

Concept Development and Analysis Technical Report

Tier 1 Environmental Impact Statement

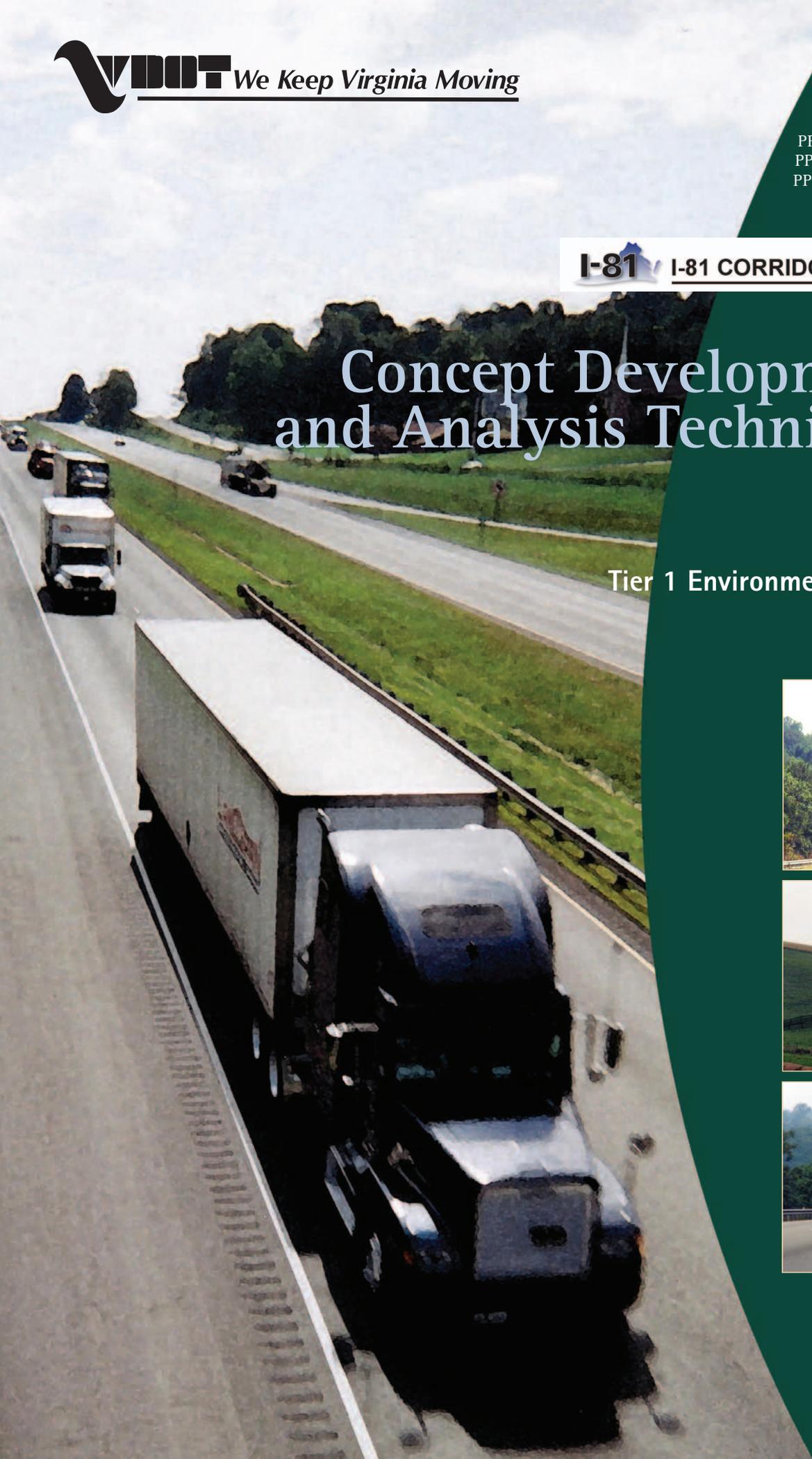




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Project Description

The Virginia Department of Transportation (VDOT) and the Federal Highway Administration (FHWA) are evaluating conditions and studying improvements that would address the future needs of the traveling public along the Interstate 81 (I-81) corridor in Virginia. FHWA and VDOT determined that a Tier 1 Environmental Impact Statement (EIS), prepared in accordance with the National Environmental Policy Act of 1969 (NEPA), would be the appropriate vehicle for fact-based analyses that allow informed decisions on corridor-length issues.

An appendix to the Tier 1 Draft EIS, this Concept Development Technical Report provides detailed information on the development, operational characteristics and costs of improvement concepts developed for the *I-81 Corridor Improvement Study*. Information in this report is summarized in the Tier 1 Draft EIS.

1.1 Study Area

The *I-81 Corridor Improvement Study* evaluates improvements to the entire 325-mile length of Interstate 81 in Virginia as well as improvements to Norfolk Southern's Shenandoah and Piedmont rail lines in Virginia. Since these two transportation facilities are geographically distant from each other for most of their length, a separate study area was created for both I-81 and the rail lines (see Figure 1-1).

The I-81 study area includes the corridor along the entire length of I-81 in Virginia. The corridor ranges in width depending on the resource being described, but is generally 500 feet on either side of the I-81 edge of pavement. This additional $\pm 1,000$ foot width was used because it was believed to represent the maximum area within which potential highway or rail improvement concepts may occur. At interchanges, the study area encompassed an area that represented the most probable maximum limits of potential interchange improvements. As described throughout the Tier 1 DEIS, the study area serves several purposes for the various environmental and transportation impacts being assessed. For the purposes of concept development, this study area was believed to be the general extents of the area that



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I-81 and Rail Study Areas

I-81 CORRIDOR IMPROVEMENT STUDY

Figure
1-1



would be physically impacted by a particular concept. It is important to note that the study areas considered for other sections of the Tier 1 DEIS (such as freight forecasting and toll impact) encompass a much larger study area because it is anticipated that impacts due to freight and tolls would be further reaching.

Since rail improvements are only being evaluated in certain sections, the rail study area (shown previously in Figure 1-1) consists of 13 discrete sections along the existing Piedmont and Shenandoah rail lines. The length of the rail improvement sections range from less than one-half mile to 10 miles long, but most of the sections are between one and two miles long. All "Build" improvement concepts evaluated for this study were subsequently developed within the limits of the study areas as described.

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Improvement Concept Development

2.1 Process

As described in Chapter 2 of the Tier 1 DEIS (Purpose and Need), the needs along the corridor are to address existing and future capacity and safety deficiencies. The potential concepts identified herein are assessed based on their ability to meet these needs.

Improvement concepts were developed to address these needs and then evaluated separately to determine whether any one concept could address safety and capacity needs for the entire corridor. A broad range of reasonable improvement concepts were considered within the guidelines of the Process Streamlining Agreement between FHWA and VDOT (see Appendix A to the Tier 1 DEIS). Some concepts emerged from the Scoping Process, some came from previous studies, and others were developed by the study team. The concepts consider planned roadway improvements at the Tennessee and West Virginia state lines and provide adequate distance for transition.

The concept development process is a dynamic one that continues to evolve as this Tier 1 study progresses and would continue its evolution in any Tier 2 studies progressed as part of this process. In addition to stand alone corridor-length improvements, the process includes developing combinations of roadway and rail improvements, various toll scenarios and Transportation System Management (TSM) that attempt to adequately accommodate 2035 traffic volumes by meeting level of service standards. The level of service standard for interstate freeway corridors as established by the FHWA is LOS C or better along urban mainline segments and LOS B or better along rural mainline segments. Urban boundaries are defined as part of the roadway functional classification process. The evolution of the improvement concepts is described in the following sections of this report.

2.2 Improvement Concepts

2.2.1 Concepts Identified During Scoping Process

Many corridor-length and non-corridor-length potential solutions to I-81 were received from the public and government agencies during the Scoping Process. Some of the concepts that emerged from the Scoping Process involved improving I-81 for its entire length in Virginia, while others called for improvements in localized areas of I-81 (*e.g.*, highways on new location including bypasses, interchange improvements, truck climbing lanes, and auxiliary lanes). Only the corridor-length concepts were retained as stand-alone concepts because the study evaluates deficiencies and potential solutions on a corridor-length basis. Non-corridor-length concepts were eliminated from consideration as stand-alone concepts. Some of these ideas, which may be evaluated in Tier 2 if one or more of the “Build” concepts are advanced, include:

- Additional interchanges to alleviate traffic on local roadways and other existing interchanges;
- Incorporation of existing and planned bicycle trails in the area and inclusion of bicycle facilities crossing I-81;
- Additional and improved rest areas;
- Consideration of park and ride facilities with bus service;
- Removal of the I-81/I-77 overlap by rerouting I-77 or I-81;
- A separate parallel four- to six-lane interstate highway from near the Tennessee state line to north of Abingdon. Existing I-81 would be designated Business I-81 and the new interstate would be primarily for through traffic; and
- Preservation or improved accessibility of non-motorized traffic (pedestrians, bicycles, horses, and buggies) from one side of I-81 to the other.

The only corridor-length concept that emerged from the Scoping Process that was eliminated from consideration was an alternate corridor for heavy truck traffic, possibly a new interstate between I-81 and I-95. An entirely new interstate facility is not a reasonable solution to the I-81 corridor capacity deficiencies and was, therefore, eliminated.

2.2.2 Concepts Considered

Once the scoping concepts were reviewed, the study team developed additional stand-alone concepts. The No-Build Concept and 211 combinations of TSM, road improvements, rail improvements and various toll scenarios were considered. Their ability to address the capacity portion of the Purpose and Need of the *I-81 Corridor Improvement Study* was noted in the form of the number of miles of I-81 that would operate below level of service standards



after the concept was built (described in Chapter 2, Purpose and Need) and the number of miles where excess capacity would be provided. Excess capacity was defined as the provision of at least one more lane than the number of lanes required to provide level of service at or above level of service standards. For example, if a lane could be removed from a section, but the section still operated at or above the level of service standard, the segment was considered to provide excess capacity. Each concept was evaluated for 650 miles, which is comprised of 325 miles in each direction.

The cost for the improvement concepts included estimated construction costs, right-of-way costs, and engineering costs expressed in year 2005 and year 2015 dollars. An annual inflation factor of 3.89 percent was used to project the 2015 costs, which is the standard rate used in all VDOT cost approximations.

2.2.3 Improvement Concept Descriptions

No-Build Concept

I-81 is predominantly a four-lane limited access interstate highway; however, there are two areas with a six-lane cross-section (from Mileposts 0 to 7 near Bristol and from Mileposts 72 to 81 (the I-77 overlap area)). The No-Build Concept is defined as the I-81 roadway as it exists in 2005 plus sixteen construction projects included in the *Virginia Transportation Six-Year Improvement Program for Fiscal Years 2006 – 2011* and Metropolitan Planning Organizations' Long Range Plans that are fully funded through construction. It was assumed that these projects with funding commitments would be completed by 2035.

The No-Build Concept does not include any future potential improvements that are not currently funded through construction. Table 2.2-1 summarizes the roadway construction projects that are included in the No-Build Concept. Rail improvements necessary to maintain the 2005 level of service on the Norfolk Southern rail system in Virginia were assumed to be in place and are included in the No-Build Concept.



Table 2.2-1 Funded I-81 Projects Included in No-Build Concept

Map ID #	County	Milepost	Description
1	Montgomery	109	Grade change at ramp termini
2	Roanoke	142	Widen with signals at Exit 142 (Route 419) ramps
3	Botetourt	162	Widen northbound and southbound bridge
4	Rockbridge	180	I-81 Bridge and approaches
5	Rockbridge	185	Northbound and southbound approaches and bridges over Buffalo Creek
6	Rockbridge	185	Northbound truck climbing lane
7	Rockbridge	191	Northbound and southbound approaches and bridges over Maury River
8	City of Harrisonburg	244	Bridge Widening (four lanes) & replacement – safety improvement
9	Frederick	307	Safety improvements at Exit 307
10	Frederick	310	Safety Improvements at Exit 310
11	Frederick	313	Widen northbound and southbound bridges over Abram's Creek and extend acceleration and deceleration lanes
12	Frederick	313	Interchange safety improvement
13	Frederick	315	Safety improvements at Exit 315
14	Frederick	317	Safety improvements at Exit 317
15	Frederick	320	Safety improvements, extend SB rest area acceleration lanes
16	Frederick	323	Bridge widening – safety improvement

Source: Virginia Transportation Six-Year Improvement Program for Fiscal Years 2006-2011

Transportation System Management (TSM) Concept

This improvement concept includes safety improvements (*e.g.*, lengthening of acceleration lanes at interchanges), truck climbing lanes, Intelligent Transportation System (ITS) elements, and Transportation Demand Management (TDM) measures.

TSM measures would include the following projects:

- Increasing weaving distance between northbound ramps at Exits 14 and 94
- Increasing weaving distance between southbound ramps at Exits 220, 221, 222, 247
- Increasing acceleration and/or deceleration lane lengths at Exits 132, 137, 140, 141, 143, 146, 156, 162, 167, 168, 180, 323

- Constructing southbound truck climbing lanes at Mileposts 119-128, 166.5-167.5, 182-184, 186.8-190, 234.6-236.4
- Constructing northbound truck climbing lanes at Mileposts 165.7-166.8, 168.7-174, 184.2-186.1, 191.7-202, 236.5-237.5
- Improving ramp geometry and/or length at Exits 35, 39, 47, 50, 67, 70, 80, 126, 251, 291
- Improving ramp geometry and/or length at the rest areas at northbound Exit 129.3 and southbound Exit 158.

TDM measures, such as the use of park and ride facilities and increased use of carpooling, were accounted for by reducing traffic projections by three percent in rural areas and by five percent in urbanized areas. This additional trip reduction was taken to test whether traffic volumes along I-81 would decrease sufficiently under a comprehensive TDM program, such that the amount of additional capacity needed in 2035 would be reduced. In cases where the TSM Concept is incorporated into other concepts (as described in the sections below) the three to five percent reduction was not included.

Rail Concepts

The rail lines that are included in this study are all owned by Norfolk Southern Railroad. There are currently no federal highway funding categories that VDOT can use to implement improvements to privately owned rail lines as part of this study. Any improvements to such railroads would, in fact, be at the discretion of Norfolk Southern Railroad.

Multimodal interface opportunities such as new intermodal terminals, access roads to existing terminals or proposed terminals are potential interface enhancements that can be provided in the I-81 corridor. The recent federal transportation law (SAFETEA-LU) has specific appropriations for these types of interface facilities that the Commonwealth of Virginia could take advantage of in I-81 corridor. In addition to \$41.5 million of designated funding (or “earmarks”) to “manage freight movement and safety improvements along I-81,” SAFETEA-LU also included a number of general freight finance provisions and projects that Virginia may be able to take advantage of in obtaining additional funds to improve privately owned rail lines. Freight provisions of SAFETEA-LU that may offer opportunities to improve rail freight movement along the I-81 corridor include:

- Section 1601: Transportation Infrastructure Finance and Innovation Act (TIFIA)
- Section 1602: State Infrastructure Banks (SIB)
- Section 11-1143 Tax-exempt Financing of Highway Projects and Rail Truck Transfer Facilities (Private Activity Bonds)
- Section 9002: Capital Grants for Rail Line Relocation Projects
- Section 9003: Rehabilitation and Improvement Financing

In addition to the freight provisions of SAFETEA-LU, a number of its project programs also offer the possibility of providing funds for rail improvements, including:

- Section 1301: Projects of National and Regional Significance
- Section 1302: National Corridor Infrastructure Improvement Program
- Section 1934: Transportation Improvements
- Section 1701: High Priority Projects Program

The rail concepts that were examined are described in more detail in Section 3.2.4.

Rail Concept 1

This improvement concept includes minor improvements to the Norfolk Southern (NS) Piedmont Line from the West Virginia state line to Manassas, including improvements to one of the most congested sections of the NS Piedmont Line, the section from Front Royal to Manassas. The improvements address both capacity and operating speed limitations. The *I-81 Corridor Improvement Study Transportation Technical Report* includes details of the types of improvements included in this concept. Figure 3.2-1 illustrates the location of Rail Concept 1 improvements.

Rail Concept 2

This improvement concept includes improvements to the Norfolk Southern Piedmont Line within the Commonwealth of Virginia, with major improvements occurring in nine segments. Rail Concept 2 was proposed in the *Northeast-Southeast-Midwest Corridor Marketing Study* as the Virginia-based investment scenario¹. This concept is focused on improvements to the NS Piedmont Line, including improvements between Manassas and Front Royal (as with Rail Concept 1). However, Rail Concept 2 assumes rail operations of up to six pairs of trains daily in each direction (12 total trains). Details of the types of improvements included in this concept are outlined in the *I-81 Corridor Improvement Study Transportation Technical Report*. Figure 3.2-2 illustrates the location of Rail Concept 2 improvements.

Rail Concept 3

This improvement concept includes all improvements to the Norfolk Southern Piedmont Line included in Rail Concept 2, as well as minor improvements to the Norfolk Southern Shenandoah Line. Railroad operations on both the Shenandoah and Piedmont Lines are quite heavy, but the Piedmont is a faster route and carries the majority of the higher speed traffic. The new operations would add an additional 12 trains (six in each direction) north of

¹ Ibid, page 57