



# **INTERSTATE 81 PHASE 2 CORRIDOR EXPANSION: MAKING WAY FOR ECONOMIC GROWTH AND SAFETY**

Grant Application

Submitted by: Maryland Department of Transportation State Highway Administration  
Submitted to: U.S. Department of Transportation



# I-81 PHASE 2 CORRIDOR EXPANSION

**BUILD 2018 Project Information - Please complete all fields.**  
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Field Name	Response	Instructions
Project Name	Interstate 81 Phase 2 Corridor Expansion: Making Way for Economic Growth and Safety	Enter a <b>concise</b> descriptive <b>title</b> for the project. This will need to be the same title used in the Grants.gov SF-424 submission, as well as the application narrative.
Project Description	I-81 Phase 2 Corridor Expansion Project will expand the interstate from four to six lanes over a 3.5-mile segment, with interchange improvements, traffic control upgrades, and storm water management improvements. The Project addresses existing design limitations by expanding highway capacity to meet freight demand and improving design for better safety and mobility outcomes. Phase 2 is a part of a four-phase, 12.1 mile expansion of I-81 in Washington County; Phase 1 is currently under construction.	Describe the project in plain English terms that would be generally understood by the public, using <b>no more than 100 words</b> . For example, "The project will replace the existing bridge over the W river on Interstate-X between the cities of Y and Z" or "the BUILD Grant will fund construction activities for streetcar service from location X to location Y." Please <b>do not</b> describe the project's benefits, background, or alignment with the selection criteria in this description field.
Urban/Rural	Urban	Identify whether the project is located in a rural or Urbanized Area (UA), using the drop-down menu, according to the 2010 Census Urban Area designation. Updated lists of UAs are available on the Census Bureau website at <a href="http://www2.census.gov/geo/maps/dc10map/UAUC_RefMap/ua/">http://www2.census.gov/geo/maps/dc10map/UAUC_RefMap/ua/</a> . Urban Clusters (UCs) are rural areas for the purposes of the BUILD Discretionary Grants program. For more information on urban and rural designations, refer to Section C.3.ii of the Notice of Funding Opportunity for the BUILD Discretionary Grants program.
Urbanized Area	Hagerstown-Martinsburg Urbanized Area	If you have identified the project as located in a 2010 Census designated Urbanized Area, please provide the name of the Urbanized Area. If you have identified the project as located in a rural area, please type "N/A."
Project Type	Road - New Capacity	Identify the "Primary" and "Secondary" project type combination that <b>most closely aligns with your project</b> from the choices in the drop-down menu. See the "Project Types" tab in this file for further information and project type definitions. <b>If the drop-down does not appear, please type in your "Primary" project type.</b>
Primary Project Location Zip Code	21740	Identify the <b>5-digit zip code of the project location</b> . If the project is located in multiple zip codes, please identify the most centrally located zip code.
Project Previously Submitted?	Yes - More than once	Identify whether the project was submitted in a prior BUILD/TIGER round, and if so, whether it was submitted more than once, using the drop-down menu.
Prior BUILD/TIGER Funds Awarded to Project?	No	Identify <b>whether the project has previously received BUILD/TIGER funding</b> , and if so, whether that funding was through a planning or capital grant, using the drop-down menu.
Is this part of a Program of Projects?	No	Identify whether the project is part of a Program of Projects. A program of projects consists of independent projects that address the same transportation challenge and whose combined benefits, including funding efficiency, are greater than if the projects are completed individually. Only applicants that generate additional non-Federal revenue as described in Section E.1.i.h. of the Notice of Funding Opportunity for the BUILD Discretionary Grants program may submit applications as part of a Program of Projects. For additional information on Program of Projects eligibility, refer to Section C.3.v. of the Notice of Funding Opportunity for the BUILD Discretionary Grants program.
How many applications are a part of this Program of Projects?		If this is a part of a Program of Projects, enter the total number of BUILD applications that will be submitted as part of this Program of Projects, including this one. Leave blank if this application is not part of a Program of Projects.
Program of Projects Name		If this is a part of a Program of Projects, enter a <b>concise</b> descriptive <b>title</b> for the <b>Program</b> . This should be different than the Project Name above and will need to be the same title used across all projects within this Program of Projects. Leave blank if this application is not part of a Program of Projects.
BUILD Request	\$25,000,000	Enter the total amount of funds requested for this project from BUILD in this application. [Maximum entry \$25,000,000. There is no minimum entry for projects applying strictly for a planning grant; however, for any applications resulting in the completion of construction activities, the minimum urban entry is \$5,000,000 and the minimum rural entry is \$1,000,000]
Total Project Cost	\$76,759,921	Enter the total cost of the project. This should be equal to the sum of Total Federal Funding and Total Non-Federal Funding.
Total Federal Funding	\$25,000,000	Enter the amount of funds committed to the project from ALL federal sources <b>including the proposed BUILD amount</b> . [There is no minimum entry for projects applying strictly for a planning grant; however, for any applications resulting in the completion of construction activities, the minimum urban entry is \$5,000,000 and the minimum rural entry is \$1,000,000]
Total Non-Federal Funding	\$51,759,921	Enter the amount of funds committed to the project from non-federal sources.
Tribal Government?	No	Select "Yes" from the drop-down menu if the applicant is a federally recognized tribal government.

**Project Sponsor: Maryland Department of Transportation  
State Highway Administration (MDOT SHA)**

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**Attachments**

- Benefit-Cost Analysis (BCA)*
- Cost Estimate (CostEst)*
- Budget Cost Estimate Review Workshop Results (BudgetCER)*
- Financial Plan (FinPlan)*
- MDOT Funding Commitment Letter (MDOTLtr)*
- Letters of Financial Commitment and Support (Support)*
- CTP, TIP and LRTP*
- Phase 2 Tech Project Engineering Drawings (Phase2Tech)*
- Project Management Plan (PMPlan)*
- EA and FONSI (EAFONSI)*



# Section 1

## Executive Summary

The **Interstate 81 Phase 2 Corridor Expansion: Making Way for Economic Growth and Safety (I-81 Phase 2)** project represents a critical investment in one of the most heavily utilized freight corridors in the United States. Only four lanes wide, the Maryland segment of I-81 carries freight volumes among the highest in the nation by lane mile, falling within the top one percent of all freight corridors.

High truck volume contributes to an already high and rising crash rate in Maryland's portion of the interstate, resulting in substantial delays for interstate freight movement as well as for the region's residents. Between 2011 and 2017, the total number of crashes increased by 70 percent and truck crashes nearly doubled, increasing by 192 percent on the I-81 corridor in Maryland. Within **I-81 Phase 2** project limits, total crashes increased 37 percent and truck crashes rose by 34 percent between 2015 and 2017.

The **I-81 Phase 2** project is part of a larger, four-phase \$386.7 million investment that will expand I-81 in Maryland from four to six lanes from the West Virginia to the Pennsylvania state lines. **I-81 Phase 2** costs represent approximately 19 percent of the total cost of the four-phase project. Maryland Department of Transportation State Highway Administration (MDOT SHA) is requesting \$25 million in Better Utilizing Investments to Leverage Development

(BUILD) grant funds to complement the State's funding of \$51.76 million to complete construction of the **I-81 Phase 2** project by Spring 2025. The **I-81 Phase 2** project will expand the capacity of a 3.5-mile segment of I-81 and improve three interchanges, contributing to the overall modernization of the interstate that is being undertaken by all I-81 corridor states. **I-81 Phase 2** will result in improved safety, increase mobility for the region's rural population, and accommodate freight tonnage that is expected to increase 70 percent over the next 25 years.

**ENHANCE RURAL MOBILITY AND SAFETY:** **I-81 Phase 2** will provide capacity to meet anticipated freight volume and regional population forecasts. Modernized interchanges and surface improvements will also reduce crashes by 40 percent, helping both commercial and rural users safely access the region. **Phase 2** will enhance the Interstate-to-Interstate connection of I-70 (also on the National Highway Freight Network) and I-81, and will extend the benefits of Phase 1 through to this critical linkage. The connection of these two interstates is vital to the future movement of freight and commerce through the East Coast.

### INCREASE ECONOMIC COMPETITIVENESS:

I-81 carries 10 percent of the nation’s gross domestic product, which equates to \$1.85 trillion, as an alternate route to move trucks out of heavily urbanized areas along the I-95 Corridor. The **I-81 Phase 2** will expand lane capacity and modernize three interchanges, decreasing travel time and alleviating freight bottlenecks. A more efficient freight route directly results in increased productivity –both at the regional and national levels. Washington County employs more than 71,045 workers at 3,450 companies. Twenty-six percent of those employed by Washington County’s top employers are involved in businesses that rely directly on the local transportation network, such as warehousing, distribution, logistics, and transportation.<sup>1</sup> Approximately 20 businesses and industrial parks, including 2 technology parks, are concentrated in the Hagerstown-Williamsport areas – within the **I-81 Phase 2** project limits.<sup>2</sup> Volvo/Mack Group Trucks, JLG, Hagerstown Truck Enterprises, RAMPF, VT Industries, Tractor Supply Co, Bowman Logistics, and FedEx Ground will directly benefit from **I-81 Phase 2** improvements due to their proximity to I-81 and I-70. Phase 2 will also impact the many distribution centers along the corridor, such as BP Solar, Costco, Dot Foods, Random House, Kohl’s, Family Dollar, Ferguson Enterprises, and CARQUEST.<sup>3</sup> An investment in **I-81 Phase 2** results in increased economic competitiveness because travel savings and crash reduction help I-81 businesses and distribution centers more efficiently reach consumer markets. Additionally, the construction of I-81 Phase 2 is estimated to **create 832 Maryland jobs during the project’s construction phase**, as calculated by WSP analysis using RIMS II multipliers published by the US Bureau of Economic Analysis (BEA).

### PARTNERS FOR REGIONAL GROWTH

**I-81 Phase 2** will impact the financial viability and success of an economic development initiative within the northern limit of the project through the interchange with Halfway Boulevard. Washington County, local private sector partners, and the Appalachian Regional Commission are investing

\$6.37 million on a joint development effort at the Halfway Boulevard and I-81 interchange located in southwest Hagerstown. This 0.6-mile extension of Halfway Boulevard from its current terminus west to Maryland Route 83 (Greencastle Pike) will spur commercial development on the lands surrounding the new road and alleviate growing traffic issues in this area while improving connectivity between Interstates 70 and 81 and the existing nearby commercial/industrial areas. Halfway Boulevard has been identified as one of Maryland’s “Critical Urban Freight Corridors” due to the high truck volume: 26 percent of traffic eastbound at Halfway Boulevard are trucks and 41 percent of traffic westbound are trucks. Together, both projects will increase freight access and connectivity while helping reduce traffic and safety hazards on surface roads.

**Phase 2 is a critical segment of Maryland’s I-81 corridor expansion project; a BUILD investment will not only expedite Phase 2, but will enable the MDOT SHA to complete the rest of the project more quickly.**

**I-81 Phase 2** encompasses three of the most vital interchanges with level of service (LOS) needs – where I-81 meets US 11, I-70, and Halfway Boulevard. The safety and timely flow of traffic at these three points is integral to MDOT’s local and regional partners who rely on the corridor to bolster regional economic growth. Upon completion of the four-phase expansion project, Maryland’s I-81 will be a six-lane facility poised to safely transport some of the highest levels of freight per day in the nation, supporting economic growth in Western Maryland, the Appalachian Region, and the East Coast for many decades to come.

1. Maryland Department of Commerce, “Major Employers in Washington County”, Accessed July 2018: <http://commerce.maryland.gov/Documents/ResearchDocument/MajorEmployersInWashingtonCounty.pdf>.
2. Washington County Department of Business Development, “Economic Data Summary: Washington County”, 2016.
3. I-81 Corridor Coalition, “Interstate 81 Multistate Corridor Study”, 2012.

# Section 2

## Project Description

### 2.1 THE I-81 PHASE 2 CORRIDOR EXPANSION PROJECT IN CONTEXT

Interstate 81 is a federally-designated freight corridor serving communities and businesses along the East Coast and within the Appalachian Region, as shown in Figure 1. I-81 is the mostly heavily trafficked freight route in Maryland's state highway system, with weekday vehicle miles travelled by trucks anticipated to grow by 56 percent by 2040. It is a vital route for the distribution of raw materials and finished goods to and from Appalachia and some of the largest consumer markets in the Northeast. Products like gravel, sand, wood products, non-metal mineral products, plastics, animal feed, foodstuffs, pharmaceuticals, machinery, motorized vehicles, and furniture are moved along I-81, making up approximately **10 percent of the nation's gross domestic product with a gross value of more than \$1.85 trillion.**

The Maryland Veterans Memorial Highway (I-81) corridor expansion program is broken into four segments. The 12.1-mile, four-phase I-81 corridor expansion in Washington County is already underway to modernize and invest in Maryland's most heavily traversed freight route. Phase I, the I-81 Widening and Bridge Rehabilitation project, is currently under construction. **I-81 Phase 2** is the subject of this grant request. The MDOT SHA is committed to funding Phase 3 and 4 if **I-81 Phase 2** secures a BUILD investment.

The MDOT SHA seeks a BUILD grant to bridge the gap in construction funding for **Phase 2** of the reconstruction and widening of I-81 from 2,000 feet North of MD 63/MD 68 to 1,000 feet North of Halfway Boulevard, a 3.5-mile alignment. The **I-81 Phase 2 project will:**

- ✓ Expand the interstate from four to six lanes with construction of two new travel lanes (one southbound and one northbound);
- ✓ Improve interchanges at the three interstate exits within project limits: U.S. 11 interchange in Williamsport, and southwest of Hagerstown, the interchanges at I-70 and Halfway Boulevard;
- ✓ Install traffic control upgrades;
- ✓ Install sound barriers; and,
- ✓ Implement of stormwater management improvements.

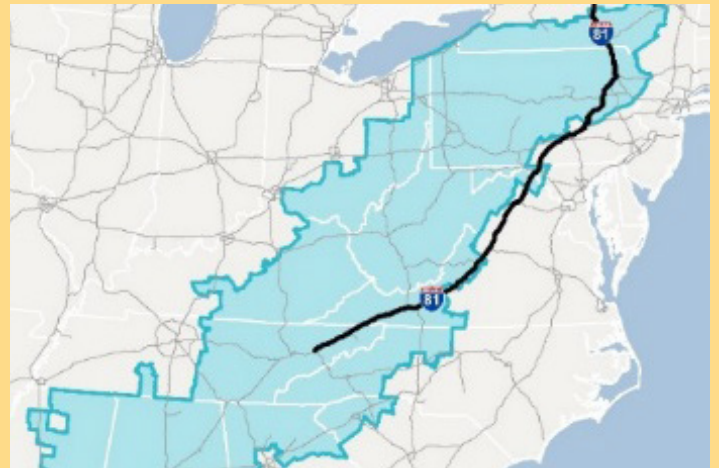


Figure 1: I-81 National Highway Freight Network serving Appalachian Region

Planning and environmental review for the entire Maryland I-81 corridor expansion is complete and design and engineering are underway for **I-81 Phase 2**. The MDOT SHA has committed \$5 million to pre-construction activities. The total estimated cost for **I-81 Phase 2** is \$76.76 million. The BUILD grant request of \$25 million will cover 32.5 percent of total project costs. The MDOT SHA will commit \$51.76 million in remaining funds to complete design, right-of-way, and construction of **Phase 2** if awarded the BUILD grant.

The proposed six travel lanes and interchange upgrades over 3.5 miles resulting from the BUILD investment will substantially increase freight volume capacity and is expected to reduce the number of crashes in the corridor by at least 40 percent. These improvements complement the existing effort to complete Phase 1 by the MDOT SHA as well as the recently completed expansion of I-81 in West Virginia, extending increased capacity and safety for a 23-mile stretch spanning West Virginia and Maryland.

### TRANSPORTATION CHALLENGES TO BE ADDRESSED

**Phase 2** will address three primary transportation challenges that inhibit freight movement and safe travel along the corridor in Maryland. These challenges include:

**Freight Demand.** There is an inadequate number of lanes to accommodate current traffic volume and projected growth through 2045. Currently, the Maryland I-81 corridor is a four-lane facility and carries an average of 19,400 trucks per day through the State. More than one-quarter – 27 percent – of the vehicles on this stretch of I-81 are trucks. In a 2015 study, the MDOT SHA found that I-81 is the most heavily traversed corridor by trucks in the entire State and will see an increase in truck VMT by 56 percent by 2045. Freight moved in tons is expected to increase by roughly 70 percent over the next 25 years, while forecasts indicating approximately 30,000 trucks per day by 2045.

**Traffic Operations.** Increasing truck and overall traffic volume has accelerated roadway deficiencies due to substandard interchange ramp configurations and insufficient lengths of merge lanes. Maryland is recognized as having the most dangerous stretch of I-81 in the nation, where there is a concentration of ten interchanges within just 12.1 miles.<sup>4</sup> Traffic volumes along I-81 south of I-70 are anticipated to grow by over 35 percent between now and 2045. These volumes are expected to result in several failing merge, diverge, and weaving operations at the US 11 and I-70 interchanges without any improvements in the corridor. Further, future travel speeds along both northbound and southbound I-81 are expected to decrease significantly between the US 11 and I-70 interchanges. The level-of-service (LOS) along I-81 has deteriorated with the rise in traffic volume, and traffic conditions will worsen with the projected increase in volume if no improvements are made. The expected LOS for the three interchanges in **Phase 2** is D, E, F, by 2040 if not awarded the grant.<sup>5</sup>

**Safety.** Crash rates have risen at an alarming rate on Maryland's 12-mile segment of I-81 due to high truck traffic and substandard design. Between 2011 and 2017, the number of crashes increased by 85 percent along the corridor. The 12.1-mile segment in Maryland has a significantly higher fatality crash rate compared to similar roadways within Maryland. The fatality rate is over double along the I-81 corridor than the system statewide.

### PROJECT SCOPE OF WORK

The **I-81 Phase 2** includes widening, reconstruction, and interchange improvements along a nearly 4-mile segment of I-81 in Maryland. **I-81 Phase 2** is one component of a four-phase, 12.1-mile, multi-year project with an estimated total project cost of \$386.7 million, as shown in Figure 2. Over four phases, I-81 will be widened from the existing four lanes to six, 12-foot lanes. Widening will be to the inside of the roadway (toward the median) for the entire 12.1-mile segment. All travel lanes will be resurfaced, and improvements will be made where



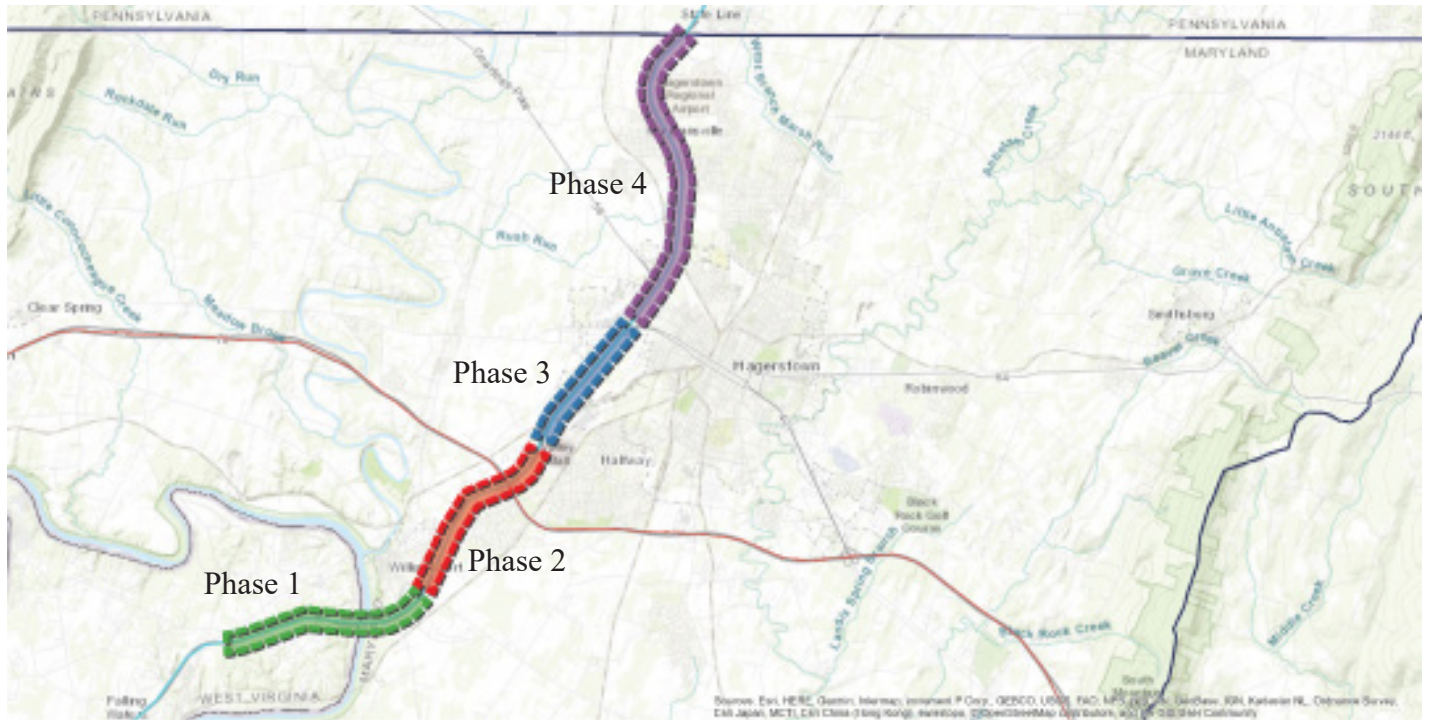


Figure 2: Map of Maryland I-81 Corridor Expansion Project Phases

necessary to ten interchanges and 14 mainline bridges. The MDOT SHA commenced construction on Phase 1 in 2016, and design activities for Phase 2 began in June 2017. The MDOT SHA requests BUILD funding for **I-81 Phase 2**. The Environmental Assessment and FONSI/4(f) Evaluation were completed in 2004 and 2010, respectively. The environmental reevaluation for Phase 2 underway and is on-schedule to be approved by the FHWA to meet the timeline of a BUILD investment in **I-81 Phase 2**.

**PHASE 1**

Phase 1 includes improvements along I-81 from south of US 11 in West Virginia to north of MD 63/ MD 68 including widening and superstructure replacement of two bridges over the Potomac River and two bridges that cross over MD 63. In addition, noise barriers will be constructed as warranted within the project limits and other improvements include resurfacing, landscaping, traffic barrier upgrades, and construction of stormwater management facilities. The design for Phase 1 commenced in 2013 and was completed in the Spring of 2016. The project was procured using the design-bid-build method in accordance with state procurement regulations. Phase 1 has been under construction since 2016 and is anticipated to open on-time in 2020.

Project Phase	Miles	Project Limits/Description
Phase 1 (Funded and Under Construction)	1.3	North of US 11 (WV) to north of MD 63/MD 68. Includes widening and interchange improvements at MD 63/MD 68.
Phase 2 (BUILD Request)	3.5	2,000' North of MD 63/MD 68 to 1000' North of Halfway Boulevard. Includes widening and three interchange improvements at US 11, I-70 and Halfway Boulevard.
Phase 3 (Unfunded)	2.0	1000' North of Halfway Boulevard to US 40. Includes widening and one interchange improvement US 40.
Phase 4 (Unfunded)	5.3	US 40 to PA 163 (State line). Includes widening and four interchange improvements at MD 58, Maugansville Road, Maugans Avenue, Showalter Road, and PA 163.

Figure 3: I-81 Corridor Expansion Project Phases

**PHASE 2 - BUILD PROJECT SCOPE**

**Phase 2** includes the widening of I-81 from 2,000 feet north of MD 63/MD 68 to 1,000 feet north of Halfway Boulevard. A northbound and southbound lane will be added in the median to expand the highway to six travel lanes with interchange improvements at three interchanges. The primary elements to the **I-81 Phase 2** project are listed in Figure 4.

Phase 2
<p><b>Addition of North- and Southbound Travel Lanes</b>                      There are 3.5 miles of roadway upgrades from MD 63/MD 68 to the interchange of Halfway Boulevard to widen the existing dual highway to six travel lanes. The travel lanes will be twelve-feet wide and the two new lanes will be constructed in the median. The existing traffic lanes will also be resurfaced.</p>
<p><b>Interchange Upgrades</b>                      Interchange upgrades, as necessary, are planned at US 11, I-70, and Halfway Boulevard to improve traffic operations.</p>
<p><b>Stormwater</b>                      Construction of drainage and storm water management measures throughout the limits of the project.</p>
<p><b>Traffic Controls</b>                      Phase 2 includes landscaping and traffic barrier upgrades to improve traffic operations.</p>
<p><b>Sound Barriers</b>                      Phase 2 includes 3 miles/feet of sound barrier to mitigate the increased traffic noise.</p>

Figure 4: Phase 2 Corridor Expansion Project Details

**PHASES 3 AND 4**

Phases 3 and 4 extend from Halfway Boulevard in Hagerstown to the Maryland border with Pennsylvania at PA 163, a distance of 7.3 miles. The design and construction of these phases are unfunded at this time. Design will commence once **Phase 2** funding is in place. Phase 3 will include the widening of I-81 between Halfway Boulevard and interchange upgrades at US-40. Phase 4 will complete the remaining work on the I-81 corridor in Maryland, extending from north of US 40 to PA 163 for a length of 5.3 miles, widening I-81 to six travel lanes and making interchange improvements at MD 58, Maugansville Road, Maugans Avenue, Showalter Road, and PA 163.

**2.2 BUILD TRANSPORTATION DISCRETIONARY GRANTS REQUEST**

The I-81 four-phase corridor expansion project has been a longstanding priority for the State and represents one of the MDOT SHA's largest investments in Western Maryland. Planning activities began in 2001 with the completion of a Purpose and Need Statement and preliminary engineering. More than 15 years later, MDOT broke ground in October 2016 on Phase 1, which is fully funded through a combination of state and federal formula funds. The MDOT SHA is now aggressively setting the stage to advance Phase 2 through final design to begin construction in 2021. The BUILD grant request for **Phase 2** would make up 32.5 percent of the funding for **Phase 2**, but the BUILD investment would make up only 6.4 percent of the overall four-phase project cost.

The MDOT SHA is requesting a BUILD grant in the amount of \$25 million for Phase 2 to widen I-81 to six lanes from 2,000' North of MD 63/MD 68 to 1000' North of Halfway Boulevard for an approximate distance of 3.5 miles. **I-81 Phase 2** will enhance the Interstate-to-Interstate connection of I-70 (also on the National Highway Freight Network) and I-81, extending the benefits of Phase 1 through this critical linkage that is vital to the movement of freight and commerce throughout the East Coast. The interchange at I-81 and Halfway Boulevard leverages \$6.3 million in local and private investment in the Halfway Boulevard Extension project, which completes a vital local highway connection between I-70 and I-81, allowing local freight traffic to travel fewer miles and spend less time on local surface roads and intersections and to better serve the rural and freight needs of western Maryland and the Appalachian Region.

4. National Highway Traffic Safety Administration, "Fatality Analysis Reporting System", 2016.
5. MDOT SHA, Travel Forecasting and Analysis Division, "I-81 Traffic Operations Analysis", October 2017.

# Section 3

## Project Location

### THE I-81 CORRIDOR

I-81 – also known as it passes through the State as the Maryland Veterans Memorial Highway – is a continuous north-south highway extending from Canada to Tennessee designated as a major freight corridor on the National Highway Freight Network. I-81 serves the Appalachian Region, providing a critical linkage between the region and the major consumer markets in the Northeast. It is also a major connector along the East Coast, linking Maryland, Pennsylvania, Virginia, and West Virginia, and is heavily utilized as a long-distance truck bypass around areas of urban congestion, delivering freight throughout the region.

I-81 provides access to the Virginia Inland Port, which is located five miles from I-81 near the junction with I-66. The Inland Port receives cargo from the other three state-owned ports (Norfolk International Terminals, Newport News Marine Terminal, and Portsmouth Marine Terminal) five days a week for distribution, in effect bringing the ports in the Hampton Roads area 220 miles closer inland. The Franklin County Regional Intermodal Facility in Greencastle, Pennsylvania also services freight traffic on I-81. Norfolk Southern provides rail access to the both inland ports, making I-81 a

critical truck corridor in Maryland. Several major North American distribution facilities are located near the I-81 corridor, beginning with the Nova Bus Manufacturing and Headquarters and Prevost Manufacturing and Headquarters in Quebec, Canada to the Volvo Group Powertrain Manufacturing and Technology facility in Hagerstown, Maryland to the Mack Trucks World Headquarters in Greensboro, North Carolina.<sup>6</sup>

### PROJECT LIMITS

The four-phase, I-81 corridor expansion project is located in Washington County, Maryland, stretching from Berkeley County, West Virginia, to the border with Franklin County, Pennsylvania, for approximately 12 miles. The **I-81 Phase 2 Corridor Expansion** project begins on I-81 from 2,000 feet north of MD 63/MD 68 to 1,000 feet north of Halfway Boulevard, a distance of 3.5 miles. The project lies within Maryland's 6th Congressional District, which includes the western Maryland counties of Garrett, Allegany and Washington, as well as the western part of Montgomery County. **I-81 Phase 2** is located in the Hagerstown-Martinsburg Urbanized Area, which is considered urban for the purposes of the FY 2018 BUILD grant program.



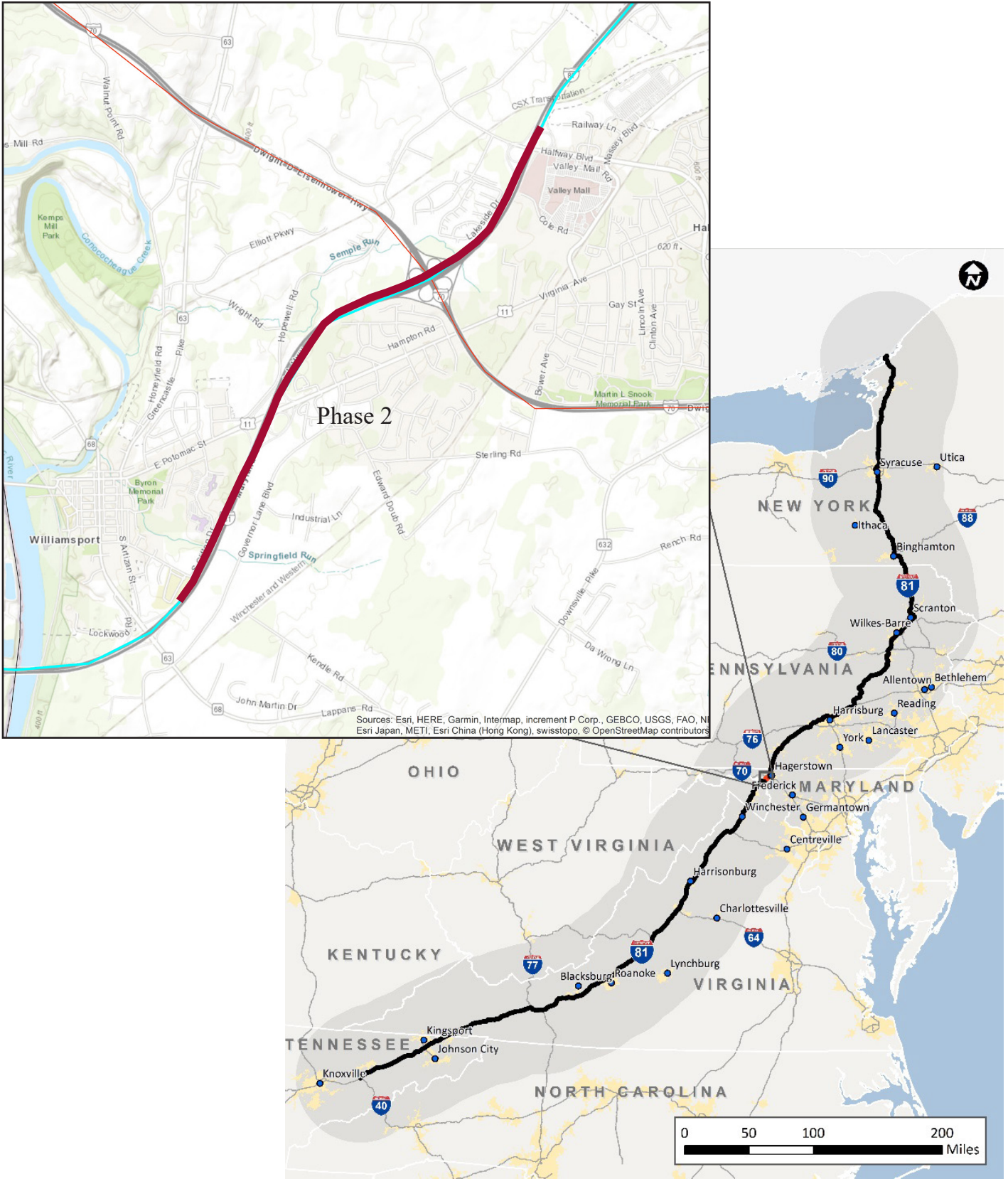


Figure 5: I-81 Phase 2 Project Limits in Comparison to I-81 Corridor



**I-81 PHASE 2 END USERS**

Washington County residents are among the primary end users for **I-81 Phase 2**. Per the 2016 U.S. Census Bureau’s Annual Estimate of the Resident Population, Washington County’s population is 150,292. The County’s population is concentrated around Hagerstown and along I-81, as well as smaller pockets of population in the areas of Smithsburg and Boonsboro. From 2006 to 2016, the region’s overall population increased by approximately 10 percent, with population increases of 4.2 percent for Washington County. The City of Hagerstown has grown by an additional ten percent since the turn of the century and is now Maryland’s sixth largest city, supporting economic growth in Western Maryland.

<b>Estimated Population</b>	<b>150,292</b>
<b>Estimated Households</b>	56,067
<b>Estimated Persons Per Household</b>	2.71
<b>Estimated Average Household Income</b>	\$70,993
<b>Estimated Median Household Income</b>	\$56,228
<b>Estimated Per Capita Income</b>	\$27,066

*Figure 6: Demographic Overview*

Source: Population: U.S. Census Bureau, 2016. Households: U.S. Census Bureau, 2010 American Community Survey. Per Capita Income: U.S. Department of Commerce, Bureau of Economic Analysis, 2009.

Businesses that move freight and manage logistics along the East Coast are also primary end users for **I-81 Phase 2**. I-81 is classified as a major freight corridor in the United States by FHWA. These highway corridors must carry at least 8,500 trucks per day or more than 50 million tons per year. The Maryland I-81 corridor carries an average of 19,400 trucks per day, and more than 30 percent of total traffic within **I-81 Phase 2** project limits are commercial vehicles.<sup>7</sup>

Year	County	City of Hagerstown
<b>1980*</b>	113,086	34,132
<b>1990*</b>	121,393	35,445
<b>2000*</b>	131,923	36,687
<b>2010**</b>	147,430	39,662
<b>2020***</b>	<b>169,300</b>	
<b>2025***</b>	<b>178,950</b>	

*Figure 7: Estimated Population Growth*  
Source: \* U.S. Census Bureau (2000). \*\* U.S. Census Bureau, Census 2010. \*\*\* Projections by the Maryland Department of Planning (2010).

In addition to the sheer volume of commercial users within **I-81 Phase 2** limits, the freight transported along the entire corridor is valuable. There are nearly 3.5 million tons of freight that move into, out of, and through Washington County and 95 percent are carried on trucks. The county is a net importer of freight, with nearly 2.5 million tons of goods valued at \$1.6 billion. Freight that is shipped from the county is, on average, more valuable than imported freight by a factor of nearly three times the value. This attests to the many value-adding industries within the county. Data from IHS Global Insight indicate that total freight tonnage moving through the county is expected to increase by 30 percent by the year 2040. Figure 8 depicts how the volume of freight tonnage is expected to grow over the next 25 years.

TRUCK	FROM WASHINGTON COUNTY			TO WASHINGTON COUNTY		
	Tons	Value (\$M)	Value/ Ton	Tons	Value (\$M)	Value/ Ton
<b>2015</b>	965,718	\$1,818	\$1,883	2,520,000	\$1,607	\$637
<b>2040</b>	1,260,000	\$2,148	\$1,705	2,920,000	\$2,375	\$813
<b>Increase (%)</b>	30%	18%	-9%	16%	48%	28%

*Figure 8: Value and Tonnage of Motor Carrier Freight Movement, 2015, 2040*

Source: IHS Global Insight. Amounts shown are in present value (nominal) dollars.

6. Volvo Trucks Group, “The Many Ways I-81 Intersects Our Business”, I-81 Corridor Coalition Annual Event, April 2018.

7. 2017 Maryland Strategic Goods Movement Plan

# Section 4

## Grant Funds & Sources / Uses of Project Funds

### PROJECT COSTS

The BUILD grant request of \$25 million for **I-81 Phase 2** represents 32.5 percent of the project cost. The remaining funding comes from committed state funds. The MDOT SHA prefers to apply federal funding to as few projects as possible to minimize the approval, oversight, and payment processes required of federally funded investments. Most federalized projects require a minimum 20 percent local match, so most of the MDOT SHA's larger highway projects utilize an 80/20 funding split and smaller projects utilize 100 percent state funding. However, the 80/20 split is not representative of the total state contribution to the State Highway system. In FY 2017, Maryland contributed \$876 million - or 66 percent - of the \$1.318 billion expended on state roads and highways, while the federal government contributed \$442 million, or 34 percent.

A project cost estimate for **I-81 Phase 2** was prepared by the MDOT SHA. The summary is provided in Figure 9, and a copy of the cost estimate is attached and labeled "**CostEst**". The **I-81 Phase 2** cost estimate of \$76.8 million reflects the improvements specified in these financial planning documents and is a probable cost estimate.

### FHWA COST ESTIMATE REVIEW AND MDOT REVISED COST ESTIMATE

A review team consisting of FHWA, the MDOT SHA and consultants conducted a Cost Estimate Review (CER) workshop to review the cost and schedule estimates for the I-81 corridor expansion program. The objective of the review was to verify the accuracy and reasonableness of the project's cost estimate and schedule, and to develop a probability range for the cost estimate that represents the projects' current stage of development. The results were used as the basis for setting the baseline total cost in the Initial Financial Plan. A copy of the CER is attached and labeled "**BudgetCER**".

In addition to the CER, and to develop a more efficient, financially feasible, and implementable project scope, the MDOT SHA developed a revised cost estimate. For example, the CER estimate assumes the construction of new structures, the condition of which the MDOT SHA does not believe merits replacement, thus realizing considerable cost savings. Furthermore, whereas the CER estimate is escalated and includes inflation to an assumed obligation year of 2023, this revised estimate assumes obligation in 2020, lessening the effect of inflation on the estimate.

Phase 2 Cost Category	Project Costs
Right of Way	\$1,900,000
PE	\$8,715,000
Grading	\$1,297,000
Drainage and SWM	\$13,876,000
Structures	\$7,000,000
Paving	\$12,319,000
Shoulders	\$1,170,000
Landscape	\$2,180,000
Traffic and Utilities	\$3,250,000
Contingency (35%)	\$17,432,450
Professional Services (15.3%)	\$7,620,471
<b>Total Project Cost</b>	<b>\$76,759,921</b>

Figure 9: Project Cost Estimate for I-81 Phase 2

The current project cost estimate also includes expanded project limits. In the CER, **Phase 2** project limits end near the I-70 interchange. In the cost estimate used for this proposal, **Phase 2** uses the CER estimates but also includes an additional one mile of work up through the Halfway Boulevard interchange. Expanding the project limits allows **Phase 2** to support the ongoing economic development investment and access road construction.

**FINANCIAL PLAN**

Using the CER, the MDOT SHA released a comprehensive Financial Plan in June 2016 for the I-81 Corridor Expansion project in accordance with the requirements of 23 U.S.C. 106 and the Financial Plan guidance issued by the FHWA. The plan provides detailed cost estimates to complete the project and the estimates of financial resources to be utilized to fully fund the project. The cost data in the Financial Plan provides an accurate accounting of costs incurred to date and include a realistic estimate of future costs based on engineer’s estimates and expected construction cost escalation factors. While the estimates of financial resources rely upon assumptions regarding future economic conditions and demographic variables, they represent realistic

estimates of resources available to fund the project as described. A copy of the Financial Plan is attached and labeled “**FinPlan**”.

**FUNDING COMMITMENTS**

Maryland will utilize state funding to fund 67.5 percent of the total project cost for **I-81 Phase 2**. State funding is programmed through the Maryland Transportation Trust Fund, which supports capital projects, state transportation system operations and maintenance, MDOT Administration, and debt service. The BUILD grant request of \$25 million represents 32.5 percent of the project cost.

Phase 1 of the corridor expansion project is fully funded and is included FY 2017–FY 2022 Consolidated Transportation Program (CTP) funded at \$93 million for construction, with an additional \$5 million for design and engineering added for **Phase 2**. **Phase 2** construction costs are anticipated to be programmed in future CTPs once final engineering is underway. A funding commitment letter for Phase 2 is attached and labeled “**MDOTLtr**”. Figure 10 shows the funding sources for I-81 Phase 2.

In addition, the four-phase, I-81 corridor expansion project is programmed in the FY 2017–FY 2020 Transportation Improvement Program (TIP) and is identified as the number one transportation priority in HEPMPO’s 2040 Long Range Transportation Plan (LRTP) completed in April 2018, Phase 1 and 2 are recognized priorities. A commitment letter from HEPMPO is included in the attachment named “**Support**”. The **I-81 Phase 2** project is on the fiscally constrained project list and part of the approved transportation conformity analysis. Copies of the **CTP**, **TIP**, and **LRTP** are available at the web links listed in the footnote.<sup>8</sup>

**FEDERAL FUNDS PROGRAMMED FOR THE PROJECT**

**PHASE 2 - BUILD PROJECT SCOPE**

The MDOT SHA is requesting \$25 million in BUILD grant funding for **I-81 Phase 2** as shown in Figure 10. BUILD grant funding is being requested for **Phase 2** final engineering, right-of-way acquisition, and construction. The MDOT SHA will obligate state funds to cover all remaining final engineering, right-of-way, and construction costs.

Should the BUILD grant request be funded at less than the full amount requested, MDOT may seek to program National Highway Performance Program (NHPP) funding for **I-81 Phase 2**. However, the MDOT SHA understands that federal funds cannot exceed 80 percent of the total project cost for any given project phase and agrees to abide with all BUILD cost share requirements.

<b>Phase 2 Funding Source</b>	<b>Funding Amount</b>	<b>Status</b>	<b>Percent Share of Phase 2 Costs</b>
Maryland Transportation Trust Fund	\$51,759,921	Confirmed	67.5%
<i>FY 18 BUILD Grant Investment</i>	<i>\$25,000,000</i>	<i>TBD</i>	<i>32.5%</i>
<b>Total Project Cost</b>	<b>\$76,759,921</b>		

*Figure 10: Project Funding Sources for I-81 Phase 2*

8. [http://www.mdot.maryland.gov/newMDOT/Planning/CTP/CTP\\_18\\_23\\_Final/SHA%20Washington.pdf](http://www.mdot.maryland.gov/newMDOT/Planning/CTP/CTP_18_23_Final/SHA%20Washington.pdf),  
[http://www.mdot.maryland.gov/newMDOT/Planning/CTP/Final\\_CTP\\_16\\_21/Documents/2035\\_MTP\\_010816\\_Web.pdf](http://www.mdot.maryland.gov/newMDOT/Planning/CTP/Final_CTP_16_21/Documents/2035_MTP_010816_Web.pdf)  
[https://www.dropbox.com/s/7vdpripyglem3m9/HEPMPO\\_LRP\\_Final.pdf](https://www.dropbox.com/s/7vdpripyglem3m9/HEPMPO_LRP_Final.pdf)

“Improvements to I-81 will have a positive impact on nearly all of Volvo Group’s facilities in the United States.”

*-Pierre Jenny, VP Operations, Powertrain Production, Volvo North America*



*The Volvo Powertrain factory in Hagerstown, MD, covers 1.5 million square feet of floor space and employs about 1,700 people*



# Section 5

## Merit Criteria

**The I-81 Phase 2 Corridor Expansion Project** positively addresses all eight BUILD Grant Program merit criteria:

1. Safety
2. State of Good Repair
3. Economic Competitiveness
4. Environmental Protection
5. Quality of Life
6. Innovation
7. Partnership
8. Non-Federal Revenue for Transportation Infrastructure Investment

### 1. SAFETY

Crashes that occur on Maryland's stretch of I-81 represent a disproportionate number of accidents in Washington County, 15 percent.<sup>9</sup> The unacceptable level of crashes is partially due to a concentration of ten interchanges in a 12.1-mile span (current design standards recommend at least two miles between interchanges) and the roadway does not meet modern design standards for limited access highways. Interstate travel (I-81 and I-70) accounts for 50 percent of the VMT in Washington County. I-81 in Maryland averages about 71,300 AADT with truck volumes accounting for 27% of all traffic. Portions of I-81 near Halfway Boulevard exceed those numbers. The high volume of truck traffic exacerbates the weaving, merge, and diverge problems associated with the closely-spaced interchanges.

### SAFETY: IMPROVE SAFETY TO REDUCE CRASHES AND MITIGATE TRAVEL DELAYS

The high freight volume and design deficiencies described above impair safety along the I-81 corridor in Maryland. This is particularly evident within the **Phase 2** limits that include the interchanges at I-70 and Halfway Boulevard. High truck volumes lead to greater risk for serious crashes that can cause fatalities and injuries, as well as resulting in hours of backlog congestion. The rate for truck-related crashes of 17.8 crashes per 100 million vehicle-miles is substantially higher than the statewide average rate for similar roadways of 5.0 crashes per 100 million vehicle-miles. For **I-81 Phase 2**, almost 20 percent of all crashes on this segment of roadway are related to trucks – an increase of 3 percent compared to last year and an increase of 5 percent since 2010. The fatal crash rate was substantially higher than the statewide average at 0.8 fatal crashes per 100 million vehicle-miles, see Figure 11. Alcohol and surface conditions were not considered factors in any of these crashes.

YEAR	Crash Rate (Crashes per Million VMT)	Truck Crash Rate (Crashes per 100 Million VMT)	Fatal Crash Rate (Crashes per 100 Million VMT)	Injury Crash Rate (Crashes per 100 Million VMT)
2010	24.8	6.8	0.8	11.7
2011	27.4	4.6	0.4	12.2
2012	35.0	9.3	0.8	13.7
2013	34.0	9.7	0.8	14.3
2014	43.7	17.8	0.8	17.0
2015	40.8	11.7	0.0*	13.4
<b>Statewide Rate</b>	<b>44.3</b>	<b>5.0</b>	<b>0.3</b>	<b>15.8</b>

Figure 11: I-81 Crash Rates Compared to Maryland Statewide Averages (2015)

To provide context to the crashes that are occurring along I-81, the MDOT SHA has found that weave problems exist at the I-70, Halfway Boulevard, US 40, and MD 58 interchanges, resulting in a high number of rear-end truck crashes and sideswipe crashes. The heavy truck weaving problems occurred more frequently in the southbound direction of travel, and the volume of truck traffic is reflected in the involvement of trucks in the crashes totals. Nearly 30 percent of all reported crashes on the four-phase, I-81 corridor involved trucks between 2010 and 2017.



Based on crash data between 2010 and 2017, there were 386 reportable crashes that occurred within Maryland’s I-81 corridor, including four fatal crashes and 145 crashes resulting in injuries. In 2017 alone, there were 27 injuries and one fatality resulting from crashes. Total crashes increased 37 percent between 2015 and 2017 while truck crashes rose considerably by 34 percent during the same period across the Maryland’s 12.1-mile I-81 corridor.



**CRASH IMPACTS ON NONRECURRING CONGESTION DELAYS**

Reportable crashes have a direct impact on the lives and wellbeing of motorists and an economic impact on motorists and businesses transporting goods on the interstate system. When a severe crash occurs along I-81 and causes a closure of a lane or the roadway, lengthy vehicle backlogs occur and impact thousands of travelers. There is no adjacent highway that serves as a viable detour and, subsequently, traffic congestion becomes profoundly problematic with each crash that occurs on the system.

“When an accident occurs on I-81 in Maryland, it causes retail and restaurant sales to drop at a 17-28% rate for the day depending on the length of time the accident backlogs traffic.”

-Julie M. Rohm, General Manager Valley Mall

Nationally, FHWA estimates that approximately 25 percent of all traffic congestion is caused by traffic incidents and 45 percent of all nonrecurring congestion.

The reliability of travel times along I-81 in Maryland has become a significant problem for motorists and freight carriers. Based on available INRIX travel time data, nearly 200,000 hours of vehicle-delay have occurred along this roadway corridor just since January 2014. As illustrated in the Benefit-Cost Analysis (BCA) attachment, traffic delays have fluctuated substantially, both by hour and day, making it difficult for motorists to anticipate or avoid traffic congestion. Traffic incidents have been identified as a root cause of substantial delays.

**SAFETY: BUILD AND NO BUILD SCENARIOS**

The reduction in crashes attributable to I-81 corridor improvements is anticipated to align closely with the recently realized reduction of crashes along I-81 in West Virginia. In 2011, West Virginia completed a six-lane expansion project along the I-81 corridor. Like the I-81 Corridor Expansion project in Maryland, West Virginia widened I-81 from four lanes to six lanes. **The project resulted in an 80 percent reduction of crashes along the corridor over a four-year period when compared to the previous four years**, shown in Figure 12. The realized safety benefits in West Virginia are a strong

indicator that Maryland will experience a similar crash reduction. West Virginia’s section of I-81 was in worse condition overall before the expansion project was undertaken, therefore the MDOT SHA has been conservative in estimating the number of crashes that will be prevented on the Maryland stretch of I-81 due to the corridor expansion project. This allows for the possibility that some of the safety improvements experienced by West Virginia may have been related to general improvements in highway condition rather than to the corridor widening and interchange upgrades. Therefore, for purposes of the Benefit-Cost Analysis, the MDOT SHA is assuming a more modest reduction of 40 percent in crashes related to the **I-81 Phase 2** project.

**2. STATE OF GOOD REPAIR**

The MDOT SHA takes a proactive position to ensure a long-term state of good repair for the interstate facility and appropriately plans for increases in traffic volume. As initially found in the 2001 Purpose and Need Statement and reaffirmed in recent planning documents, the project need is substantiated by freight demand, traffic operations, and safety. This BUILD project is consistent with the MDOT SHA’s efforts to improve the condition of existing transportation facilities and systems, maintain assets in a state of good repair to minimize life cycle costs, and improve resilience. All operation and maintenance on Maryland’s state highways are performed by the

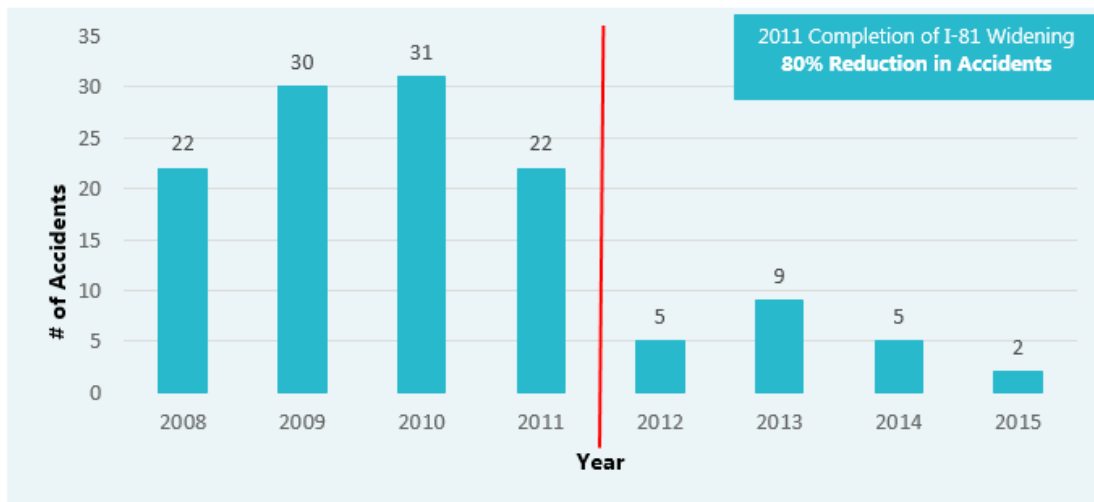


Figure 12: West Virginia traffic crash decrease following 2011 widening of I-81

MDOT SHA. With over 17,000 lanes miles to operate and 26 percent of those roads rated in poor condition, the MDOT SHA is keenly aware of the critical need to maintain its system to safely and effectively move people and freight.<sup>10</sup>

**3. ECONOMIC COMPETITIVENESS**

Almost entirely contained within the federally-designated Appalachian Region, I-81 is a vital route for the distribution of raw materials and finished goods to and from Appalachia and some of the largest consumer markets in North America. I-81 also serves as a long-distance truck bypass around major areas of urban congestion. This is evidenced by the extraordinary freight volumes that are among the highest in the nation by lane mile. Traffic volume data reveals that the amount of trucks per lane of highway along this stretch in Maryland is one of the highest in the nation, falling within the top one percent. A 2012 study published by the I-81 Corridor Coalition quantifies the economic significance of I-81 to the Appalachian Region, identifying I-81 as a critical asset supporting national and global commerce.

**FREIGHT DEMAND: EXPAND CAPACITY TO ACCOMODATE FORECAST FREIGHT DEMAND**

In 1989, overall volumes ranged from approximately 30,000 to 50,000 AADT along the I-81 corridor. Now, nearly three decades later, the volume on I-81 averages 71,300 AADT. The MDOT SHA’s statewide travel demand model projects AADT to be as high as 110,000 vehicles by 2040, representing a growth of nearly 40,000 total vehicles per day, shown in Figure 13. Recurring traffic congestion during peak periods

and the number of crashes are expected to become more frequent and more severe. The truck-involved crash and fatality rates along I-81 in Maryland are twice as high as the statewide averages for similar roadways. These crashes result in hours of backlog congestion that impact freight deliveries all along the I-81 corridor.

Per FHWA’s Freight Analysis Framework (FAF) forecasts, truck traffic on I-81 in Maryland is expected to increase by more than 50 percent over the next 30 years to reach nearly 30,000 trucks per day by 2045. Within FAF’s national database of highway segments, this section of I-81 is already within the top one percent of segments with respect to the number of trucks per travel lane. Continued increases in freight demand threaten to render I-81 in Maryland obsolete in terms of capacity reducing the economic competitiveness of the region.

**FREIGHT DEMAND: BUILD AND NO BUILD SCENARIOS**

Using microsimulation modeling, the MDOT SHA evaluated the operational improvements and capacity enhancements that **Phase 2** of the project will provide upon completion. The analysis considered existing 2016 and future 2040 No Build and **Phase 2** Build AM and PM peak hours for the I-81 corridor in Washington County. The results of the analysis focused on the section of the I-81 corridor from MD 63/MD 68 to the Halfway Boulevard interchange (Phase 2). Figure 13 shows traffic volume for I-81 **Phase 2** in 2016, under a 2040 No-Build scenario, and a 2040 **I-81 Phase 2** scenario.

Source: FHWA Freight Analysis Framework 4.0

ROADWAY SECTIONS (SOUTH TO NORTH)	2016 EXISTING	2040 NO BUILD AADT	2040 PHASE 2 AADT
WEST VIRGINIA STATE LINE TO MD 68	66,500	94,800	103,900 (+9.5%)
MD 68 TO HALFWAY BLVD	66,800-86,000	95,000-110,750	104,000-115,700 (+4.5% TO +9.5%)
HALFWAY BLVD TO US 40	81,800	104,300	106,100 (+1.7%)
US 40 TO PENNSYLVANIA STATE LINE	60,700-77,200	75,900-95,600	75,900-96,000 (NO CHANGE TO +0.5%)

Figure 13: Traffic Volume for I-81 Phase 2 (2016)



SCENARIO	AUTO VMT	TRUCK VMT	TOTAL VMT
EXISTING	1,603,009.77	330,206.76	1,933,216.53
NO BUILD	2,064,563.35	370,448.12	2,435,011.47
PHASE 2 (OPENING DAY)	1,672,058.66	336,596.45	2,008,655.11
PHASE 2 ONLY	2,087,022.30	381,198.13	2,468,220.43

Figure 14: Vehicle Miles Traveled for I-81 Phase 2 (2017)

The analysis shows that the I-81 Phase 2 project will result in traffic volume nine percent higher than in the No Build scenario within the Phase 2 project limits, shown in Figure 14. The additional capacity will provide relief to other congested parallel facilities within the region by increasing travel speeds and reducing crashes. Alternatively, under a No Build scenario, the MDOT SHA has found that travel speeds will decline dramatically at the three interchanges within the I-81 Phase 2 project limits.

Completion of Phase 2 will result in higher travel speeds, a critical component to attracting and sustaining efficient freight movement. Travel speeds decrease in both directions of the I-81 mainline corridor in the 2040 No Build conditions, which reflect LOS degradation in the segments along I-81

without the project, as shown in Figure 15. With the completion of Phase 2, the model shows speeds nearly all return to the 2017 existing conditions through the implementation of Phases 1 and 2. Along certain segments, the new six-lane facility will increase speed by more than ten miles per hour, expediting the movement of freight through the corridor. The MDOT SHA’s modeling results address recurring delay, which includes typical daily peak period traffic congestion. Nonrecurring delay, including the impacts of traffic incidents, is not considered in the modeling. However, the project’s safety benefits, as discussed earlier, are anticipated to provide additional improvements to traffic congestion and speeds.

“Our employees’ commutes at many of our plants are often negatively affected as arriving to work on time and getting home at a reasonable hour can often prove difficult and unsafe.” - Pierre Jenny, VP Operations, Powertrain Production, Volvo North America

	I-81 Segment	2017 Existing	2040 No Build
<b>I-81 Southbound</b>	Between Halfway Ramps	66 (60)	64 (37)
	Halfway Blvd to I-70	65 (61)	49 (29)
	Between I-70 Ramps	66 (62)	60 (18)
	I-70 to US 11	66 (59)	64 (42)
	Between US 11 Ramps	69 (65)	68 (63)
<b>I-81 Northbound</b>	Between US 11 Ramps	65 (67)	10 (55)
	US 11 to I-70	60 (63)	12 (39)
	Between I-70 Ramps	66 (66)	62 (65)
	I-70 to Halfway Blvd	60 (56)	63 (61)
	Between Halfway Ramps	63 (61)	61 (60)

Figure 15: AM (PM) Travel Speeds for I-81 Phase 2, Existing Conditions and 2040 No Build

Source: SHA I-81 Phase 2 Traffic Operations Analysis

2017 PM Existing			2040 PM No Build		2040 PM Phase 2	
Facility (Weave, Diverge, or Merge)	Density (pcpmpl*)	LOS	Density (pcpmpl)	LOS	Density (pcpmpl)	LOS
I-81 NB Diverge to Halfway Blvd EB	19.1	C	28.6	D	18.8	B
I-81 SB Diverge to Halfway Blvd WB	22.0	C	44.5	E	24.5	C
I-81 Aux Lane between Halfway Blvd and I-70	22.0	C	60.1	F	30.1	D
I-81 NB Diverge to I-70	22.0	C	28.7	D	39.0	E
I-81 SB Merge from I-70	28.8	D	52.9	F	28.8	D
I-81 NB Diverge to US 11	11.8	B	28.2	D	15.7	B
I-81 Merge from US 11 (MD) EB	12.7	B	17.1	B	12.2	B
I-81 Merge from US 11 (MD) SB	18.9	B	23.7	C	21.6	C
I-81 SB Diverge to US 11 (MD)	14.0	B	55.4	F	28.1	D
I-81 SB Merge from US-11 (MD)	25.9	C	35.7	E	20.1	C
I-81 NB Diverge to MD 63/MD 68	11.6	B	14.5	B	11.7	B
I-81 NB Merge from MD 63/MD 68	12.5	B	23.3	C	12.4	B
I-81 SB Diverge to MD 63/MD 68	16.3	B	16.9	B	10.3	B
I-81 SB Merge from MD 63/MD 68	10.7	B	14.6	B	7.7	A

Figure 16: AM/PM Peak Level of Services, Build and No Build Scenarios (2017)

Source: SHA I-81 Phase 2 Traffic Operations Analysis

**TRAFFIC OPERATIONS: BUILD AND NO BUILD SCENARIOS**

Freight movement needs reliable traffic operations with minimal delays. The Level of Service (LOS) on the **Phase 2** segment currently ranges from B to D, and are projected to deteriorate to B to F by 2040 under the No Build scenario. The increase in density throughout the corridor can be attributed to increased volumes leading to increased truck-to-auto friction, causing degradation of the I-81 merges and diverges. Several notable, high-traffic areas are projected to operate poorly (LOS E), or to fail (LOS F), under the 2040 No Build conditions, as shown in Figure 16. Currently, the I-81 merge lanes from I-70 operate at a deficient LOS D.

Under 2040 **Phase 2** conditions, several of the previously identified LOS degradations under 2040 No Build are mitigated to acceptable levels of services while also expanding capacity for freight movement.

**4. ENVIRONMENTAL PROTECTION**

The MDOT SHA utilized the Streamlined Environmental/Regulatory Process for the project planning phase of the I-81 corridor study. The project planning phase concluded with a FONSI document approved by FHWA and concurrence from the environmental review/permit agencies on a preferred/selected alternative and a corridor permit for wetland/waterway impacts. Any changes during subsequent phases of the project will likely require only a reevaluation of the NEPA document and modification/update of the corridor permit. However, the MDOT SHA is interested in participating in U.S. DOT’s new environmental permitting approach.

**I-81 Phase 2** presents an opportunity to mitigate impact and rectify previous environmental impacts. The design of **I-81 Phase 2** minimizes impacts to wetlands, waterways, trees, forests and/or endangered species by limiting the pavement widening to the median side to the maximum

extent feasible and practical. Improvements to ramps and/or interchanges could result in more impacts to resources, however, mitigation efforts will be incorporated into the project. There are a minimal number of existing stormwater facilities within the limits of work because the original I-81 construction did not include these facilities. As a result, a majority of the runoff drains to median inlets and is conveyed through pipes that outfall on the outside of the roadway into road side ditches and/or outfall into streams. Stormwater management facilities have been added as part of limited scope roadway improvements at the I-70 and Halfway Boulevard interchanges. The 2010 FONSI found that **I-81 Phase 2** retaining walls will be used to minimize impacts to wetland areas and to avoid 6 to 8 residential displacements. Furthermore, 2:1 side slopes are proposed where appropriate to minimize impacts to streams and wetlands. The steeper sides slope and retaining walls will allow for 1,073 LF of streams and approximately 31,000 square feet (0.71 acre) of wetlands to be avoided.

**I-81 Phase 2** stormwater management (SWM) facilities will use Environmental Site Design (ESD) to the maximum extent practicable (MEP). Median areas will be evaluated to try and maximize the impervious surface runoff treatment through the use of grass swales and bioswales. In addition to ESD practices in median areas, roadside areas within existing right-of-way on the outside of the I-81 northbound and southbound lanes will be used as necessary to treat the Impervious Area Requiring Treatment (IART) and satisfy Environmental Site Design Volume (ESDv) requirements. Site investigations will also evaluate the suitability of using existing areas within interchanges for SWM facilities to maximize treatment while minimizing impacts to adjacent properties and environmentally sensitive areas. It is estimated that the IART for the median widening will be approximately 13.98 acres with an ESDv requirement of approximately 154,038 cf. Washington county requires 10-year control, and possibly 100-year control if the county determines that there are historic flooding issues nearby.

In addition to SWM using ESD to mitigate impacts to water quality, evaluation of existing drainage outfall conditions will be included in the concept development and, should improvements be required based on existing conditions, these will be incorporated into the Design-Build Concept Performance Specifications. Evaluation of existing streams adjacent to the I-81 corridor is also to be included in the concept development and, where stream stabilization or restoration measures are deemed appropriate, these can be incorporated into the Design-Build Concept Performance Specifications. An investigation of potential wetland and forest stand mitigation sites in the vicinity will be performed as part of the concept development. Should wetland and/or forest impacts be such that mitigation is necessary, the Design-Build Concept Performance Specifications will incorporate these mitigation requirements using the sites identified during the concept phase.

The Maryland Air and Radiation Management Administration was consulted to determine the adequacy of the specifications in terms of satisfying the requirements of the “Regulations Governing the Control of Air Pollution in the State of Maryland.” These specifications were determined to be consistent with the requirements of these regulations. Therefore, during the construction period, all appropriate measures (Code of Maryland regulations 26.11.06.03D) will be incorporated to minimize the impact of the proposed transportation improvements on the air quality of the area. Specifically, the application of water during demolition, land clearing, grading, and construction operations will work to minimize fugitive dust.

Sound barriers will be evaluated for the project due to predicted noise impacts at sensitive receptors adjacent to the project corridor. In general, noise impacts extend approximately 100 to 350 feet from the edge of pavement depending on the surrounding topography and include the majority of the front-row receptors. As part of the project, all noise impacted receptors will warrant noise



mitigation consideration and will be evaluated for feasibility and reasonableness criteria in accordance with the MDOT SHA Highway Noise Policy. All potential noise mitigation recommendations during the preliminary design noise analysis will be re-evaluated during the final design phase of the project using final engineering elements.

### 5. QUALITY OF LIFE

The 12-mile stretch of I-81 in Maryland lies entirely within Washington County, extending from the West Virginia state line at the Potomac River through historic Williamsport to Hagerstown, nicknamed “Hub City” for its position at the crossroads of I-81 and I-70 and CSX, Norfolk Southern, and the Winchester & Western railroads. Hagerstown is also the commercial and industrial hub for a tristate area that includes Western Maryland, South Central Pennsylvania, and the Eastern Panhandle of West Virginia. From the I-70 interchange, the I-81 corridor continues another 7.8 miles north to the Pennsylvania state line.

Washington County benefits from its convenient location in the heart of the Appalachian region, where excellent rail service and the national transportation network via I-81 and I-70 provide access to 50 percent of the nation’s population overnight. Approximately 20 business and industrial parks, including two technology parks, are concentrated in the Hagerstown and Williamsport areas with easy access to I-81 and I-70 as shown in Figure 17.

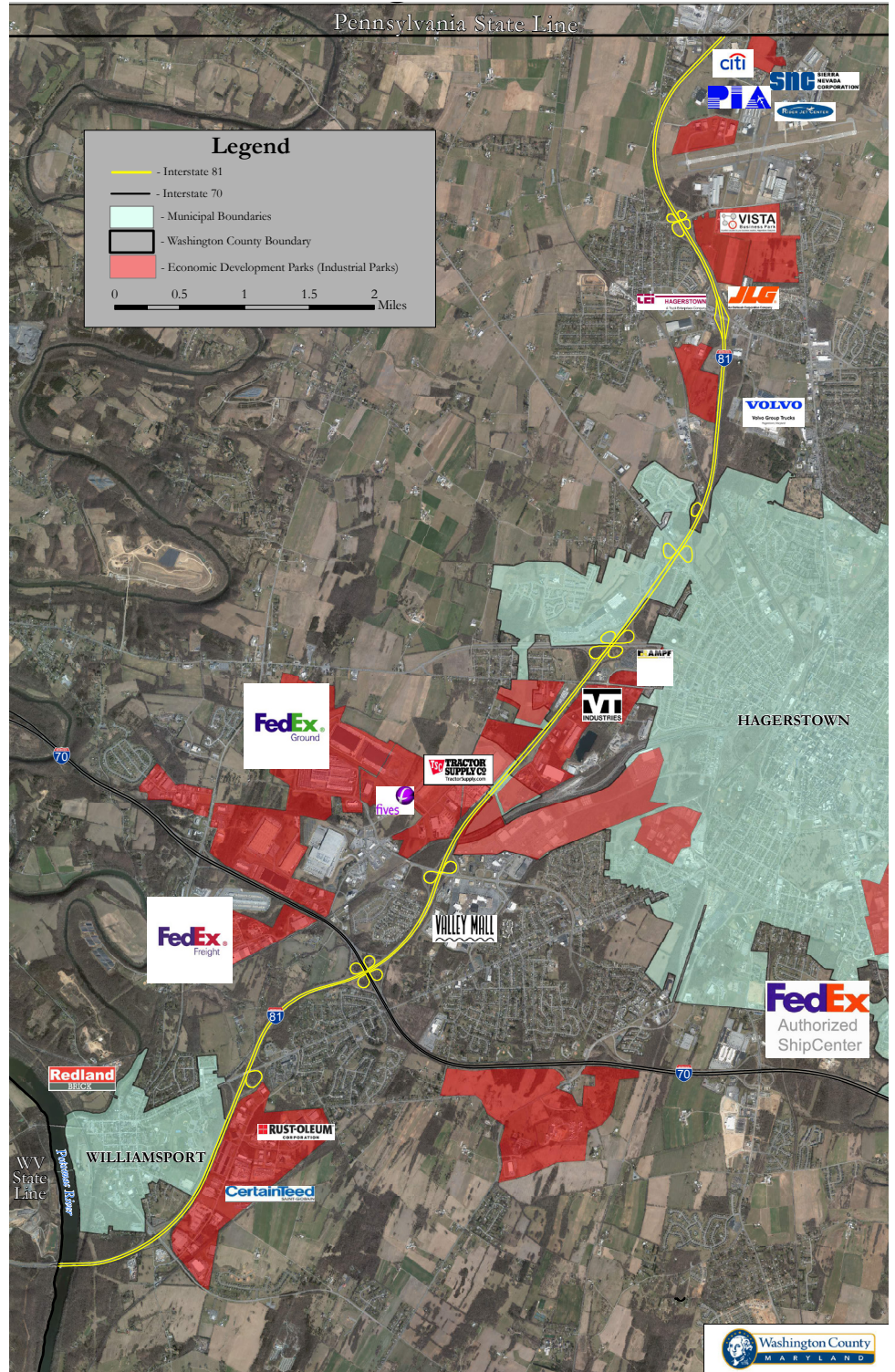


Figure 17: I-81 Freight Generating Businesses on the I-81 Corridor Generators in Maryland Map



Nearly 2,180 acres are ready for commercial and industrial development and approximately six million square feet of office, commercial, warehouse, and manufacturing space is available for sale or lease. The availability of industrial and office properties, combined with easy access to Maryland's busiest freight highway, I-81, position Washington County for continued growth and development that is anticipated in the short- and long-term horizon. Currently, Washington County has more than 71,045 workers at its 3,450 companies and is anticipating strong and stable growth with the availability of developable land along I-81. The Greater Hagerstown region is a fast-growing area in a rural setting. Local businesses such as the Federal Express Mid-Atlantic distribution sites and Volvo Trucks powertrain manufacturing plant in Hagerstown heavily depend upon free-flow access to both I-81 and I-70 for efficient supply chain management.

### 6. INNOVATION

The MDOT SHA is a leader in innovative practices among state departments of transportation. The MDOT SHA plans on utilizing several innovative strategies to deliver the **I-81 Phase 2** project on time and on budget. The **I-81 Phase 2 Corridor Expansion** project will showcase innovations in environmental review and permitting and experimental project delivery. The project planning phase concluded with a FONSI document approved by FHWA in 2010 and concurrence from the environmental review/permit agencies. However, the MDOT SHA is interested in participating USDOT's new environmental and permitting approach.

The MDOT SHA has worked to ensure all forms of innovation are capitalized, including efficiencies brought forth by project delivery methods. Based on this evaluation, Design-Build is the preferred delivery model for the **I-81 Phase 2** project. Design-Build will incentivize the contractor to stay on-time and on-budget by integrating design and construction under one contract. To further speed the pace of project construction, the MDOT SHA intends to

use Special Experimental Projects Number 14 (SEP-14) tools. The MDOT SHA will explore the applicability and benefits of SEP-14 concepts such as No Excuse Bonuses, which gives the contractor final deadline for completion. If work is completed before the deadline, the contractor receives a bonus. Only catastrophic events, such as hurricanes, are considered excuses for not meeting the deadline. The MDOT SHA will also consider other innovative contracting practices that could accelerate project significant savings in time to delivery, reduce the life cycle cost of the project, and provide a quality result. The MDOT SHA will also evaluate the benefits of alternative procurement methods such as Alternative Technical Concepts (ATC) and Best Value. ATCs allow contractors to submit changes to the agency's supplied construction criteria. The Best Value procurement method will allow the MDOT SHA to consider all aspects of a bidder's proposal and not just price. The Best Value approach recognizes factors such as project understanding, past performance, schedule, and quality control with the desired result being a less expensive project with a higher level of quality.

Effective July 1, 2017, the Maryland Energy Administration (MEA) will offer an Electric Vehicle Supply Equipment (EVSE) rebate program to an individual, business, or state or local government entity for the costs of acquiring and installing qualified EVSE. Between July 1, 2017, and June 30, 2020, rebates are up to the following amounts, for 40 percent of the costs of acquiring and installing qualified EVS. In addition, the MDOT SHA recently submitted a request to FHWA to designate I-81 as a national EV corridor. If approved, I-81 will join a growing national network for alternative fueling and charging infrastructure along national highway system corridors.

### 7. PARTNERSHIP

The I-81 Corridor Widening project has come to fruition due to strong constituent and business advocacy at the local and regional levels. **I-81**

**Phase 2** enjoys support and partnership from key stakeholders because of its impact on economic growth in the region. In fact, grassroots efforts from local officials and the public has led the MDOT SHA and the Hagerstown/Eastern Panhandle Metropolitan Planning Organization (HEPMPO) to reprioritize funding in the HEPMPO long-range transportation plan to advance this project. Today, it is identified as the number one transportation priority for Washington County in the Washington County Comprehensive Plan as well as HEPMPO's long range transportation plan.

The I-81 Corridor Coalition completed a study in 2012 that discusses the economic significance of I-81 to the Appalachian Region and locates I-81 as a critical asset supporting national and global commerce. The Coalition is a consortium of stakeholders dedicated to improving the safety, continuity, and efficiency of commercial and personal travel along the I-81 corridor. This regional partnership is comprised of state departments of transportation, metropolitan and regional planning organizations, non-governmental organizations, and private entities located across six states. The MDOT SHA's **I-81 Phase 2** project is strongly endorsed by the Coalition, as the project's travel efficiency and safety benefits will be realized by a wide spectrum of public and private organizations.

In terms of project partners, HEPMPO is a primary project stakeholder that supports the MDOT SHA's planning and advocacy efforts to advance the project. In concert with the MPO, Washington County is also a primary project stakeholder and vocal advocate for the project. Letters of support from HEPMPO and the Washington County Board of Commissioners among those included in the attachment labeled "**Letters of Financial Commitment and Support.**"

The **I-81 Phase 2** limits also impact a Washington County development investment at the interchange located at Halfway Boulevard. Washington County entered a cooperative agreement with Bowman Development Corporation to extend Halfway

Boulevard to MD 63 near the I-70 interchange. The County anticipates investing approximately \$1.5 million on the project, matching the developer's investment in access roads between the interchange and the commercial development space. The project will open 180 acres for development and the developer plans to build a 500,000-square foot facility on the site. The facility is a combination of warehouse and manufacturing facility that would capitalize on the existing truck traffic feeding from the linkage between I-81 and I-70. According to the developer, "the ability to move traffic on I-81 will be important" in finding tenants interested in accessing major distribution centers like Tractor Supply, FedEx Ground, Kellogg, and Staples.

The County and its developer view the **I-81 Phase 2** as an essential component to the financial feasibility of the development at the interchange. The extension of Halfway Boulevard will spur commercial development on the lands surrounding the new access road and alleviate growing traffic issues in this area while improving connectivity between Interstates 70 and 81 and the existing nearby commercial/industrial areas. The County has identified the extension of Halfway Boulevard to MD 63 as an essential link for the economic development of businesses and has started preparing for the road extension which will provide access to developer property for development.

The location, coupled with incentives, will make the area attractive to businesses looking to locate or expand in the region. This area is zoned "Highway Interchange," which means potential uses include commercial activities or light-industrial land uses that serve highway travelers, provide goods and services to a regional population, or uses that have a need to be located near the interstate for access by many employees or receiving shipped goods via highways, per the County's zoning ordinance. In addition, the area is located within the County's Enterprise Zone, which allows businesses which build or expand and/or add employees to receive tax credits on property and state income tax. The site is

primed to foster economic growth and the **I-81 Phase 2** project will help this development become fully realized.

Currently, two business/industrial parks are located near the proposed roadway, Hunters Green Business Park and Hopewell Valley Business Park. Businesses located in these parks include FedEx Ground, Fives Cinetic, Staples Distribution, Home Depot Distribution, and Tempur Sealy. The extension of Halfway Boulevard will benefit these businesses by providing an alternate method of accessing both Interstates 70 and 81.

In addition to moving freight and people along the East Coast and within the Appalachian Region, I-81 is recognized as a catalyst for economic development in the County. Improvements to safety and travel time on I-81 will directly impact the attractiveness of the region to businesses looking to locate or expand their facilities.

### 8. NON-FEDERAL REVENUE FOR TRANSPORTATION INFRASTRUCTURE INVESTMENT

Maryland was one of the first in the nation to create a Transportation Trust Fund, an integrated account dedicated to funding the state's transportation needs. The Fund supports debt service, maintenance, operations, administration and capital projects and unexpended funds are carried over year-over-year. The Maryland General Assembly is solely responsible for increases to the Fund. The General Assembly is also responsible for working with MDOT to allocate funds to projects and programs, like **I-81 Phase 2**. MDOT prepares several long-term planning documents that are used to determine transportation investment priorities. These include the six-year Consolidated Transportation Program, updated annually, and the 20-year Maryland Transportation Plan, revised every five years. MDOT uses these plans to develop annual operating and capital budget requests for the General Assembly's consideration. **I-81 Phase 2** continues to have significant support,

as evidenced by the MDOT SHA's commitment of state funding ("**MDOT Funding Commitment Letter**").

The Transportation Trust Fund is indexed to the Consumer Price Index and a sales and use tax equivalent rate that is annually adjusted as a percentage of retail price (Md. Tax-General Code Ann. §9-305, §9-306, §2-1103; 2013 Md. Laws, Chap. 429). Indexing the Fund to inflation provides a non-federal revenue stream. Despite this recent investment, Maryland's transportation needs continue to outpace available funding. As a result, the MDOT SHA has considered other alternatives to funding its transportation needs, particularly for the **I-81 Phase 2** project.

The MDOT SHA considered a public-private partnership (P3) delivery model for **I-81 Phase 2**. The MDOT SHA determined that **Phase 2** (nor the entire, four-phase project) is not an ideal candidate project for P3 because there is not sufficient private sector market appetite. The limited number of lane miles constrain the project's financial feasibility and the rate of return that would be acceptable to potential concessionaires. The MDOT SHA found that projects with greater than 30 lane miles are projects more suitable to P3. Instead, the MDOT SHA chose the Design-Build delivery method as a way to maximize its scarce dollars. Design-Build decreases the schedule for delivery since design/engineering and construction are managed under one procurement. The MDOT SHA estimated that the procurement time-savings will result in accelerating the project by 12 to 18 months. Design-Build will also provide opportunities for innovation to address congestion and constructability concerns along mainline I-81 and at the interchange ramps. **I-81 Phase 2** leverages the state's 67.5 percent contribution to the project and will be delivered in such a way as to maximize both state and federal dollars spent on the project.

9. National Highway Traffic Safety Administration, "Fatality Analysis Reporting System", 2016.

10. MDOT Transportation Asset Management Plan

# Section 6

## Project Readiness

The MDOT SHA will have all necessary pre-construction activities completed by June 30, 2020 and intends to obligate a BUILD investment for the construction of **I-81 Phase 2** by September 30, 2020. The MDOT SHA has demonstrated a significant capacity to deliver projects utilizing the Design-Build project delivery method on over 45 projects valued at over \$900 million. Additionally, four Design-Build contracts for the Intercounty Connector Mega-project valued at over \$1.5 billion were delivered by the MDOT SHA. The **I-81 Phase 2** has been in the planning process for more than 15 years. The MDOT SHA first initiated a planning study for the four-phase, I-81 corridor expansion in July 2001. An Environmental Assessment (EA) was completed on September 15, 2004, and a Finding of No Significant Impact (FONSI) was issued on February 25, 2010, for the project due to minimal impacts to resources.

Phase 1 design activities began in 2013, were completed in March 2016, and the MDOT SHA began construction in October 2016, with anticipated completion in Summer 2020. A statewide priority, the MDOT SHA is now actively advancing **Phase 2** through the design and engineering process and fully anticipates letting a contract on **Phase 2** in the Spring of 2020. While design officially commenced in June 2017, the completed design and construction documents for Phase 1 will provide the MDOT SHA with efficiency during **Phase 2**.



## 6.1 TECHNICAL FEASIBILITY

In June 2016, the MDOT SHA issued a Project Management Plan (PMP) for the project. The PMP provides a detailed description of the management systems and processes that will guide the full range of project activities to ensure project completion, as well as organizational roles and responsibilities and key staff. The PMP certifies technical feasibility. In addition, the plans for Phase 2 are attached and labeled as “**Phase2Tech**.” A copy of the PMP is attached and labeled “**PMPlan**”.

## 6.2 REQUIRED APPROVALS

### NEPA STATUS AND ENVIRONMENTAL STUDIES

The MDOT SHA followed the regulatory requirements of the National Environmental Protection Act (NEPA) in preparing environmental review documentation for the I-81 corridor expansion program in Maryland. Agency concurrence on the Purpose and Need was received in October 2001, and an EA was completed on September 15, 2004. MDOT issued a FONSI/4(f) Evaluation document for the project in February 2010. A reevaluation document was completed for Phase 1 in 2016, which enabled Phase 1 to be advertised for construction and to begin work in October 2016. These environmental reevaluations evaluate and document changes in project scope; engineering design; environmental conditions; environmental laws, regulations, and policies; or changes in socioeconomic, cultural, and natural environmental impacts since the approval of the FONSI to determine if supplemental NEPA documentation is required. The environmental reevaluation for **Phase 2** is expected to be approved by the FHWA in 2019 or 2020. Copies of the EA and FONSI are attached and labeled “**EAFONSI**”.

The FONSI describes how the selected alternative was chosen to minimize impacts to environmental resources. For the entire four-phase program, the MDOT SHA Selected Alternative will require approximately 31.7 acres of right-of-way; however, no residential or

commercial displacements are required. Within the limits of disturbance for the MDOT Selected Alternative, 7,876 linear feet of stream, 1.19 acres of wetlands, 4.0 acres of floodplain, and 18.2 acres of woodlands will be impacted.

The MDOT SHA worked with the National Park Service to secure necessary permits for the work within the park. The Selected Alternative includes measures to mitigate impacts to streams, wetlands, forests, parkland, and historic resources. A total of 16 Noise Sensitive Areas (NSAs) were identified within the project area.

### OTHER REVIEWS, APPROVALS, AND PERMITS

The MDOT SHA has obtained all necessary approvals and permits for Phase 1, and will complete the permit and approval process for Phase 2 by February 2020. The permits received for Phase 1 include: Maryland Department of Environment (MDE) E&S Approval; MDE SWM Approval; NPDES Permit for Storm Water Associated with Construction Activity; MDE Non-Tidal Wetland Permit; MDE Water Quality Certification; U.S. Army Corps of Engineers Permit; and the Maryland Department of Natural Resources (DNR) Roadside Tree Permit.

### 6.3 PROJECT SCHEDULE

A project schedule for I-81 Phase 2, including an anticipated contract award timeframe, is displayed in Figure 18.

ACTIVITY	DATE
Preliminary Concept Plans	July 2018
RFQ Advertisement	January 2019
RFP Advertisement	Summer 2019
Selection, Award, and Notice to Proceed	Spring/Summer 2020
Acquisition of Right-of-Way; Complete Engineering; Begin Construction	Spring 2020 – Spring 2021
Ongoing Construction; Delivery of Beneficial Use (DBU), Phase 2 Complete	Spring 2021 – Spring 2025

Figure 18: I-81 Phase 2 Corridor Expansion Project Schedule

### PUBLIC ENGAGEMENT AND LETTERS OF SUPPORT

The MDOT SHA has facilitated robust public engagement throughout the planning process, with informational public workshops held on November 5, 2001, November 8, 2001, and May 26, 2004. An Alternatives Public Workshop was held on June 20, 2002. As noted throughout this application, the I-81 corridor expansion program has come to fruition due to strong constituent and business advocacy at the local, regional, and multistate levels. Public support is demonstrated by multiple letters of support issued by key elected officials, agencies, businesses, residents, and other local and regional stakeholders. These letters are attached and labeled “**Letters of Financial Commitment and Support**”.

### 6.4 FEDERAL WAGE RATE REQUIREMENTS

Davis-Bacon Federal wage rate requirements as described under subchapter IV of chapter 31 of title 40, U.S.C., apply to all projects receiving BUILD grant funds and apply to all parts of the project, whether funded with BUILD Transportation Discretionary Grant funds, other Federal funds, or non-Federal funds. If the I-81 Phase 2 project is selected to be awarded a BUILD grant, the MDOT SHA will require covered contractors and subcontractors performing work on the project to provide weekly payroll statements accompanied by a Statement of Compliance indicating that the payrolls are correct and complete and that each laborer or mechanic has been paid not less than the proper Davis-Bacon prevailing wage rate for the work performed.

### 6.5 ASSESSMENT OF RISKS AND MITIGATION STRATEGIES

Project risks for **I-81 Phase 2** are outlined in the Project Management Plan, which is attached and labeled “**Project Management Plan**”. In addition, risk mitigation strategies have been fully delineated in detail for Phase 1 and will serve as a foundational baseline for developing the more formal risk mitigation strategy for **Phase 2**. The Phase 1 Risk mitigation strategy is available upon request.

# Section 7

## Project Costs and Benefits

A benefit-cost analysis (BCA) was conducted for **I-81 Phase 2** in accordance with the benefit-cost methodology, values, and assumptions specified by U.S. DOT in the 2018 Benefit-Cost Analysis Guidance for Discretionary Grant Programs document.<sup>11</sup> The BCA, the methodology and results of which are described in greater detail in the attachment named "**BCA**", demonstrates that the project is likely to generate substantial economic benefits. As shown in Figure 19, the project is expected to generate a benefit-cost ratio (BCR) of 2.23 and a net present value (NPV) of \$71.3 million at a conservative discount rate of 7 percent.

Case	Net Present Value (2017\$)	Benefit-Cost Ratio
Case A: 7% Discount Rate	\$71.3 M	2.23
Case B: 3% Discount Rate	\$159.6 M	3.50

Figure 19: BCA Results

### 7.1 PROJECT ASSESSMENT DEFINITION AND COSTS

In accordance with feedback received from U.S. DOT following the FY 2017 INFRA grant application, the BCA was conducted for **I-81 Phase 2** improvements only—that is, the BCA only considered the project costs and expected benefits associated with Phase 2. Although this narrow approach indicates that substantial economic benefits are expected to result from the Phase 2 alone, the analysis likely understates the full magnitude of benefits that are likely to be generated by the full four-phase project. In addition, the BCA was conducted with an analysis period corresponding to the first 20 years of the project’s operations, following project opening in 2025, consistent with U.S. DOT’s feedback.

The baseline, or No Build, case used in the BCA assumes that the **I-81 Phase 2** improvements are not constructed, and that the facility remains in the current condition (assuming that ongoing Phase 1 improvements are completed according to the project schedule). The Build case assumes that the **I-81 Phase 2** improvements are constructed as described earlier in the application; to define the travel conditions along the facility following completion of the project, travel-demand modeling was performed by the MDOT SHA for both the No Action and Build cases.

Costs used in the BCA were provided by the MDOT SHA. As shown in Figure 20, capital costs were divided into construction, design, and right-of-way, and were assumed to be expended in accordance with the project schedule outlined in Section 6.2.

Incremental maintenance costs were estimated using a per-lane-mile assumption of \$10,000 per year—that is, approximately \$70,000 in annual, incremental maintenance costs. This estimate is likely conservative. Rehabilitation costs are not expected to be expended until the midpoint of the project’s useful life, which is projected to be 50 years. Because the BCA only covers 20 years of project benefits, the analysis period concludes before the 25th year of the project’s operations; therefore, no rehabilitation costs were assumed to be expended in the BCA.

Category	2017\$
Design	\$8,715,000
Right-of-Way	\$1,900,000
Construction (Including Contingency)	\$66,144,921
<b>Total</b>	<b>\$76,759,921</b>

Source: Maryland State Highway Administration

Figure 20: Project Capital Costs

	Projected Number of Crashes Reduced Annually				Crash Savings, Undiscounted (2017\$)
	All Crashes	PDO Crashes	Injuries (Persons)	Fatalities (Persons)	
2025	74.4	46.8	42.5	1.1	\$16.0
2030	78.1	49.1	44.6	1.2	\$16.8
2035	81.9	51.5	46.8	1.3	\$17.6
2040	85.8	54.0	49.1	1.3	\$18.5

Figure 21: Crash Reductions for Selected Years

## 7.2 PROJECT BENEFITS

Two broad categories of monetizable benefits were captured in the BCA: anticipated safety benefits from reduced crashes along the facility; and anticipated travel benefits from increased operational capacity and performance.

## 7.3 SAFETY

The first broad category is safety benefits resulting from reduced crashes; benefits here include various cost savings related to property damage, personal injury, loss of income, and insurance costs. Based on the 80 percent reduction in crashes of all types observed over the four years since the I-81 widening in West Virginia (see Section 5.1), significant comparable crash reductions are also anticipated in Maryland. Based on guidance provided by U.S. DOT following the 2017 INFRA grant application, a crash-modification factor (CMF) for **I-81 Phase 2** of 40 percent was assumed for the BUILD application BCA. That CMF indicates that the expected number of crashes in the project area will be reduced by 40 percent following the project’s opening.

The magnitude of that reduction was calculated by determining the historical crash rates on the existing facility, using data for 2010 through 2016 furnished by the MDOT SHA. For these years, the number of crashes—including those resulting in a fatality, injury, or property damage—was compared to the total VMT for the facility; those crash rates were then applied to the travel demand forecasts produced by the MDOT SHA to determine the potential number of crashes in future years. The expected 40 percent reduction was then applied to future year values, which were then compared to the expected number of crashes in the No Action condition, which were also estimated using the aforementioned travel demand forecasts. As shown in Figure 21, **I-81 Phase 2** is expected to substantially reduce vehicle crashes, injuries, and fatalities along the facility.



**7.4 TRAVEL TIME SAVINGS**

Within the second category of travel benefits, two discrete benefit estimates were made:

- The value of travel time savings for highway users (auto and commercial-vehicle operations) resulting from increased capacity;
- Additional travel time savings from reduced incident delays (auto and commercial-vehicle operations); in this case, only crash related incident delays were considered. As described earlier, the project is expected to have major impacts on safety, based on compelling evidence from the similarly improved I-81 in West Virginia, greatly reducing the unusually high number of serious crashes including fatalities consistently observed over the past four years.

The first category of travel time savings were estimated in the BCA based on travel demand modeling conducted by the MDOT SHA to support this application. As seen in Figure 22, daily PHT are expected to be reduced for passenger vehicles, while trucks are expected to experience a slight increase. These changes, both negative and positive, were annualized in the BCA, while linear interpolation was used to derive travel time savings estimates for years between horizon years, as well as for years following the 2040 model year. Figure 22 also indicates a small increase in VMT on a regionwide basis compared with the No Build, likely due to some route shifting and/or induced trips, to take

advantage of the increased capacity and faster travel times on I-81, rather than induced growth in the regional transportation network. These impacts are assumed to be minor from a BCA standpoint as they do not reflect a change in mode share but rather an adaption to take advantage of the improved conditions on I-81, relative both to the No Action condition and to other facilities in the network.

Travel time savings expected to result from avoided incident delays were estimated using the INRIX data described in Section 5.1. In addition to the much more significant benefits of reduced crashes themselves (including fatal crashes), reduced crashes can save substantial time – delays that can stretch into hours. To estimate those savings, a sizeable database of daily traffic information, from 2014 through October 2016, was examined. Among the indicators in the database are daily delay hours for passengers and trucks. By matching daily delay hours to the dates of known serious crashes, it was possible to estimate an average annual (crash-related) delay.

To derive the value of incident delay reductions, it was assumed that major incidents causing significant delay would fall by 40 percent, consistent with U.S. DOT guidance following submission of the previous INFRA grant application, and with the CMF that was used to calculate safety benefits.

Scenario	Year	Auto			Truck			Total		
		VMT	VHT	PHT	VMT	VHT	PHT	VMT	VHT	PHT
Existing	2016	1,603,010	31,099	46,026	330,207	5,000	5,000	1,933,217	36,098	51,026
No Build	2040	2,064,563	43,133	63,836	370,448	6,410	6,410	2,435,011	49,543	70,246
Phase 2 (Opening Day)	2025	1,762,567	35,157	52,033	344,758	5,488	5,488	2,107,325	40,645	57,521
Phase 2 Only	2040	2,087,022	42,955	63,574	381,198	6,546	6,546	2,468,220	49,502	70,120

Figure 22: Project Daily VMT, VHT, PHT vs Existing and No-Build  
Source: MDOT SHA

**7.5 RESIDUAL VALUE**

The analysis period covered by the BCA includes 20 years of operation, beginning in 2025. Because the project is expected to have a useful life of 50 years, approximately 60 percent of the project’s capital costs will remain as a residual value; this figure was calculated using the straight-line depreciation method.

**7.6 BENEFITS SUMMARY**

A summary of expected project benefits is shown in Figure 23 below. A copy of the BCA is attached and labeled “**BCA**”.

“As the largest real estate developer in Washington County, Bowman Development is greatly affected by the I-81 widening project. Along with out other numerous investments, we are currently investing \$17M into a \$504,200 SF warehouse within a mile of I-81 with a completion date of December 1st 2018. The success of this project will depend on the continued efficient and safe traffic flow on I-81.” - *Donald M. Bowman, Owner and Chairman of the Board, Bowman Group*

Long-Term Outcome	Basis for Benefit	Benefit Category	Discounted at 7%, 2017\$
Economic Competitiveness	<ul style="list-style-type: none"> <li>Passenger Travel Time Savings - PHT reductions</li> </ul>	50,0000 annual PHT saved by 2040	\$5.1 M
	<ul style="list-style-type: none"> <li>Crash related incident delays reduced by 40%</li> </ul>	Reduced PHT and Truck VHT based on INRIX daily delay data and known major crashes on I-81  12,260 vehicle hours of incident delay saved, 2040	\$1.8 M
Safety	<ul style="list-style-type: none"> <li>Vehicle crash reductions based on expansion from 4 to 6 lanes and reconstruction of hazardous exit and entry ramps</li> <li>40% reduction based on West Virginia data</li> </ul>	Reduced Highway Crashes:  86 fewer crashes per year in 2040 including at least one fewer fatality	\$121.4 M
State of Good Repair	<ul style="list-style-type: none"> <li>Not monetized but interchange improvements will replace or rebuild older interchanges not designed to best modern standards</li> </ul>	Not quantified	
Residual Value	<ul style="list-style-type: none"> <li>Remaining asset value following the analysis period</li> </ul>		\$6.8 M
<b>TOTAL</b>			<b>\$130 M</b>

Figure 23: I-81 Phase 2 Summary of Expected Project Benefits

11. U.S. Department of Transportation. 2018 Benefit-Cost Analysis Guidance for Discretionary Grant Programs. 2018.



# Attachments

- Benefit-Cost Analysis (BCA)
- Cost Estimate (CostEst)
- Budget Cost Estimate Review Workshop Results (BudgetCER)
- Financial Plan (FinPlan)
- MDOT Funding Commitment Letter (MDOTLtr)
- Letters of Financial Commitment and Support (Support)
- CTP, TIP and LRTP
- Phase 2 Tech Project Engineering Drawings (Phase2Tech)
- Project Management Plan (PMPlan)
- EA and FONSI (EAFONSI)



