouraging operator investment due to short contract terms.

- **Local agency purchase with direct operational control:** A local agency can purchase a railway line and assume full operational control, offering complete local control of operations. However, it is subject to local budgets, political considerations, and full FRA/Railroad Retirement considerations, effectively becoming a "Railroad Department" within a municipality.
- **Local agency purchase with operator lease for freight and/or excursion:** A local agency can purchase a railroad and lease it to operators for freight and/or excursion, which is a common arrangement nationwide. However, contractual limits on operator contract duration may deter capital maintenance or improvements, and a detailed operating agreement, financial disclosures, and periodic requalification of the operator are required.
- **Nonprofit owner with full excursion and freight rights:** A nonprofit organization can own all property and assets, and form a subsidiary to handle freight operations, with potential profitability from freight operations. However, they face extensive Federal Railroad Administration regulation and cost, and complications with the IRS for the affiliated for-profit company.
- **Nonprofit owner with full excursion and contracted freight rights:** A nonprofit organization can control all property and assets, and contract with a short line freight carrier for all regulated rail activity, retaining marketing and sales control. However, the regulatory 'split' may cause confusion in management responsibility for track and regulatory authority.

Typical at Grade Crossings

Virginia Department of Transportation, 2018

This document contained six at-grade crossing types at various locations along the alignment where the proposed trail and a roadway would intersect. All the diagrams assumed that only the trail would be constructed, and the rail would be removed. Crossing types included were:

Typical Crossing at Signalized Intersection

Typical Mid-Block Crossing

Dedicated Pedestrian Traffic Signal

Typical Entrance/Driveway Crossing

Typical Mid-Block Crossing with Limited Sight Distance

Typical Mid-Block High-Speed Crossing with Limited Sight Distance

National Historic Register Listings along the Proposed Shenandoah Valley Rail Trail

This document is a list of the National Historic Register Listings along the proposed trail alignment with descriptions of each listing.

Economic Impact & Funding Opportunities

Economic Impact – A Proposed Rail-to-Trail Shenandoah Valley

CHMURA Economics & Analytics, 2018

Two Economic Impact studies were produced to measure the effect the rail trail would have on the economy in the area. In a conservative scenario, the Chmura Economic Impact study estimated the proposed trail would attract 195,924 visitors per year after it targeted opening in 2030. Visitors spending would generate an estimated $10.8 million per year and would support 98 new jobs in Shenandoah and Rockingham County. The combined tax revenues for those two counties and eight towns along the trail would generate an estimated $245,661 per year from 2030 onward. In a more optimistic scenario, Chmura estimated the proposed trail would attract 280,334 visitors per year from 2030 onward. Visitor spending would generate an estimated $15.5 million

per year from 2030 onward and would support 140 new jobs in the region. The combined tax revenues for localities along the trail were estimated to be $351,443 per year from 2030 onward.

Economic Impact of the Proposed Shenandoah Rail Trail

Alliance for the Shenandoah Valley, 2021

The second Proposed Shenandoah Rail Trail impact study stated that the additional spending, jobs, income, and taxes from the new tourist spending would impact the three-county region. A detailed economic model for the region was used to estimate the significant economic impacts expected from the trail. The new annual spending was projected to be $32.3 million (in 2030 dollars) a year when the trail is fully opened to the public. An estimated 319 new jobs would be generated in 2030 with the majority in tourist-related businesses including restaurants, hotels and motels, and retail stores. The expanded economy is expected to generate an estimated $10 million in 2030. The study stated a higher tax revenue of $1.7 million for counties, $200 thousand for towns, and $600 thousand for the state would be produced each year. Although the estimates for the trail construction and maintenance would differ with the addition of the railroad rehabilitation, the economic impact may still be valid.

Property Valuation

Feasibility Study for a Linear Park in the Shenandoah Valley

Department of Conservation and Recreation, 2021

In November of 2021, DCR published a feasibility study for a linear park in the Shenandoah Valley region of Virginia from the Town of Front Royal to the Town of Broadway. The study was divided into three sections: feasibility, timing, and anticipated revenues and costs. The Shenandoah Rail Trail Exploratory Partnership was formed with the vision of transforming the unused rail corridor into a multi-use trail. A field survey was performed in May 2021 to determine the requirements for a rail-trail project and to develop cost estimates. The study noted that the total cost per mile of $1.1 million to $1.3 million is slightly higher than the average rail-trail project due to the number of structures along the alignment. Public surveys and outreach noted widespread support for the project with some concerns raised by a few adjacent landowners. Demographic research documented latent demand for bike/ped infrastructure in the study area. Research showed that there is a need for more parks in the study area. There are not enough federal, state, or local parks to meet demand in Northern Virginia. The report stated that a linear park from the Town of Broadway to the Town of Front Royal is feasible, barring costs for construction are not too great. The study went on to mention that the Shenandoah Valley Rail Trail could have the potential to provide increases in residential property values of 3% to 4% within the more developed towns along the corridor. It would also be possible that the rail trail's influence may diminish in the more rural areas between population centers with a minor to no impact on property values. Since this study was produced to remove the rails, its results may not be useful in producing a rail-with-trail alternative. Besides the obvious dismissal of the construction cost, the property value estimates may be invalid as well.

Property Valuation - Shenandoah Valley Rail-Trail Feasibility Study

Virginia Department of Transportation, Department of Conservation and Recreation, Department of Rail and Public Transportation, 2021

The Virginia Department of Transportation, in collaboration with the Department of Conservation and Recreation and the Department of Rails and Public Transportation, conducted a feasibility study on the Shenandoah Valley Rail Trail. The study aimed to assess the potential impacts of the rail trail facility on property valuations along the study corridor. The study team planned to use a statistical, hedonic model to determine a pricing premium associated with the trail facility by comparing the price of residential properties with similar attributes, except proximity to the subject trail. The Shenandoah Valley Rail Trail study corridor is characterized by its considerable variation, with an overall length of 48.5 miles and numerous small towns along the rail line, connected by rural, agricultural land uses. Each town along the rail line contains unique economic and demographic characteristics that may translate to different priorities and values in terms of both residential real estate considerations and perceived importance of recreational trails. The study team determined that a literature review and summary of similar study efforts would be more appropriate in the consideration of property value influences based on the

potential 48.5-mile rail trail corridor. Based on the review, it was conceivable that the Shenandoah Valley Rail Trail, through successful planning and design, could have the potential to provide modest increases in residential property values of 3% to 4% within the more developed towns along the corridor. However, the rail trail's influence may diminish in the more rural areas between population centers with a minor to no impact on property values.

APPENDIX I: REVIEW OF RAILS-WITH-TRAILS WITH REDUCED SEPARATION

Introduction

There is a lack of nationwide standards for physical, lateral, and vertical separation between railways of different types and traffic and shared-use trails in rail-with-trail applications. This memo was composed to identify locations and corridors where trails have been built less than 11 feet from the edge of an adjacent railway.

Rails-with trails were identified from the Trail Link database [9] compiled by the Rails to Trails Conservancy. There were 400 identified rails-with-trails in this database from throughout the United States. Rails-with-trails were reviewed for rail-with-trail segment length and overall corridor length. To compare with the 48.5-mile-long Shenandoah Valley Rail-with-Trail corridor, all 21 trails identified as having more than 10 miles of trail adjacent to rail were inspected. 97 trails (76 between 3 and 10 miles of rail-with-trail) were identified with more than 3 miles of rail-with-trail. 98 corridors were identified that were mostly if not all rails-with-trails, with minimal potential for separation of trail from rail in the future. Note that these were not exclusive groups.

Onsite trail inspection was not possible, so plan review was conducted for 103 of the 400 trails by reviewing their entire length in plan, aerial, and Google Streetview. Where possible, Google Streetview was used to approximate distance between rail and trail. Images from Streetview or the Trail Link database are shown below, where available.

In total, 103 corridors were reviewed as part of this exercise for trail segments or points where the edge of rail was within 11' of the edge of the trail. The selection criteria these 103 trails comprised trails with over 10 miles of rail-with-trail, trails with over 3 miles of rail-with-trail, and trails with over 80% rail-with-with trail. Of the 103 corridors inspected, only 18 had segments or points where the distance between rail and trail was less than 11'. These were trails that were within 11' of the edge of railway for some distance, from several feet to several miles, with or without physical barriers like a fence or railing. The process for identifying the 18 corridors with less than 11' separation is diagrammed in Figure 1. The rail-with-trail corridors identified in this report are summarized in Table 1.

Eighty-five of the 103 trails surveyed had more than 11' of separation throughout their corridors, with most trails separated from nearby railways by vegetated ditches or berms wider than 11'. Half of the 18 corridors with less than 11' separation had a fence, railing or other barrier between the rail and trail at their closest segments. Seven of the 18 trails had nearby freight operations on nearby railways, while 4 railways had excursion railways. Of these, only 5 freight railways were separated from the trails by a physical barrier. Among the 11 freight or excursion rail services, there was a slight (5 inches) difference between average separation with fences and without, with slightly longer distances for fenced corridors. Five of the adjacent railways were transit corridors, all of which were separated from the trail by fences. Along their closest segments, the trail is within the rail right of way for 14 of the 18 corridors.

[9] TrailLink: Trail Maps & Guide for Biking, Hiking & Running Trails | TrailLink at http://traillink.com

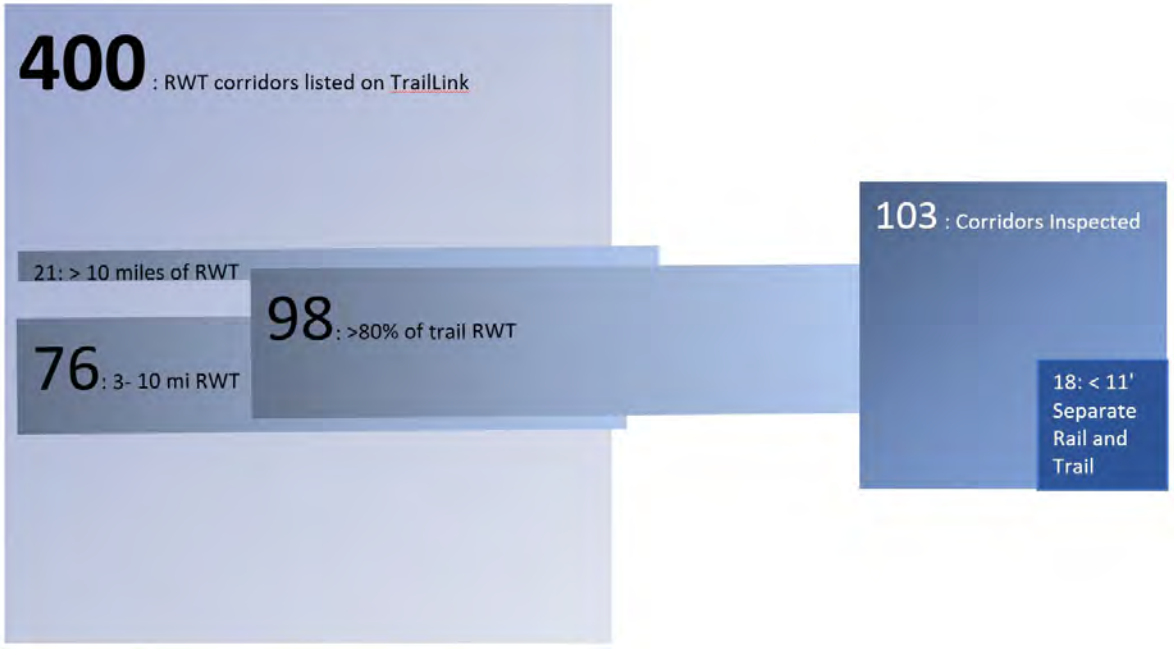


Figure 1: Selection criteria and search process to identify rail-with-trail corridors with less than 11' separation. The areas of the diagram match the number of corridors considered.

Big River Crossing – AR & TN

Location: Between West Memphis, AR & Memphis. TN, Crossing the Mississippi River.

Length: 1 mile trail, with 0.9 miles on a rail bridge

Typical Separation: Less than 6', but vertically separated with rail above shared use path (Figure 2).

Date Established: Shared use path opened in 2016 on structure attached to north side of rail bridge built in 1916.

Rail Use: Active Freight Rail line crossing on two tracks on this bridge.

Figure 2: Shared use path attached to the side of the Harahan Rail Bridge across the Mississippi River.

This shared use path was built on the north side of the Harahan rail bridge a century after the rail bridge was built. The 2-track rail bridge still carries east-west rail traffic across the Mississippi River between Arkansas and Tennessee. More information can be found at Big River Crossing | Arkansas Trails | TrailLink.

El Dorado Trail - CA

Location: Between Camino, CA & Shingle Springs, CA

Length: 35.9 mile trail, with 25.3 miles coincident with rail

Typical separation: Various trail alignments along corridor, including gravel between ties (0' separation) and separate paved paths. The eastern section is not adjacent to any rail, beginning as paved shared use path >11' from inactive rail at Missouri Flat Rd in Placerville. The paved trail is within 8' of the inactive rail line from Placerville (Figure 3). At El Dorado Rd, the trail is no longer paved, but vertically and laterally separated from the rail line (Figure 4). At Mother Lode Dr, the trail is fully within the space between the rails of the inactive railway (Figure 5). The trail continues in this condition past Shingle Springs Rd. An example of the El Dorado Western Excursion trains can be seen at the crossing with Sunset Lane in Shingle Springs (Figure 6).

Date Established: The El Dorado trail was opened in 2022

Rail Use: There are tourist excursion trains on the western section of rail-with-trail on Sundays between Shingle Springs and El Dorado Station.

Figure 3: El Dorado Rail Trail crossing Forni Rd in Placerville, CA with reduced separation between the inactive rail line and the paved, shared use, two-way trail.

Figure 4: El Dorado Trail at El Dorado Rd, showing unpaved, single-track to the left of the railway.

Figure 5: El Dorado Trail crossing Mother Lode Dr, showing trail between the rails.

Figure 6: The El Dorado Trail at Sunset Ln in Shingle Springs, CA, showing an example of the excursion trains run by the El Dorado Western (based on a Speeder locomotive).

The route follows two former rail lines, the Southern Pacific Railroad and Michigan-California Railroad. A small section of the railroad tracks in the corridor is still in occasional use, although gravel has been placed between the ties to make mountain biking easier. The El Dorado County Historical Museum operates excursion trains on the El Dorado Western Railroad on Sundays between the Shingle Springs Depot (4241 Mother Lode Drive) and the El Dorado Station (6000 Oriental Street). More details at El Dorado Trail | California Trails | TrailLink.

Rose Canyon Bicycle Path - CA

Location: Connecting Gilman Dr and La Jolla Colony Dr with Santa Fe St in San Diego, CA.

Length: 1.1 Miles, all adjacent to rail and I-5 corridor

Typical separation: Trail alignment varies in distance to rail but separated by less than 11' for 0.7 miles of several segments. Entire trail is separated from commuter rail line by fence (Figure 7).

Date Established: 2021

Rail Use: Commuter Rail and Amtrak

Figure 7: View from the Rose Canyon Bicycle Trail, showing Proximity to Rail Transit Line and Fencing. Figure from traillink.com.

The rail corridor next to this trail serves both San Diego's light rail transit and the Amtrak Pacific Sunliner routes. The trail's smooth surface is ideal for a variety of activities, including in-line skating and pushing a baby stroller. More information can be found at [Rose Canyon Bicycle Path | California Trails | TrailLink.]

West Rail Line Bike Path - CO

Location: Connecting Denver and Lakewood, CO.

Length: 6.3 Miles, with 3.63 mile adjacent to light rail line

Typical separation: Less than 4' separation, protected by railing at narrowest points (Figure 8).

Date Established: 2013

Rail Use: Light Rail

Figure 8: Bike Trail Adjacent to West Light Rail line in metro Denver.

Colorado's West Rail Line Bike Path parallels the W Line, a new light rail corridor through Denver and Lakewood that was known during construction as the West Rail Line. The Regional Transportation District (RTD), the public transit agency for the 8-county Denver area, opened the separated pathway—a rail-with-trail project—along with the new rail corridor in 2013. More information can be found at West Rail Line Bike Path | Colorado Trails | TrailLink.

Cardinal Greenway - IN

Location: Southeast from Jonesboro, IN to Richmond, IN

Length: 62 miles, with only 4.5 miles adjacent to rail

Typical separation: less than 11' In some locations where right of way is constrained, protected from railway by fence (Figure 9).

Date Established: Last link opened between Losantville and Mt. Pleasant in 2007

Rail Use: Section of corridor near Marion to the north is adjacent to active Norfolk Southern railway.

Figure 9: Cardinal Greenway next to Rail at Historic Passenger Rail Station in Muncie, IN.

For a segment at the beginning of the Cardinal Greenway into Marion, the path runs adjacent to and then crosses an active Norfolk Southern line as the greenway passes through a flat, rural landscape that highlights industrial and farmland scenery. This portion of the trail is a rail-with-trail and separated from the active rail line by vegetation. The paved pathway is open from sunrise to sunset, and it's well-maintained and mostly flat for its entire length. More information can be found at Cardinal Greenway | Indiana Trails | TrailLink.

Harper's Ferry – MD & WV

Location: Between Maryland and West Virginia, Crossing the Potomac River.

Length: 0.14 miles on a 0.14 mile rail bridge

Typical Separation: Less than 6', separated from the railway by an anti-climbing fence (Figure 10).

Date Established: Shared use path opened in 2016 on structure cantilevered from the South side of the bridge.

Rail Use: Amtrak and MARC Commuter rail

Figure 10: Harper's Ferry Railroad Bridge Trail across the Potomac, facing West Virginia.

This bridge crosses the Potomac River near its confluence with the Shenandoah River at Harpers Ferry, West Virginia. It features a cantilevered section for pedestrian access, connecting the Appalachian Trail from West Virginia to Maryland and linking to the Chesapeake & Ohio Canal National Historic Park (C&O Canal Towpath). There was a significant event in December 2019, when multiple cars of a train owned by CSX derailed from the railroad bridge. This incident damaged a portion of the pedestrian footbridge attached to the railroad bridge, which had prevented access across the Potomac River. The trail and bridge reopened by July 2020. For further information see Harpers Ferry Railroad Bridge | Maryland Trails | TrailLink.

Santa Fe Rail Trail - NM

Location: Southwest from Santa Fe to Lamy, NM

Length: 16.8 miles, with 15.4 miles adjacent to or near commuter rail line

Typical separation: Less than 11' with wire barrier in the northern sections of the trail near downtown and the northern terminus of the Albuquerque-Santa Fe Rail Runner Commuter Line (Figure 11).

Date Established: 2010

Rail Use: Commuter Rail & Santa Fe Southern Railway.

Figure 11: Santa Fe rail-with-trail next to Rail Runner Commuter Rail in Downtown Santa Fe.

The pathway parallels the Santa Fe Southern Railway, an active tourism line, in a rail-with-trail configuration. A traditional rail-trail on its northern end, the rail is paved for nearly 4 miles between the Railyard and Rabbit Road in Santa Fe. For more information see Santa Fe Rail-Trail | New Mexico Trails | TrailLink.

Camp Chase Trail - OH

Location: Between Columbus, OH and London, OH, to the west of Columbus

Length: 15.9 mile trail, with 12.55 miles next to railway

Typical Separation: Paved Shared use Path with <11' separation between active freight railway and trail at western end of trail (Figure 12). Other sections to the east have wider separation with fencing between the railway and trail or lateral separation > 15'.

Date Established: 2015

Rail Use: Active freight rail line adjacent to trail

Figure 12: Western end of the Camp Chase Trail, with nearby tank rail cars approved for flammable liquid storage.

To create the Camp Chase trail, the Columbus and Franklin County Metropolitan Park District worked with the Camp Chase Rail Company to manage the regulations and construction requirements needed to acquire an easement alongside active railroad tracks, finalizing the easement in 2009. Further information can be found at Camp Chase Trail | Ohio Trails | TrailLink and Ohio's Camp Chase Trail - Rails to Trails Conservancy | Rails to Trails Conservancy.

Celina Coldwater Bikeway - OH

Location: Connecting the Ohio towns of Celina and Coldwater.

Length: 4.61 miles, all next to rail line

Typical Separation: Less than 11' separating edge of rail with edge of trail for some segments but protected by tall fence (Figure 13).

Date Established: 1980s

Rail Use: Freight Rail on an old Penn Central Line

Figure 13: Celina Coldwater Bikeway separated from rail by 10'-12' and a fence. Picture provided by TrailLink.com.

The rural route between Celina and Coldwater is dominated by views of the active railroad line along the old Penn Central line to the west and cultivated fields to the east. More information can be found at Celina Coldwater Bikeway | Ohio Trails | TrailLink.

Simon Kenton Trail - OH

Location: Connecting Springfield and Bellefontaine, OH.

Length: 35.5 mile trail, with 23.83 miles next to rail

Typical separation: Less than 10’ separation between rail and trail for long sections of the RWT corridor north of Urbana (Figure 14).

Date Established: The first section of the trail was opened in 2001 and has been expanded since.

Rail Use: Active freight rail line for 16 miles between Bellefontaine and Urbana.

Figure 14: Simon Kenton Trail showing less than 10' separation between rail and trail.

Between Bellefontaine and Urbana, OH, the trail is chip-sealed and separated from the rail line by 10-30’ in sections. South of Urbana and into Springfield the trail is paved and separated from the rail line by more distance. More information available at Simon Kenton Trail | Ohio Trails | TrailLink.

T.J. Evans Panhandle Trail - OH

Location: Between Hanover and Newark in Licking Co., OH

Length: 9.8 mile trail, all adjacent to trail

Typical separation: Less than 11' separation for most of the corridor, with fence separating trail from rail (Figure 15).

Date Established: 2000

Rail Use: Ohio Central rail freight

Figure 15: T.J. Evans Panhandle Trail within 11' of rail line.

Beginning just east of downtown Newark, the T. J. Evans Panhandle Trail runs parallel to active tracks of the Ohio Central railroad. More information can be found at T. J. Evans Panhandle Trail | Ohio Trails | TrailLink.

Great Allegheny Passage – PA & MD

Location: Connection of Pittsburgh, PA with Cumberland, MD

Length: 150 mile trail, mostly near rail, but with 24.2 miles adjacent to rail

Typical separation: Section with less than 11' separation between Frostburg, MD and Cumberland, MD (Figure 18), including section in Brush Tunnel with trail within 6' of rail near Corriganville, MD (Figure 16 & 17).

Date Established: The first section opened in 1986 and the trail was completed in 2013

Rail Use: Active Freight & Excursion trains by the Western Maryland Scenic Railroad.

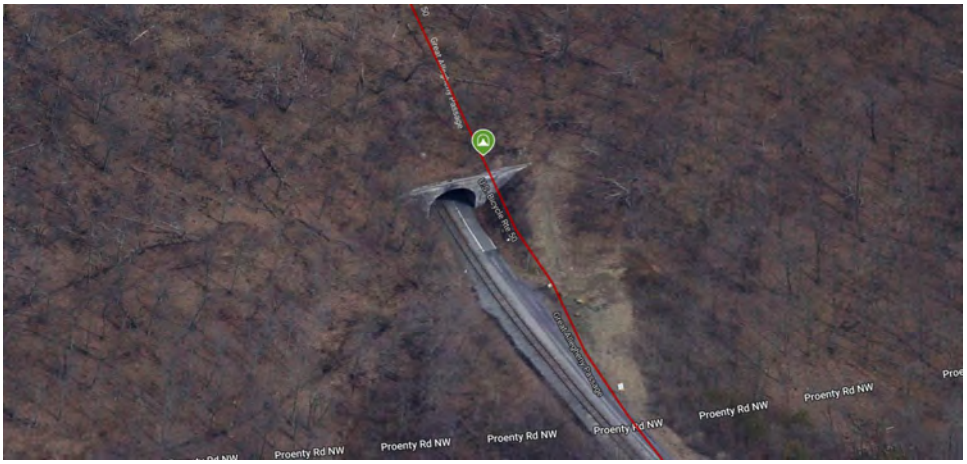


Figure 16: South entrance of the Brush Tunnel near Corriganville, MD, showing rail-with-trail.

Figure 17: The entrance to the Brush Tunnel, showing less than 6' separation between rail and trail and the scale of the excursion train. Photo provided by wmsr.com.

Figure 18: Rail within 6' of edge of trail at Helmstetter's Curve west of Cumberland, MD.

The trail parallels active freight rail lines South of Pittsburgh but is more than 20' separated from the active rail line and separated by fences and property lines. Only east of Frostburg, MD does the Western Maryland Scenic Railroad operate Excursion trains run once or twice in each direction from Cumberland on Thursday, Friday, Saturday, and Sunday during the summer and every day of the week in the fall. More details on the excursion train service in Maryland is available at https://wmsr.com/. More information on the trail is available at Great Allegheny Passage | Maryland Trails | TrailLink . An excerpted video is available at YouTube .

Five Star Trail - PA

Location: Greensburg, PA

Length: 9.8 mile trail, all adjacent to rail

Typical separation: Less than 11’ separation from active freight line (Figure 19).

Date Established: 1996

Rail Use: Active Freight

Figure 19: Five Star Rail-with-Trail in Greensburg, PA, showing less than 4' separation between rail and trail.

The Five Star rail-with-trail shares the route with the Southwest Pennsylvania Railroad, a short-line railroad that runs trains from Greensburg south to Smithfield. More information can be found at Five Star Trail | Pennsylvania Trails | TrailLink.

Schuylkill River Trail - PA

Location: Between Philadelphia, PA and Berks County, PA

Length: 82.4 mile trail, with 10.9 miles next to rail in several segments

Typical separation: Most of the corridor has greater than 20’ separation between edge of rail and edge of trail. There is <11’ separation at a point near a commuter rail transit lines near Norristown, PA (Figure 20) as well as near Conshohocken commuter rail station (Figure 21). Shared use path separated from commuter railway by a 4’ fence.

Date Established: 2022

Rail Use: SEPTA commuter rail line and planned intercity rail line.

Figure 20: Schuylkill River Trail at Norristown Transportation Center showing brief separation of less than 11' under structure for the SEPTA R100 High Speed Line.

Figure 21: Schuylkill River Trail near the Conshohocken Commuter Rail Station, showing less than 11' separation between the railway and the trail with fencing.

The Schuylkill River Trail shares some segments of its corridor with the active Norfolk Southern Railroad and the Reading Blue Mountain & Northern Railroad, as well as SEPTA commuter rail. Former rail lines along this route include the Reading Railroad Schuylkill and Lehigh Branch, the Pennsylvania Railroad Schuylkill Valley Line, the Reading Railroad Main Line to Philadelphia and the Reading Railroad Main Line to Pottsville. More information can be found at Schuylkill River Trail | Pennsylvania Trails | TrailLink and at Pennsylvania's Schuylkill River Trail - Rails to Trails Conservancy | Rails to Trails Conservancy.

Heritage Rail Trail County Park - PA

Location: Between York, PA and Freeland, MD at the Maryland State Line

Length: 27.4 mile trail, with 20.2 miles next to rail and

Typical separation: Less Than 11' in same right of way (Figure 22), with southern the 10 miles along an active excursion train rail line (Figure 23). There are several bridges shared by the active railway and the trail (Figure 24).

Date Established: 1992

Rail Use: Excursion trains in use along rail line to south near Maryland, south of York, PA

Figure 22: Heritage Rail Trail County Park in York, PA, showing less than 4' separation between the railway and the paved shared use path. Railway is inactive in this section.

Figure 23: Southern Section of Heritage Rail Trail, showing stone path next to active excursion rail line.

Figure 24: Rail-Trail Bridge in Heritage Rail-Trail near York, PA.

The southernmost ten miles of the trail travel primarily between Hanover Junction and New Freedom, where the trail parallels an historic and active rail line. Trail users can expect regular train traffic and are warned to *look both ways before crossing the tracks at any point*. An 1860s steam locomotive, the "Steam Into History" ride is active as an excursion train along this trail. More information at Heritage Rail Trail County Park | Pennsylvania Trails | TrailLink.

Montour Trail - PA

Location: Surrounding Pittsburgh to the south and west through Allegheny and Washington counties, PA

Length: 61.5 miles of trail, with 3.5 miles adjacent to rail

Typical Separation: Less than 11’ in section between Southview Rd and Millers Run, with constrained right of way for rail and trail (Figure 25).

Date Established: 1985

Rail Use: Inactive

Figure 25: Grade crossing at Southview Rd near McDonald, PA, showing less than 11' separation between Montour Trail and rail.

This trail follows an inactive rail line for 3.5 miles, with separation of more than 14’ between the rail and the trail for most of the alignment, except for the 0.3 mile section shown in Figure 26, above. More information is available at Montour Trail | Pennsylvania Trails | TrailLink

James White Greenway - TN

Location: Part of the greenway network for, Knoxville, TN

Length: 1 mile of trail, all adjacent to rail

Typical Separation: Less than 11' for most of the corridor, with the railway 2-3' higher than the trail and separated by a 4' high fence (Figure 26).

Date Established: in place by 2016

Rail Use: Freight rail

Figure 26: The James White Greenway within 11' of the edge of rail.

This trail parallels both the Tennessee river and the Knoxville and Holston River short line railroad tracks. It is part of the 113 mile Knoxville Greenway network. More information is available at James White Greenway | Tennessee Trails | TrailLink.

Mount Vernon Trail - VA

Location: Connecting Arlington, Alexandria, and the Mount Vernon estate in Fairfax Co.

Length: 18 miles of trail, 0.5 miles adjacent to inactive rail

Typical Separation: Less than 11' for 0.5 miles near inactive rail line, with only grassed verge separating the railway from the trail (Figure 27).

Date Established: 1972

Rail Use: Inactive

Figure 27: Mount Vernon Trail crossing Montgomery Street north of Old Town Alexandria, showing less than 6' separation between the trail and inactive rail line.

This trail connects three developed jurisdictions and Reagan National airport (DCA) in Northern Virginia. In Alexandria, the trail parallels an inactive rail line, often within 11 feet. Despite the modern crossing infrastructure, the last regular user of this railway was commuter rail transit ending in 1932. More information is available at Mount Vernon Trail | Virginia Trails | TrailLink

Summary

Table 1 presents a summary of the characteristics of the 18 rail-with-trail corridors identified to have less than 11' separation between the rail and

Table 1: Summary of 17 Rail-With-Trail Corridors with Less Than 11' Separation between Rail and Trail Edges

	State	Location	Open Year	Miles	Miles RWT	Miles RWT <11'	Right of Way	Separation	Protect Structure	Rail Service	Train Type	Rail User
Big River Crossing	TN-AR	TN-AR	2016	1	0.9	0.9	Bridge	6-11'	Fence	Freight	Freight	Union Pacific
El Dorado Trail	CA	Camino-Shingle Springs	2022	35.9	25.3	22	Rail ROW	0-11'	None	Small Excursion	Speeder	El Dorado Western
Rose Canyon Bicycle Path	CA	San Diego	2021	1.1	1.1	0.7	Highway	6-8'	Fence	Transit	Light Rail & Intercity	San Diego MTA & Amtrak
West Rail Line Bike Path	CO	Denver-Lakewood	2013	6.3	3.63	1.5	Rail ROW	2-8'	Railing	Transit	Light Rail	Denver MTA
Cardinal Greenway	IN	Jonesboro-Richmond	2007	62	4.5	0.1	Rail ROW	8-11'	Fence	Short Line Freight	Freight	Norfolk Southern
Harper's Ferry	MD & WV	MD & WV	2016	0.14	1.4	0.14	Bridge	6'	Fence	Transit	Commuter & Passenger Rail	MARC & Amtrak
Santa Fe Rail Trail	NM	Santa Fe	2010	16.8	15.4	1.6	Rail ROW	4-8'	Railing	Transit	Commuter	Rail Runner
Camp Chase Trail	OH	Columbus	2015	15.9	12.55	1	Rail ROW	8-11'	None	Short Line Freight	Freight	Camp Chase Railway
Celina Coldwater Bikeway	OH	Celina-Coldwater	1989	4.61	4.61	0.2	Rail ROW	8-11'	Fence	Freight	Freight	Penn Central
Simon Kenton Trail	OH	Springfield-Bellefontaine	2001	35.5	23.8	16	Rail ROW	6-11'	None	Freight	Freight	CSX

	State	Location	Open Year	Miles	Miles RWT	Miles RWT <11'	Right of Way	Separation	Protect Structure	Rail Service	Train Type	Rail User
T.J. Evans Panhandle Trail	OH	Hanover-Newark	2000	9.8	9.8	9.8	Rail ROW	6-8'	Fence	Freight	Freight	Ohio Central
Great Allegheny Passage	PA & MD	Frostburg-Cumberland	2013	150	24.2	5	Rail ROW	6-11'	None	Excursion	Full-Sized	Western Maryland Scenic Railroad
Five Star Trail	PA	Greensburg	1996	9.8	9.8	8	Rail ROW	2-11'	None	Short Line Freight	Freight	Southwest Pennsylvania
Schuylkill River Trail	PA	Philadelphia-Berks Co.	2022	82.4	10.9	0.1	Rail ROW	8-11'	Fence	Transit	Commuter	SEPTA
Heritage Rail Trail County Park	PA	York	1992	27.4	20.2	10	Rail ROW	8-11'	None	Excursion	Full-Sized	Steam Into History
Montour Trail	PA	Allegheny Co. - Washington Co.	1985	61.5	3.5	0.3	Rail ROW	6-8'	Fence	Inactive	Inactive	
James White Greenway	TN	Knoxville	2016	1	1	1	Rail ROW	8-11'	Fence	Excursion	Full-Sized	Three Rivers Rambler
Mount Vernon Trail	VA	Northern Virginia	1972	18	1	0.5	Unk.	6-8’	None	Inactive	Inactive	

APPENDIX J: NATIONWIDE RAILS-WITH-TRAILS INVENTORY

According to the Rails-to-Trails Conservancy, there are 2,423 rail trails extending over 25,934 miles total. Of these trails, 448 have rails-with-trails segments covering 1,117 miles total. The rail trail with the most rail-with-trail coverage is the El Dorado Trail in El Dorado County, California, which has over 25 miles of rail-with-trail segments. If this project were to be completed as a rails-with-trails project, it would be the longest in the category in the United States. The figure below shows more rail-with-trail facts. The table on the following page provides the names, locations, and distances of the 448 rail-with-trail segments in the US.

Data sourced from the Rails-to-Trails Conservancy and can be found here.

Trail Name	State	Total Trail Length (miles)	Rail-With-Trail Length (miles)
Chase Trail	AK	14	9
Tony Knowles Coastal Trail	AK	11	1
Decatur Trail	AL	14	0.4
Historic Bridgeport Walking Trail	AL	0.8	2
Redstone Gateway Greenway	AL	0.5	0.16
Arkansas Missouri Trail	AR	0.75	0.6
Arkansas River Trail	AR	22.71	0.4
Frisco Trail	AR	2.39	0.6
Big River Crossing	AR, TN	1	0.9
Route 66 Trail	AZ	4.9	3
Yuma Crossing Bike Path (Colorado River Levee Multi-Use Path)	AZ	3.4	1.2
Alton Avenue Bike Trail	CA	1.8	1.8
Arroyo Simi Bike Path	CA	8.6	0.13
Baine Avenue Trail	CA	0.75	0.6
Bear Creek Bikeway	CA	3.6	0.6
Cal Park Hill Tunnel	CA	2.5	2.5
Chico State Bike Path	CA	2	1.9
Chuck Pontius Commuter Trail	CA	5.5	1.8
Coastal Rail Trail	CA	4.7	4.7
East Bay Greenway	CA	0.5	0.5
El Dorado Trail	CA	35.8	25.3
Embarcadero Bike Path	CA	0.9	0.8
Exposition Line Bike Path	CA	5.22	5.22
Fillmore Bike Path	CA	3.8	1.4
Folsom Parkway Rail Trail	CA	2.9	2.4
Foss Creek SMART Pathway	CA	1.3	1
Goshen Avenue Trail	CA	5.8	5.8
Hoover Bike and Walking Trail	CA	2	2
Inland Rail Trail	CA	10.5	10.3
Joe's Trail at Saratoga De Anza	CA	1.4	1.2
Lincoln Hill Pathway	CA	1.4	0.5
Linear Park	CA	1.1	1.1
Manteca Tidewater Bikeway	CA	3.4	1.6
Martin Luther King, Jr. Promenade	CA	0.75	0.75
Napa Valley Vine Trail	CA	28.02	3.2
Northwestern Pacific Rail Trail	CA	0.8	0.8
Novato Downtown SMART Pathway	CA	0.9	0.8
Old Highway 40 Bike Path	CA	2.8	3
Omer Rains Coastal Bike Trail	CA	4.1	1.2
Orange Line Bike Path	CA	15.7	0.4

Trail Name	State	Total Trail Length (miles)	Rail-With-Trail Length (miles)
Petaluma SMART Pathway	CA	1.2	1.2
Railroad Safety Trail	CA	1.9	1.8
Richmond Greenway	CA	2.5	1.3
Rohnert Park/Cotati SMART Pathway	CA	3.7	3.7
Rose Canyon Bicycle Path	CA	1.1	1.1
Sacramento River Parkway	CA	8.6	2.8
San Clemente Beach Trail	CA	2.3	2.1
San Fernando Road Bike Path	CA	7.2	7.4
San Francisco Bay Trail *only portions not accounted for by other trails	CA	328	6.7
Santa Cruz Coastal Rail Trail	CA	2.5	0.35
Santa Fe Trail (Visalia)	CA	2.5	1.6
Santa Maria Valley Multi-Purpose Trail	CA	2.7	0.4
Santa Paula Branch Line Trail	CA	2.5	1.7
Santa Rosa SMART Pathway	CA	3.8	3.8
Sierra Bike Trail	CA	7.1	6.7
Walnut Trail	CA	3.4	3.4
Watsonville Rail Trail (Coastal Rail Trail Segment 18)	CA	1.2	0.25
Watts Towers Crescent Greenway	CA	0.2	0.2
Animas River Trail	CO	10.22	1.91
Arkansas River Trail (Pueblo)	CO	10.1	0.1
Eagle Valley Trail	CO	42	10
Inca Street Multi-use Trail	CO	0.75	0.75
Littleton Community Trail	CO	2.6	1.4
Long View Trail	CO	4.4	1.3
Mason Trail	CO	4.5	3.8
New Santa Fe Regional Trail	CO	17.9	4.3
Power Trail	CO	3.9	3.7
Union Pacific Trail	CO	0.6	0.6
West Rail Line Bike Path	CO	6.3	3.63
Wonderland Creek Greenway	CO	3	0.2
Yampa River Core Trail	CO	7	0.85
Derby Greenway	CT	1.97	0.2
Niantic Bay Boardwalk	CT	1.1	1.1
Metropolitan Branch Trail	DC, MD	7.9	2.46
Georgetown-Lewes Trail	DE	9.6	0.9
James F. Hall Trail	DE	1.8	1.16
Sorenson's Way	DE	1.4	0.1
Capital Cascades Trail	FL	2.7	0.1
Doctors Lake Drive Bike Path	FL	4.5	4.5
El Rio Trail	FL	5.12	0.11
Fred Marquis Pinellas Trail	FL	46	0.17

Trail Name	State	Total Trail Length (miles)	Rail-With-Trail Length (miles)
Gertrude's Walk	FL	0.25	0.2
John Yarbrough Linear Park Trail	FL	5.97	2.73
M-Path Trail	FL	9.4	9.35
Old Brick Road Trail	FL	5.4	5.4
Oldsmar Trail	FL	11	0.1
Orlando Urban Trail	FL	2.6	0.2
Kennesaw Mountain-to-Chattahoochee River Trail	GA	10.38	4.7
Augusta Canal National Heritage Area Trails	GA	7.9	0.6
Blind Willie McTell Trail	GA	1.1	0.9
East Point PATH	GA	1.4	0.3
Senoia Multi-use Trail	GA	1.5	0.2
Silver Comet Trail	GA	61.65	9.1
Stone Mountain Trail	GA	25.23	5.5
218 Trail	IA	1.43	0.69
Bellevue Rivervue Trail	IA	2.3	0.22
Cedar Valley Nature Trail	IA	70.6	5.55
Chautauqua Park Trail	IA	1.8	0.8
Clinton Discovery Trail	IA	9.8	0.47
Floyd River Trail	IA	3.2	1
Gay Lea Wilson Trail	IA	20.9	4.3
Indian Creek Trail	IA	3.86	0.7
John King Trail	IA	0.5	0.2
Jordan Creek Trail	IA	8.6	0.6
Linn Creek Recreational Trail	IA	10	1
North Ridge Trail	IA	6.5	2.3
Perry Creek Trail	IA	4.4	0.45
Prairie Farmer Recreational Trail	IA	20	0.7
Running River Trail System (Riverside Park)	IA	5.3	2.75
Sauk Rail Trail	IA	33.2	2.1
Southern Levy Trail	IA	0.7	0.7
Trolley Trail (Clear Lake/Mason City)	IA	7.5	0.9
Long Bridge Trail	ID	5.3	0.4
North Idaho Centennial Trail	ID	24	1.29
Chain O' Lakes Bike Path	IL	3.2	1.5
Constitution Trail & Historic Route 66 Trail	IL	50.5	17
Des Plaines River Trail	IL	56.1	3.2
East Prairie Bicycle & Walking Path	IL	1	1
Fox River Trail	IL	45.7	3.1
Great River Trail	IL	63.3	18.6
Green Bay Trail	IL	6.5	6.29
H.U.M. Trail	IL	3.5	3.22

Trail Name	State	Total Trail Length (miles)	Rail-With-Trail Length (miles)
Hickory Creek Bikeway	IL	3.7	0.8
Illinois & Michigan Canal State Trail	IL	79.5	9.2
Illinois Prairie Path	IL	58.52	3.6
Interurban Trail	IL	8.4	5
MCT Quercus Grove Trail	IL	18.4	2.26
MetroBikeLink Trail	IL	14	10.8
Prairie Trail	IL	26.4	10.12
Robert McClory Bike Path	IL	25.4	8.8
Rock Island Trail	IL	38.2	2
Rock River Recreation Path	IL	10	7
Skokie Valley Trail (Lake County)	IL	9.8	8.4
Stone Mill Trail	IL	1.5	1.5
Techny Trail	IL	3	0.5
Thorn Creek Trail	IL	17.2	0.24
Virgil L. Gilman Trail	IL	11.3	1.8
Wauponsee Glacial Trail	IL	22.3	0.66
McKinley Bridge Bikeway	IL, MO	1.2	0.4
Anderson Airport Trail	IN	1.5	0.67
Cardinal Greenway	IN	61	4.5
Dearborn Trails (Aurora - Lawrenceburg - Greendale)	IN	5.4	2.4
Fall Creek Trail	IN	6.9	0.4
Industrial Heritage Trail	IN	4.82	2.3
Lafayette Linear Park	IN	1.1	1.1
Little Turtle Waterway Trail	IN	1	0.45
MapleHeart Trail	IN	4.8	2
Ninth Street Trail	IN	1.3	0.85
Paradise Spring Riverwalk Trail	IN	0.82	0.25
Pigeon Creek Greenway Passage	IN	6.7	0.29
Polly Grimshaw Trail	IN	0.65	0.6
Singing Sands Trail	IN	3.6	1.1
Sweetser Switch Trail	IN	4	2.5
Tell City Riverwalk	IN	1.1	0.5
Wabash & Erie Canal Trail (Evansville)	IN	0.4	0.4
White River Greenway (Noblesville)	IN	5.9	0.45
Whitewater Canal Trail	IN	11	3
Winona Interurban Trail	IN	3.14	1.3
Armourdale Levee Trail	KS	1.3	0.3
Flint Hills Trail State Park	KS	118	3.5
Gary L. Haller Trail	KS	15.95	1.8
Katy Hike/Bike Trail	KS	1.8	0.35
Railroad Park Bike Path	KS	0.4	0.4

Trail Name	State	Total Trail Length (miles)	Rail-With-Trail Length (miles)
Sunflower Santa Fe Trail	KS	1.7	1.7
Whistle Stop Park	KS	1.8	0.91
Louisville Loop	KY	50.4	0.4
South Elkhorn Trail	KY	0.5	0.4
Town Branch Trail	KY	2.2	1.4
Baton Rouge Levee Bike Path	LA	27.8	0.37
Crescent Park Trail	LA	1.4	0.9
Mississippi River Trail (Louisiana)	LA	64.7	1.3
Cape Cod Canal Bikeway	MA	13.9	0.8
Connecticut Riverwalk and Bikeway	MA	5.4	1.5
Manhan Rail Trail	MA	9.5	0.65
Mary Ellen Welch Greenway	MA	2.8	0.84
Mass Central Rail Trail	MA	59	1.43
Neponset River Greenway	MA	8.2	1.3
Salem Bike Path	MA	1.7	0.8
Shining Sea Bikeway	MA	10.7	0.22
Somerville Community Path	MA	3.2	1.9
Southwest Corridor Park (Pierre Lallement Bike Path)	MA	4.1	1.8
Tri-Community Greenway	MA	10.6	0.6
Whitney Spur Rail Trail	MA	1.6	0.18
Blackstone River Greenway	MA, RI	29.9	8.7
Grist Mill Trail at Patapsco Valley State Park	MD	2.5	2
Gwynns Falls Trail	MD	19.7	5
Western Maryland Rail Trail	MD	27.5	0.3
Great Allegheny Passage	MD, PA	153.22	24.2
Harpers Ferry Railroad Bridge	MD, WV	0.14	0.14
Bucksport Waterfront Walkway	ME	1	0.2
Down East Sunrise Trail	ME	87.8	2.6
Eastern Promenade Trail	ME	2.1	1.33
Ellsworth Trail	ME	1.6	1.3
Fore River Parkway Trail	ME	2.6	0.06
Kennebec River Rail Trail	ME	6.79	5.4
Mountain Division Trail	ME	9.59	8.5
Papermill Trail	ME	3.97	1.2
Whistle Stop Rail-Trail	ME	15.8	0.7
Baw Beese Trail	MI	8.2	0.7
Boardman Lake Loop Trail	MI	4	0.45
Border-to-Border Trail	MI	33.13	4
Fred Meijer Heartland Trail	MI	41.9	0.4
Fred Meijer Pioneer Trail	MI	9	3.25
George Atkin Jr. Recreational Trail	MI	4.2	0.5

Trail Name	State	Total Trail Length (miles)	Rail-With-Trail Length (miles)
Little Lake to Chatham Snowmobile Trail	MI	26	0.54
Muskegon Lakeshore Trail	MI	11.2	3.1
North Central State Trail	MI	74.9	0.2
Portage Creek Bicentennial Trail	MI	4	1.3
Shaver Road Bikeway	MI	1.8	0.75
Southwest Greenway	MI	0.67	0.3
Sycamore Trail	MI	2.1	0.6
Traverse Area Recreation and Transportation Trail (TART)	MI	13	7.5
Trolley Line Trail	MI	2.8	2.8
Valhalla Trail	MI	1.3	0.5
Vassar Rail Trail	MI	2	0.4
Big Rivers Regional Trail	MN	6.08	1.41
Blazing Star State Trail	MN	6	1.3
Bruce Vento Regional Trail	MN	8.3	0.2
Camden Regional Trail	MN	14.9	3
Cannon Valley Trail	MN	20.9	0.55
Cedar Lake LRT Regional Trail	MN	4.5	3.95
Civic Center Trail	MN	1.2	1.05
Cologne Community Trail	MN	3.2	0.1
Duluth Lakewalk	MN	7	5.2
Empire Township Trail	MN	2	0.6
Graham Park Trail	MN	1.1	0.4
Hiawatha LRT Trail	MN	4.7	4.2
Kenilworth Trail	MN	1.5	1.45
Luce Line Trail	MN	76.7	5
Mesabi Trail	MN	135	2
Midtown Greenway	MN	5.5	1.4
Mill Towns State Trail	MN	6	2.1
Minneapolis Diagonal Trail	MN	3	0.11
Minneopa Trail	MN	2.7	1
Minnesota River Bluffs LRT Regional Trail	MN	19.91	0.36
North Cedar Lake Regional Trail/Cedar Lake Trail	MN	9	5
North Minnesota River Trail	MN	4.8	1.36
Red Jacket Trail	MN	6.3	0.16
Rice Creek West Regional Trail	MN	5.8	1.6
Stone Road Trail	MN	0.8	0.6
Todd Park Bike Trail	MN	2.4	0.19
Trout Brook Regional Trail	MN	1.8	0.25
Western Waterfront Trail	MN	3.4	0.5
Wilderness Trail	MN	1.3	0.8
Zumbro South Trail	MN	6.5	0.2

Trail Name	State	Total Trail Length (miles)	Rail-With-Trail Length (miles)
Carondelet Connector	MO	1	0.25
Wabash Walkway	MO	0.15	0.15
Bitterroot Trail	MT	51	4.65
Livingston Depot Center Trail	MT	1.4	1.5
River's Edge Trail	MT	55	2.24
Silver Bow Creek Greenway	MT	9.2	3
Tobacco River Memorial Trail (Kootenai Trail)	MT	7.4	0.8
Cape Fear River Trail	NC	7	0.74
Charlotte Rail Trail	NC	3.5	3.3
City Walk	NC	2.5	1.3
Irwin Creek and Stewart Creek Greenways	NC	2	0.12
Libba Cotten Bikeway	NC	0.38	0.36
Marcia H. Cloninger Rail-Trail	NC	1.7	0.1
Bismarck Trails (Hay Creek and Pebble Creek Loops)	ND	7.4	0.42
Washburn Discovery Trail	ND	2.2	0.1
Cowboy Recreation and Nature Trail	NE	202.9	1.5
FEVR Trail	NE	1	0.73
St. Joe Trail	NE	2.91	1.2
Cotton Valley Rail Trail	NH	12	2
Winnipesaukee River Trail	NH	2.7	1
WOW Trail	NH	4.94	1.1
Pleasantville to Somers Point Bike Path	NJ	8.2	0.8
Roselle Park Bike Path	NJ	0.5	0.5
Traction Line Recreation Trail	NJ	2.7	2.5
Santa Fe Rail-Trail	NM	16.8	15.4
Valle de Oro Trail	NM	2.3	2.3
Rio Grande River Trail	NM, TX	11.9	0.47
Harry Reid Union Pacific Railroad Trail	NV	13.3	6.7
River Mountains Loop Trail	NV	35.3	1.3
Cheektowaga Historic Rails to Trails	NY	2.3	1.5
EPCAL Alternative Transportation Path	NY	9.28	0.4
Erie Canalway Trail	NY	335.2	5.8
Fort Washington Park Greenway	NY	1	1
Harlem Valley Rail Trail	NY	26.2	1
Heritage Trail	NY	19.4	0.38
Hudson River Greenway	NY	12.9	0.5
Klara Sauer Trail	NY	1	0.9
Lenox Rail Trail	NY	2.2	1
Maybrook Trailway	NY	28.6	23.83
Ontario Pathways Rail Trail	NY	24.28	1.4
Philip A. Rayhill Memorial Recreational Trail (NH&W Rail Trail)	NY	5.2	0.25

Trail Name	State	Total Trail Length (miles)	Rail-With-Trail Length (miles)
Pittsford Trail System (Railroad Loop Trail)	NY	5.1	0.06
Saranac Lake Recreational Path	NY	0.52	0.52
Terry Gordon Trail	NY	1.6	1.5
Zim Smith Mid-County Trail	NY	11.3	0.35
Camp Chase Trail	OH	15.3	12.55
Celina Coldwater Bikeway	OH	4.61	4.61
Chessie Circle Trail	OH	11	4.43
County Line Trail	OH	6.75	4.42
Fairfield Heritage Trail	OH	9.5	0.6
Heritage Trail	OH	17.2	0.12
Hockhocking Adena Bikeway	OH	24.3	3.6
Iron Horse Trail (Montgomery County)	OH	7.6	1.3
Little Beaver Creek Greenway Trail	OH	12.6	0.6
Middle Branch Trail	OH	7.7	1.56
New London-Greenwich Rail Trail	OH	7.3	6.7
North Coast Inland Trail (Huron County)	OH	28.45	10
North Coast Inland Trail (Lorain County)	OH	30.7	0.1
North Coast Inland Trail (Sandusky and Ottawa Counties)	OH	29.64	11.7
Ohio & Erie Canal Towpath Trail	OH	90.6	5.8
Ohio River Trail	OH	7.6	0.49
Olde Muskingum Trail	OH	6	5.72
Portage Hike and Bike Trail	OH	16.3	5
Red Line Greenway	OH	2	2
Simon Kenton Trail	OH	35.5	23.83
T. J. Evans Panhandle Trail	OH	9.8	9.8
Triplett Pathway	OH	0.9	0.4
University/Parks Trail	OH	6.3	4.18
Wabash Cannonball Trail	OH	62.9	1.2
West Branch Trail	OH	4.5	2.5
Wright Brothers Huffman Prairie Bikeway	OH	4.6	3.7
Zane's Landing Trail	OH	2.9	2.4
Stavich Bicycle Trail	OH, PA	9.9	9
Katy Trail (Oklahoma City)	OK	6.3	1.4
Legacy Trail	OK	1.5	1
Astoria Riverwalk	OR	6.4	2.3
Central Ashland Bikepath	OR	1.8	1.8
Circle to Buchanan Multi-Modal Path	OR	1	0.4
Fanno Creek Greenway Trail	OR	10.5	0.9
Logging Road Trail	OR	3.5	1
Riverfront Trail at The Dalles	OR	9	0.98
Rogue River Greenway	OR	9.8	3.25

Trail Name	State	Total Trail Length (miles)	Rail-With-Trail Length (miles)
Springwater Corridor	OR	21.5	3.43
Steel Bridge Riverwalk	OR	0.2	0.2
Tigard Heritage Trail	OR	0.75	0.75
Tilikum Crossing	OR	0.6	0.6
Trolley Trail	OR	6	0.5
Village Green Trail	OR	0.6	0.6
Wy'East Way	OR	1.6	1.6
I-205 Multi-Use Path	OR, WA	17.4	5.3
Arboretum Trail	PA	0.8	0.8
Beaver River Trail	PA	1.7	0.4
Bristol Spurline Park	PA	2.5	0.43
Chester Valley Trail	PA	19.2	0.2
Clarion-Little Toby Trail	PA	18.4	2.75
Coal & Coke Trail	PA	6.1	1.9
Cynwyd Heritage Trail	PA	1.9	0.35
D&L Trail	PA	144.7	16
Enola Low Grade Trail	PA	29.15	6.64
Five Star Trail	PA	7.8	4.75
Gurney Street Trail	PA	0.13	0.13
Heritage Rail Trail County Park	PA	27.4	20.2
Hoodlebug Trail	PA	11.8	0.75
Luzerne County National Recreation Trail	PA	1.8	1.6
McClintock Trail	PA	9.4	1.9
Montour Trail	PA	55.9	3.5
Neversink Connector Trail	PA	1.2	0.2
North Branch Canal Trail	PA	6.2	6.2
Northwest Lancaster County River Trail	PA	15.9	5
Oil City Trail	PA	3	0.74
Pine Creek Rail Trail	PA	62.5	0.8
Schuylkill River Trail	PA	82.4	10.9
Susquehanna Bikeway	PA	3.2	0.75
Susquehanna River Walk & Timber Trail	PA	4.2	2.15
Three Rivers Heritage Trail	PA	26.6	8.3
East Bay Bike Path	SC	0.6	0.4
Mary Black Foundation Rail Trail (Palmetto Trail)	SC	1.9	0.16
Prisma Health Swamp Rabbit Trail	SC	28	0.9
Marne Creek West Trail	SD	0.6	0.15
Mitchell Community Bike Path	SD	10	1.8
Mobridge Riverfront Walking Path	SD	2.3	0.5
Sioux Falls Bike Trails	SD	26.8	2.1
Vermillion River Trail	SD	1.7	0.2

Trail Name	State	Total Trail Length (miles)	Rail-With-Trail Length (miles)
Cumberland River Greenway	TN	9.13	1.5
James White Greenway	TN	1	1
Richland Creek Greenway	TN	4.01	0.65
Riverbluff Walkway	TN	6.7	0.36
South Chickamauga Creek Greenway	TN	13.7	0.7
Tennessee Central Heritage Rail Trail	TN	5.33	0.3
Wolftever Creek Greenway	TN	2.9	0.5
A-Train Rail Trail	TX	20	12.4
Bicentennial Hike and Bike Trail	TX	6.3	2.6
Boggy Creek Greenbelt Trail	TX	1.6	0.4
Central Trail	TX	4.2	4.2
City Trail (Highland Village)	TX	3.8	0.5
Cotton Belt Trail	TX	19.84	12.3
Crestview/Highland Urban Trail	TX	0.8	0.8
Lance Armstrong Bikeway (Crosstown Greenway)	TX	5.4	0.8
Red Line Parkway Trail	TX	10	7.98
Ridgewood Trail	TX	1.2	1.3
Southern Walnut Creek Trail	TX	8.9	0.6
University Crossing Trail	TX	2	0.9
Legacy Parkway Trail	UT	13.1	0.6
Lindon Heritage Trail	UT	5.5	0.28
Moab Canyon Pathway	UT	12.7	0.4
Parley's Trail	UT	7.9	0.8
Point of the Mountain Trail	UT	2.4	2.4
Porter Rockwell Trail	UT	10.7	10.2
Burke VRE Trail	VA	1.4	0.5
Elizabeth River Trail (Atlantic City Spur)	VA	10.5	1.5
Huckleberry Trail	VA	15.2	1.2
James River Heritage Trail	VA	10.1	0.56
Metro Linear Park	VA	0.5	0.5
Potomac Yard Trail	VA	2	0.75
Virginia Capital Trail	VA	52	1.05
Island Line Trail	VT	13.4	1.5
Burke-Gilman Trail	WA	18.8	1.8
Chehalis Western Trail	WA	21.2	1.5
Chelatchie Prairie Railroad Trail	WA	0.9	0.8
Cowlitz River Trail	WA	2.5	2.5
Duwamish Trail	WA	3	1
East Aberdeen Waterfront Walkway	WA	1.6	0.7
Elliott Bay Trail (Terminal 91 Bike Path)	WA	3.4	1.6
Fish Lake Trail	WA	9.3	4.1

Trail Name	State	Total Trail Length (miles)	Rail-With-Trail Length (miles)
Foothills Trail	WA	31.3	3.5
Grand Avenue Greenway	WA	1.7	1.6
Interurban Trail South	WA	19.1	11.4
Kulshan Creek Trail	WA	2.9	0.29
Lower Yakima Valley Pathway	WA	14	6
Pigeon Creek Trail	WA	0.9	0.8
Pullman Riverwalk	WA	0.42	0.25
Rainier Trail	WA	2.5	0.65
Seattle Waterfront Pathway	WA	2	1
South Bay Trail	WA	2.5	0.9
Spokane River Centennial State Park Trail	WA	39.7	0.3
State Route 20 Arboreta Trail	WA	1.5	1.5
Tanner Trail	WA	2	0.2
Yakima Greenway	WA	22.9	0.25
Blackhawk Path	WI	2.3	0.75
Brown Deer Recreational Trail	WI	1	1
Bugline Trail	WI	17.42	1.75
Campus Drive Pedestrian and Bicycle Path	WI	0.8	0.8
Hank Aaron State Trail	WI	15.2	0.7
Kinnickinnic River Trail	WI	2.3	1.4
Kiwanis Bike Trail	WI	4	1.1
La Crosse River State Trail	WI	21	18.4
Lower Yahara River Trail	WI	2.5	1
MRK Trail	WI	4.6	4.2
New Berlin Recreation Trail	WI	7	6.3
Newberry Trail	WI	2.4	1.3
Oak Leaf Trail	WI	123.6	3.7
Ozaukee Interurban Trail	WI	30.1	10.2
Peace Trail	WI	6.4	3.9
River Bend Trail	WI	2.3	0.2
River Edge Parkway	WI	5	0.2
Riverside Corridor Bike-Walking Trail	WI	9.2	0.8
Rock River Parkway Trail	WI	2.4	0.73
Sheboygan Interurban Trail	WI	14	4.55
South Fork Trail	WI	1.7	0.2
Southwest Commuter Path	WI	5.6	1.15
West Allis Cross Town Connector	WI	0.9	0.9
Yahara River Bike Path	WI	0.9	0.18
Bridgeport Rail Trail	WV	0.8	0.5