



AMERICAN LEGION BRIDGE + I-270 MULTIMODAL IMPROVEMENTS

Project Description

MDOT MARYLAND DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION

Location: Montgomery County, Maryland

MDOT UEI: [REDACTED]

Contact: [REDACTED] 7201 Corporate Center Drive, Hanover, MD 21076

FY 2023
MPDG GRANT
APPLICATION

AMERICAN LEGION BRIDGE + I-270 MULTIMODAL IMPROVEMENTS: PROJECT DESCRIPTION

The project corridor is one of the most congested in Maryland which impedes the efficient flow of people, goods, and services including limiting interstate transit. The corridor also includes the American Legion Bridge which can no longer accommodate daily traffic levels and is limited in its ability to support efficient transit and alternative transportation options. While the bridge is safe, it will require repairs to rehabilitate its deck within the next decade – a disruptive construction activity that would further stress congestion on the already constrained bridge.

I-495 and I-270, located in the Washington, DC metropolitan area, are key elements of both the national and regional transportation infrastructure system and are two of the most heavily traveled routes in the National Capital Region and in the nation. The routes are designated as part of the National Highway System, the National Highway Freight Network, and as part of the Strategic Highway Network (STRAHNET), which provides defense access, continuity, and emergency capabilities for movements of personnel and equipment in both peace and war, as well as access for our national supply chain.¹ The routes carry hundreds of thousands of travelers each day to access employment and services. The routes are also significant freight corridors, connecting regional, as well as national markets along the I-95 corridor. As STRAHNET routes, the corridors play a vital role in connecting the numerous military installations in both Maryland and Virginia. Maintaining the efficient operations of these routes is of both national and regional significance, supporting economic vitality, freight mobility, and homeland security.

The current average annual daily traffic along the I-495 corridor is 253,000 with a projected increase to 289,000 by 2045. Along I-270, the average annual daily traffic is 259,000, projected to increase to 308,000 by 2045. The Metropolitan Washington Council of Governments 2022 Congestion Management Report identified the ten top regional bottlenecks in the region, one of which is I-495 at I-270 West Spur.

The Maryland State Highway Administration (SHA) undertook the I-495 and I-270 Managed Lanes Study to address mobility challenges along the corridors, as well as the state of good repair for the American Legion Bridge. The bridge opened in 1962 and is rated in fair condition for the superstructure and substructure. In addition, the bridge deck is in need of replacement. The bridge is anticipated to drop into “poor” condition within a three-year period unless the deck is replaced and the concrete deterioration is addressed.

This National Environmental Policy Act (NEPA) study resulted in a Record of Decision in August 2022 for the Selected Alternative, a two-lane High Occupancy Toll (HOT) managed lane network on I-495 and I-270. The Managed Lanes Study was coordinated with Virginia’s 495 Northern Extension (NEXT) project, which is also focused on the implementation of multimodal strategies along I-495 and is currently under construction. This coordination provides a comprehensive approach to improving mobility within the National Capital region.

SHA has identified the first phase of the Managed Lanes Study to be implemented is the section from south of the George Washington Memorial Parkway on I-495 (connecting to the 495 NEXT

¹ https://www.sddc.army.mil/sites/TEA/Functions/SpecialAssistant/STRAHNET/_STRAHNET%20101.pdf

project) to north of Westlake Terrace on the I-270 West Spur (the project). The location is shown in Figure 1.

Figure 1. Project Location



Source: Maryland State Highway Administration

The Selected Alternative calls for the addition of two HOT lanes in each direction on I-495. Along I-270 West Spur within the limits of this section, the project will include the conversion of the existing High Occupancy Vehicle (HOV) lane combined with an additional HOT lane to provide two HOT lanes in each direction. The typical sections are shown in Figure 2.

Figure 2. High Occupancy Toll Lanes Typical Section

I-495 from the George Washington Memorial Parkway to Cabin John Parkway / River Road



I-495 from Cabin John Parkway / River Road to I-270 West Spur



I-270 West Spur from I-495 to north of Westlake Terrace

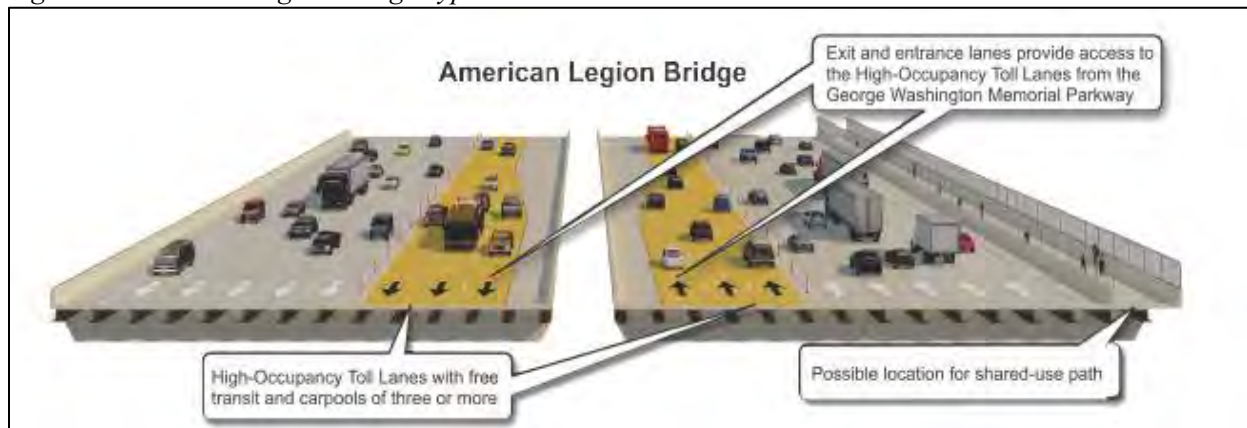


Source: Maryland State Highway Administration

Free, general-purpose lanes will be maintained throughout the system and are open to all users. Transit vehicles and carpoolers with three or more passengers will be able to utilize the new HOT lanes at no charge, providing faster, more reliable transit service and encouraging the use of carpooling and vanpooling in the region. The Washington Metropolitan Area Transit Authority (WMATA)'s Better Bus service redesign initiative proposes medium-frequency all day service and low-frequency overnight regional connector services that would use the American Legion Bridge and benefit from dedicated infrastructure. In addition, the Fairfax County Department of Transportation's Fairfax Connector Route 798 will provide express bus service, starting in 2024, between the Tysons and Bethesda WMATA rail stations. Single occupant vehicles who choose to use the HOT lanes will be required to pay the toll. The funds generated from the tolls will provide funding for transportation improvements throughout the corridor, including supporting regional expanded transit opportunities, that would not be funded otherwise.

The American Legion Bridge on I-495 between Maryland and Virginia is in danger of falling into poor condition while not meeting design standards nor accommodating today's traffic. The bridge will be replaced and widened to today's standards and to accommodate existing and future traffic. The new bridge will include expanded bicycle and pedestrian connections between multimodal facilities in Maryland and Virginia to increase active transportation opportunities and access to multiple parks, residential areas, and employment centers along I-495. These expanded multimodal connections are consistent with improvements and priorities identified in county master plans. The proposed bridge typical section is shown in Figure 3.

Figure 3. American Legion Bridge Typical Section



Source: Maryland State Highway Administration

Safety is a primary concern, and a crash analysis was undertaken within the area as part of the Managed Lanes Study. From 2016 to 2018, approximately 4,700 crashes occurred within the study area and 73% of those crashes on the freeways were rear end and sideswipe collisions occurring during congested roadway conditions. By reducing the congestion levels during peak periods and accommodating the projected increase in traffic, the unstable flow and stop/go conditions on the roadways will be addressed, leading to a reduction in the potential for these types of congestion-related crashes. The goal of the effort and this project is to ease the travel burdens, increase travel time reliability, and provide a safe and efficient network for travelers.

The Managed Lanes Study considered multiple alternatives and the Draft Environmental Impact Statement (DEIS) was developed and published in 2020. Approximately 3,000 public comments

were received and in response to these comments, an additional alternative was studied and a Supplemental DEIS (SDEIS) was subsequently developed. The SDEIS reflects the efforts to be responsive to stakeholder feedback and reduce the community and environmental impacts, including avoiding the historic Morningside Tabernacle No. 88 Moses Hall Cemetery, an African American cemetery dating from the 1800s. Extensive coordination with the National Park Service (NPS) to minimize or avoid adverse impacts to three park service areas in Maryland and Virginia near the American Legion Bridge was also undertaken. The NPS areas include the George Washington Memorial Parkway, the Clara Barton Parkway, and the Chesapeake and Ohio Canal National Historic Park. In addition to the NPS properties, the project also minimizes impacts to the Maryland-National Capital Park and Planning Commission parkland located in the project area.

The Final EIS providing responses to over 5,000 comments total on the DEIS and SDEIS was published in June 2022 with the Record of Decision issued by the Federal Highway Administration (FHWA) in August 2022. The project, which is in final design, will be implemented with two design-build contracts. The project section that extends from the George Washington Memorial Parkway to south of Cabin John Parkway will advertise in July 2024 with the contract award/notice to proceed issued in July 2025 to begin final design and construction. The section that runs from south of Cabin John Parkway to the project terminus north of Westlake Terrace will advertise in April 2025 with the contract award/notice to proceed issued in April 2026 to begin final design and construction. Based on this schedule, it is estimated both contracts will be open to traffic by Summer 2031.

The project is approximately 6.5 miles in length. Using the USDOT Equitable Transportation Community (ETC) Explorer², there are 12 census tracts identified that include, or are adjacent to, the project limits. These 12 census tracts are identified in Table 1. According to the ETC Explorer, each tract exhibits a range of burdens and vulnerabilities that are in the disadvantaged category. These vulnerabilities and burdens are found in the climate and disaster, environmental, health, and social categories

Table 1. Project Census Tracts

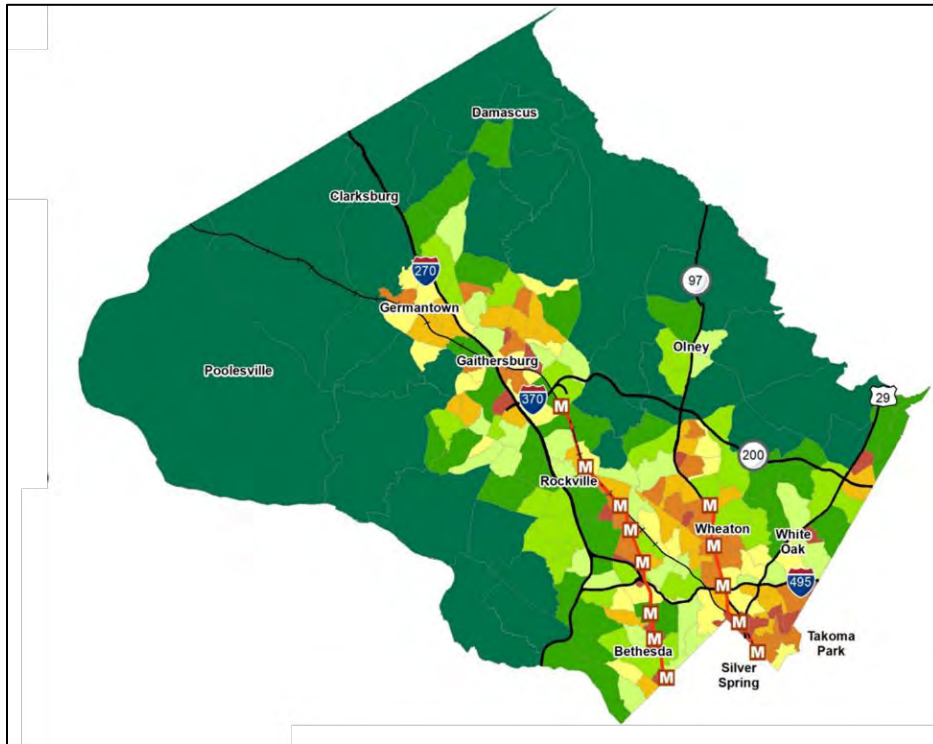
Census Tract	Location
51059470100	Fairfax County, Virginia
51059480100	Fairfax County, Virginia
24031706008	Montgomery County, Maryland
24031706009	Montgomery County, Maryland
24031705800	Montgomery County, Maryland
24031705902	Montgomery County, Maryland
24031706013	Montgomery County, Maryland
24031705901	Montgomery County, Maryland
24031704501	Montgomery County, Maryland
24031706012	Montgomery County, Maryland
24031701205	Montgomery County, Maryland
24031701206	Montgomery County, Maryland

² <https://experience.arcgis.com/experience/0920984aa80a4362b8778d779b090723/page/ETC-Explorer---State-Results/>

In addition, census tracts 24031700904, 24031700724, 2403170023, 24031700713, 2403700813, and 24031700830 in Montgomery County are identified by the Department of Housing and Urban Development as Opportunity Zones.³

According to the US Census, Montgomery County is the most populous county in Maryland, with over one million residents. The population grew over 9% from 2010 to 2020, and the growth is anticipated to continue in the future. The population is concentrated around the I-495 and I-270 corridors as shown in Figure 5, with the darker colors representing the highest population densities, underscoring the importance of the corridors to residents' daily lives.

Figure 4. Population Densities



Source: Montgomery County Planning

The US Census American Community Survey (ACS)⁴ shows approximately 48% of the employees in Montgomery County drive alone to work with a mean travel time of over 29 minutes. The ACS journey to work data⁵, identifies work trip origins and destinations. These daily work trips utilize I-495 and I-270 with almost 100,000 employees traveling into the District of Columbia for work from Montgomery County and over 22,000 employees traveling from Montgomery County to Fairfax County, Virginia on a daily basis for work. The project will provide increased mobility efficiencies as well as increased modal opportunities for travelers.

³ https://hud.maps.arcgis.com/apps/Embed/index.html?webmap=605f19bdc1594a9d99e72c478a01a8ac&extent=-127.3008,24.4482,-62.0703,52.6438&zoom=true&scale=true&search=true&searchextent=true&disable_scroll=true&theme=light

⁴ https://data.census.gov/table?q=DP03&t=Commuting&g=040XX00US24_050XX00US24031

⁵ <https://www.census.gov/data/tables/2020/demo/metro-micro/commuting-flows-2020.html>



AMERICAN LEGION BRIDGE + I-270 MULTIMODAL IMPROVEMENTS

Project Budget

MDOT MARYLAND DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION

Location: Montgomery County, Maryland

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AMERICAN LEGION BRIDGE + I-270 MULTIMODAL IMPROVEMENTS: PROJECT BUDGET, SOURCES, AND USES OF FUNDING

The project budget reflects analysis of the various components involved in the planning, development, design, and construction of I-495 from the George Washington Memorial Parkway to I-270 and I-270 from I-495 to north of Westlake Terrace. The project encompasses a range of capital expenses, which the Maryland State Highway Administration (SHA) has incurred to complete development work, right-of-way acquisition, tolling systems, and design-build work under separate contracts.

Through the FHWA cost and schedule review assessment (CSRA) process for major projects, the SHA has considered the potential challenges, risks, and uncertainties associated with a project of this magnitude. As a result, this budget section incorporates appropriate contingencies to address unforeseen circumstances, mitigate risks, and maintain project progress.

The commitment to transparency and accountability is reflected in the budgeting process and FHWA guidelines and industry best practices have been followed in the development of this budget. The project also includes established robust financial management protocols, including regular monitoring and reporting, to maintain financial discipline throughout the project lifecycle. Project implementation will include the exploration and incorporation of a range of funding vehicles, including the identification of additional funding sources, leveraging federal, state, and local partnerships, as well as exploring potential innovative financing mechanisms. The project budget provides the financial details for the allocation and utilization of funds.

Previously Incurred Costs

The project has been under development since 2017 and incurred significant costs to develop the current project scope of work. Leading up to July 2023, SHA has incurred the following development costs:

Table 1: Project Development Expenses

Cost Category	Total Cost (\$ in millions)
Program Management	\$ 21.0
Technical Advisors	\$ 73.0
Communications and Strategic Outreach	\$ 8.0
Opportunity MDOT (workforce development)	\$ 6.0
Solicitation Activities	\$ 4.0
Environmental & Program Support	\$ 66.0
Legal Advisors	\$ 17.0
Financial Advisors	\$ 11.0
MDOT SHA Staff/Facility/Other	\$ 15.0
Total Previously Incurred Costs	\$ 221.0

The Program Management of the project consists of oversight of the program delivery, technical, tolling, communications, environmental, agency coordination, and coordination with legal and financial advisors in the overall delivery of the program.

The Technical work has included conceptual design to a level of at least thirty percent, including horizontal and vertical roadway geometrics, multi-modal studies and concept design, preliminary structure (bridges, retaining walls, noise barriers, culverts, etc.) layout and conceptual design, geotechnical evaluations, concept stormwater management, conceptual hydrology and hydraulic analyses, noise studies and conceptual barrier layout, conceptual traffic/ITS engineering, conceptual tolling, and conceptual utility design and coordination to support the preparation of the environmental documents and toward development of design-build contract documents. Work also included the assessment of the overall feasibility of the project, phasing, risk, schedule, cost, operations and maintenance evaluation, and impacts (e.g., environmental resources, utilities, right-of-way, etc.) In support of the concept design and preparation of environmental documents, technical work included topographic and property surveys, field investigations (e.g., utility designation and test pitting, soil borings, pavement testing, CCTV of drainage pipes, etc.), design criteria and technical requirements development, environmental permitting and agency coordination, traffic forecasting and analyses, risk identification/tracking and mitigation, constructability reviews and impact minimization, cost estimating, scheduling, landscape and aesthetic guideline development, and extensive project stakeholder coordination. Key deliverables include project technical requirements; existing roadway, pavement, soils, structures, survey, right of way, utilities, environmental, hazardous material, and other data collection; project concept plans; concept stormwater management; tolling scenarios; feasibility, phasing, operations, and maintenance plans; traffic projections and analyses; interstate access approval report; quality assurance and quality control plan.

Communications and Strategic Outreach work includes monitoring and responding to press coverage, media and communications strategies, press releases, public messaging, social media, website, and presentations to stakeholders and industry groups.

Opportunity MDOT is SHA's program that has been focused on DBE/Small Business outreach events, workforce planning manual/process, and training manuals, and coordination with SHA Office of Equal Opportunity, minority businesses, and stakeholders.

Solicitation Activities included development of solicitation documents for contracts to support the project development work.

The Environmental & Program Support was focused on the I-495 & I-270 Managed Lanes Study, including reviewing and implementing studies, reviewing existing environmental and socio-economic data, assessing impacts, reducing impacts and limit of disturbance, and other activities related to preparation of environmental documents and permits. Key activities included public notices, public review/comment process, all draft and final environmental documents, coordination with federal, state, and local agencies, stream and wetland mitigation plans, and all US Army Corps of Engineers and Maryland Department of the Environment permits.

The Legal Advisors support the Office of the Attorney General and advise SHA on all legal matters relating to the program, including drafting contracts and agreements, managing reviews of all

contracts and legal matters, and providing review and advice related to the development of the environmental documents.

The Financial Advisors are responsible for a range of activities including completing financial analysis of the program and advising SHA on all financial matters related to program. This includes financial structuring of the program and development of financial and commercial terms of the solicitation and contract documents to align to the goals and objectives of the state, including performing financial viability analyses to ensure value is being maximized to the State and performing additional financial analyses as needed for the Bi-State Agreement, future phasing/timing.

The MDOT SHA Staff/Facility/Other costs include staff in responsible charge of the project, SHA equipment, office supplies, and other miscellaneous costs.

Future Eligible Costs

As the project moves towards construction, SHA has developed comprehensive cost estimates for total costs. Table 2 presents the nominal (escalated) value of construction costs, assuming a construction timeframe from 2025-2031.

Table 2. Capital Cost Estimates

Category	Nominal (\$m YOY)
Preliminary	\$ 361
Grading & Drainage	\$ 474
Structures	\$ 1,436
Roadway, Pavement & Landscaping	\$ 193
ITS/Traffic/Signs/Electric	\$ 133
Utilities	\$ 133
NEPA ROD Commitments, including Transit	\$ 119
Tolling Back Office Infrastructure and Systems	\$ 31
MDOT Oversight	\$ 141
Design, Engineering and Quality Management	\$ 409
Design and Construction	\$ 3,430
Right of Way	\$ 82
CSRA Risk	\$ 520
TOTAL FUTURE ELIGIBLE PROJECT COSTS	\$ 4,032

The cost estimate above has been developed in accordance with the CSRA process.

- Final design and construction costs are informed by market pricing information the state receives from its project bids including design-build contracts, inflation estimates that are regularly updated by SHA, and updated quantities based on a design of thirty percent or greater for the various design elements. These numbers include anticipated design-build contractor contingency and markup based on market precedent.

- Right-of-way acquisition costs are inclusive of the expected needs from the limits of disturbance included in the Final Environmental Impact Statement and incorporate mitigation needs as well.
- SHA has undertaken a detailed risk analysis as part of the CSRA. The outcome of that process resulted in the CSRA Risk shown in Table 2. These contingencies reflect a comprehensive figure meant to provide clarity on the potential risk exposure for unanticipated costs that would not be covered through design-build contracts.

Use and Alignment of Project Funds

Total Eligible Costs

The total eligible cost estimate for this project is \$4,032 million shown Table 3.

Table 3. Total Eligible Costs

Cost Category	Total (\$ in millions)
Capital Costs	\$3,512.0
Owner’s Risk Contingency	\$ 520.0
Total Eligible Costs	\$ 4,032.0

Funding Sources

Based on the above estimates, and applying a maximum 60% Multimodal Project Discretionary Grant (MPDG) cost share, SHA is requesting \$2.419 billion in grant funding. Table 4 below shows the breakdown of funding sources anticipated for the project:

The funding plan for this project includes 60 percent from the federal MPDG program, 20 percent from other federal sources such as a federal Bridge Investment Program (BIP) grant, and 20 percent from the state match. In addition to the MPDG/MEGA/INFRA grant program, SHA intends to submit a grant application for the FHWA Bridge Improvement Program for the replacement of the American Legion Bridge.

The dollar values for these funding sources are shown in Table 4.

Table 4: Funding Sources

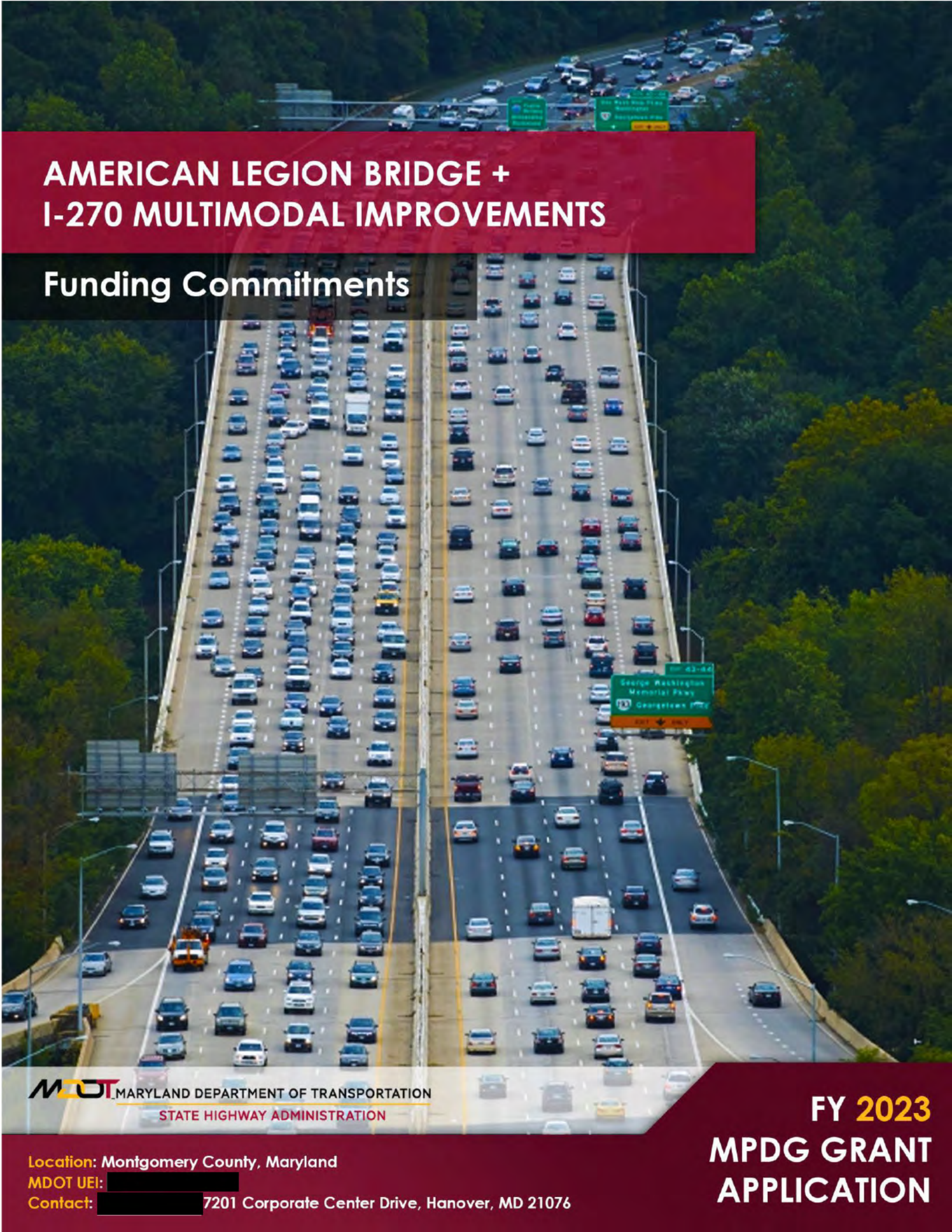
Funding Sources	Total Dollars (in millions)	Percentage
Federal MPDG/MEGA/INFRA Grants	\$ 2,419.0	60%
Other Federal Source(s)	\$ 806.5	20%
State Match	\$ 806.5	20%
Total Project Funding	\$ 4,032.0	100%

SHA is committed to meet the 20% required match for future eligible costs for the project. SHA intends to issue debt backed by toll revenues generated by the project or other state sources to meet the local cost sharing requirement. The exact composition and maximum amount of this debt is

still under consideration and subject to risks. Indicative estimates suggest that it is possible to fulfill all non-Federal funding needs through toll revenue-backed debt issuances with reasonable assumptions such as interest rate movements, market appetite for revenue-backed debt and availability of Transportation Infrastructure Finance Innovation Act (TIFIA) loans. Project debt is expected to be issued after the design-build contract(s) are awarded, allowing potential investors to review the contractual provisions protecting them from certain project risks, such as schedule delays.

Any additional non-federal funding need will be met through contributions from the state, the exact source of which is dependent upon the scale of funding needed.

In addition to applying for federal grants, SHA is exploring scenarios where additional federal funding may be needed to close potential funding gaps, which involves seeking state legislative authorization to issue grant anticipation revenue vehicles (GARVEEs) against future formula funding for this project. In addition, SHA will explore the use of the Transportation Infrastructure Finance Innovation Act (TIFIA) Program to borrow funds that would be repaid with state funding from toll revenues.



AMERICAN LEGION BRIDGE + I-270 MULTIMODAL IMPROVEMENTS

Funding Commitments

MDOT MARYLAND DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION

Location: Montgomery County, Maryland
MDOT UEI: [REDACTED]
Contact: [REDACTED] 7201 Corporate Center Drive, Hanover, MD 21076

FY 2023
MPDG GRANT
APPLICATION

August 18, 2023

The Honorable Pete Buttigieg
Secretary
United States Department of Transportation
1200 New Jersey Avenue, SE
Washington DC 20590

Dear Secretary Buttigieg:

The Maryland Department of Transportation (MDOT) State Highway Administration (SHA) is pleased to submit an application to the Multimodal Project Discretionary Grant (MPDG) program to support multimodal transportation enhancements on the American Legion Bridge, on I-495 to the I-270 West spur, and on the I-270 West spur.

The MDOT is seeking \$2,419,000,000 from the MPDG program. The National Infrastructure Project Assistance (MEGA) and the Nationally Significant Multimodal Freight Highway Projects (INFRA) sub-programs may support up to 60 percent of the eligible total project costs. The SHA will seek additional federal discretionary grant funding to support an 80 percent federal project cost share. If funded, MDOT and the State of Maryland confirm that it will provide up to \$806,500,000 in required State matching funds.


The project is documented in the National Capital Region Transportation Planning Board's Transportation Improvement Plan as T11582. In August 2022, the Federal Highway Administration (FHWA) approved a Record of Decision for the project. If awarded funding, this project would move expeditiously toward final design and construction.

The project will replace the 60-year-old American Legion Bridge, which provides a critical freight and passenger connection between Maryland and Virginia. Replacing the bridge and expanding transit and bicycle-pedestrian infrastructure will bring the asset into a state-of-good-repair and enhance safety and mobility for all users in the region.

The Honorable Pete Buttigieg
Page Two

The MDOT is ready to implement this project if awarded funding and I urge your careful consideration of this request. Should you have any questions or concerns, please contact Ms. Heather Murphy, MDOT Office of Planning and Capital Programming (OPCP) Director, at 410-865-1275 or hmurphy@mdot.maryland.gov. Ms. Murphy will be happy to assist you.

Sincerely,


[Jaclyn D. Hartman \(Aug 18, 2023 09:46 EDT\)](#)

Jaclyn Hartman
Assistant Secretary for Transportation Investments

cc: Ms. Heather Murphy, Director, OPCP, MDOT
William Pines, P.E., Administrator, SHA
Mr. Paul J. Wiedefeld, Secretary, MDOT



AMERICAN LEGION BRIDGE + I-270 MULTIMODAL IMPROVEMENTS

Outcome Criteria

MDOT MARYLAND DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION

Location: Montgomery County, Maryland

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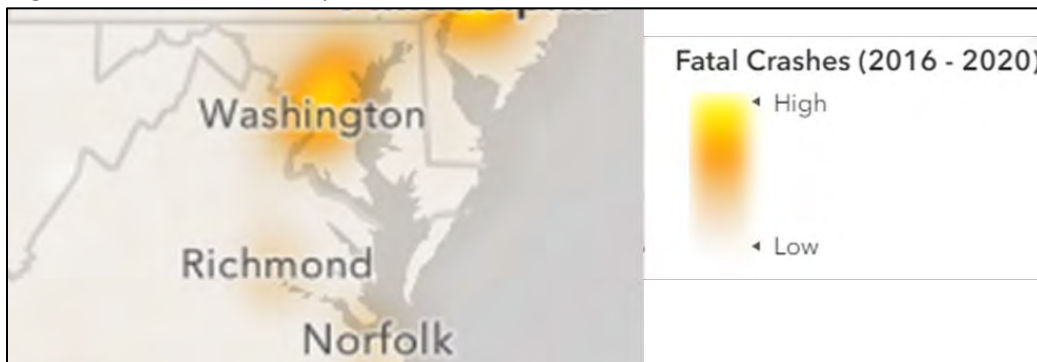
AMERICAN LEGION BRIDGE + I-270 MULTIMODAL IMPROVEMENTS: OUTCOME CRITERIA

Criterion 1: Safety

Maryland is a Vision Zero State and the vision of MDOT SHA is *“To provide a safe, well-maintained, reliable highway system that enables mobility choices for all customers and supports Maryland’s communities, economy, and environment.”* This vision embodies the commitment to safety on the State’s roadways and aligns with the USDOT focus on safety, as highlighted in the National Roadway Safety Strategy (NRSS).

As part of the NRSS, the USDOT has created several visualizations to help states and local governments in their efforts to address roadway safety. The first is a hot-spot visualization which focused on the fatal crash locations. As shown in Figure 1, the project area is identified as a hot spot location.

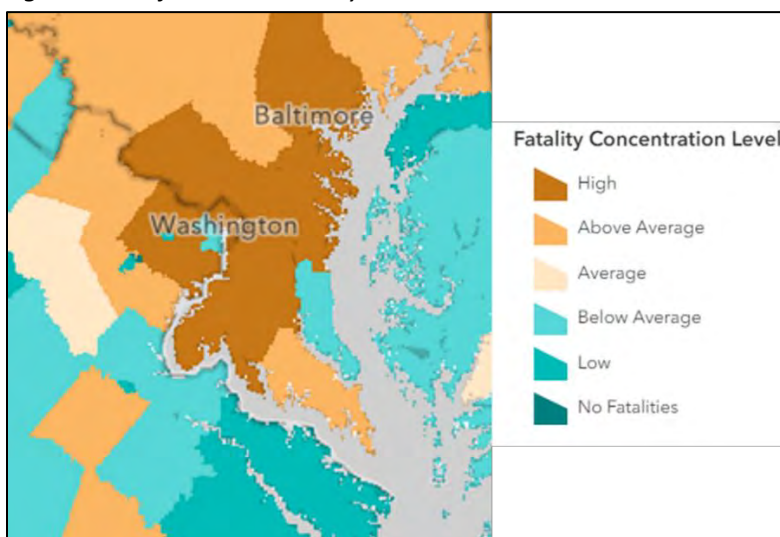
Figure 1. Fatal Crash Hot Spot



Source: USDOT: <https://storymaps.arcgis.com/stories/9e0e6b7397734c1387172bbc0001f29b>

USDOT has also mapped the fatality concentration levels. As shown in Figure 2, the concentration level of fatalities in the project area is high.

Figure 2. Project Area Fatality Concentration Level



Source: USDOT: <https://storymaps.arcgis.com/stories/9e0e6b7397734c1387172bbc0001f29b>

A focus of the National Roadway Safety Strategy (NRSS) is to increase the safe use of transit and active transportation modes, ensuring safety for those users and supporting the strategy to achieve greenhouse gas reduction goals. The managed lanes present a unique opportunity to support this strategy by efficiently facilitating the use of transit and carpooling in the less congested managed lanes. Both the Washington Area Metropolitan Transit Authority (WMATA) and the Fairfax County Department of Transportation have proposed express bus services that would use the managed lanes. Additionally, the project incorporates a barrier separated bicycle/pedestrian facility on the American Legion Bridge, providing a direct connection to the multi-use paths, trails, and parklands on both the Maryland and Virginia side of the Potomac River.

As part of the Managed Lanes Study, a detailed safety evaluation of the corridors was conducted. Over the three-year period from 2016 to 2018, approximately **4,700 crashes occurred within the study area, of which 73% were located along I-495 and I-270**. Most of the crashes (68%) resulted in property damage only, however, there were **nine fatalities**. The majority of these crashes were rear-end crashes (60%), which is indicative of congested traffic flow¹. The crashes within the corridors significantly affect the efficiency of the corridor for both automobile and freight traffic. Research studies, including those conducted by the National Highway Traffic Safety Administration², suggest that the unstable traffic flow during congested operations increases the probability of rear-end and sideswipe crashes.

Additionally, 53% of the crashes occurred during the peak travel periods (6:00 AM to 10:00 AM and 3:00 PM to 7:00 PM as defined by the operations analysis). Over the analysis period, crash frequency increased approximately 9% annually and the Average Annual Daily Traffic (AADT) increased approximately 1% to 2% per year. Environmental factors, such as lighting, weather, and pavement conditions did not play a significant role in the safety performance.³

The high proportion of rear-end and sideswipe crash types, along with the high occurrence of crashes during the peak travel periods, show a strong correlation between the existing congested freeway conditions and the safety performance of the corridors. In addition to the congested conditions, weaving movements were also identified as a contributing factor to the number of crashes. An example is the interchange of I-495 at MD 190/Cabin John Parkway which was identified as a high crash location. The crashes were due to multiple, closely spaced merges/diverges combined with congestion.

The project reduces the magnitude and duration of congestion along I-495, and at the example interchange, removes all three existing loop ramps, reconfiguring the clover-leaf design to a diamond interchange. The reconfiguration removes the weaving segments between the existing loop ramps along I-495 and reduces the potential for crashes due to horizontal curvature, significantly increasing safety for travelers. Each of the interchanges within the study area were analyzed for needs to improve both safety and operational efficiency.

¹ https://oplanesmd.com/wp-content/uploads/2022/06/02_MLS_FEIS_App-B_MDOT-SHA-Draft-App-IAPA-AppA-E_June-2022p.pdf - (Section 7)

² <https://www.nhtsa.gov/document/analyses-rear-end-crashes-and-near-crashes-100-car-naturalistic-driving-study-support-rear>

³ https://oplanesmd.com/wp-content/uploads/2022/06/02_MLS_FEIS_App-B_MDOT-SHA-Draft-App-IAPA-AppA-E_June-2022p.pdf - (Section 7)

A predictive crash analysis, based on the methodologies outlined in the Highway Safety Manual, was used to provide a quantitative analysis on how the project impacts safety performance. The predictive tools included the Enhanced Interchange Safety Analysis Tool which is used for the predictive crash analysis of mainline freeway segments, interchange ramps, acceleration lanes, crossroad ramp terminals and intersections, and crossroad segments within the project area. A safety analysis process developed for the Virginia I-495 NEXT Express Lanes project was also used for the predictive crash analysis. Traffic data, historical crash data, and roadway geometrics are used as inputs for developing the safety model.

The results of the predictive crash analysis show a decrease in crashes along the I-495 mainline freeway and ramps in the project area overall, as well as at the hotspot of I-495 at MD 190/Cabin John. The analysis shows a 6% reduction in fatal and injury crashes and a 9% reduction in property damage crashes at the interchange, with a 40% reduction in fatal and injury crashes and a 33% drop in property damage crashes on the ramps. On the freeway mainline, the predictive crash analysis shows a decrease of 20% in fatal and injury crashes and a 26% reduction in property damage only crashes. The predicted crash analysis was performed separately for the freeway mainline/ramps and the managed lanes facilities. Since the managed lanes are a new, the predicted safety analysis does not show a reduction in crashes within this facility.⁴

As part of the project analysis, an operational assessment was performed to determine the conditions in Build and No Build scenarios. In a 2027 interim year, with the project in place, the speeds, densities, and Level of Service are improved throughout the network, including serving more vehicles during peak periods.⁵ For the horizon year of 2045, the speeds, densities, and Level of Service continue to be improved throughout the network, enhancing both safety and mobility. With the Build condition, during the AM peak period, 16% more vehicles are accommodated, with all vehicles accommodated by the end of the analysis period. During the peak PM period, the Build conditions result in serving 67% more vehicles with 80% less unserved vehicles by the end of the analysis period.

As demonstrated through the operational analysis, the project reduces congestion levels, particularly during peak periods, addresses the needs of the system, and accommodates existing traffic and long-term traffic growth on I-495. By reducing the extent and duration that the freeway and local roadway operate under congested, unstable flow, and stop-and-go conditions, the potential for the congestion-related crashes is significantly reduced, particularly during peak periods.

The project also includes Intelligent Transportation System devices that will have the ability to dynamically collect real-time data and measure speeds along the roadway. These devices will be tied into an active warning system to alert motorists to downstream roadway conditions, such as congestion and slow speeds ahead. This monitoring will be very beneficial for driver information systems, such as triggering messaging/signing to motorists. This project will include an active

⁴ https://oplanesmd.com/wp-content/uploads/2022/06/02_MLS_FEIS_App-B_MDOT-SHA-Draft-App-IAPA-AppA-E_June-2022p.pdf (Section 7.2.4)

⁵ https://oplanesmd.com/wp-content/uploads/2022/06/02_MLS_FEIS_App-B_MDOT-SHA-Draft-App-IAPA-AppA-E_June-2022p.pdf - (Executive Summary)

warning system, that includes elements such as queue detection and warning messages, which has been found to reduce crashes⁶.

Criterion 2: State of Good Repair

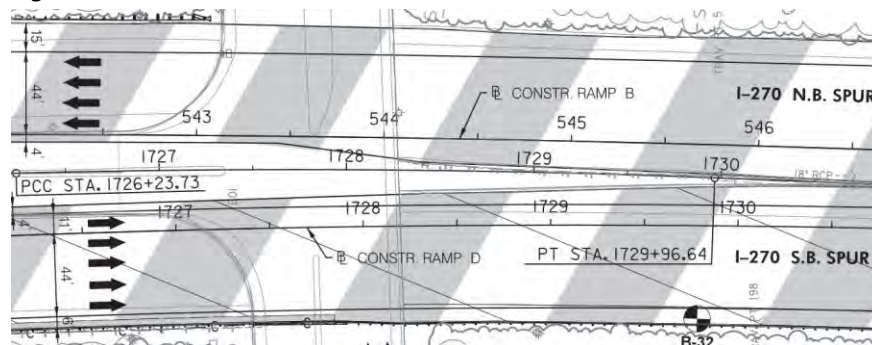
The key purpose of this project is modernizing and improving efficiency of transportation of people, goods, and services in the corridor. Most of the infrastructure in the corridor was originally constructed more than 60 years ago and cannot support today’s transportation needs nor is it up to today’s current design standards. Many geometric features do not meet current design standards, roadside barriers are not up to today’s safety criteria, bicycle and pedestrian facilities do not meet current standards and complete streets criteria, and the American Legion Bridge is in danger of falling into poor condition while not meeting design standards nor accommodating today’s traffic.

As part of the project, the corridor will be modernized by being brought into a state of good repair and accommodating future transportation efficiency in the corridor. Approximately 72 miles of general-purpose lanes, ramps, and side roads will be rehabilitated, 28 new miles of high-occupancy toll lanes will be constructed, and 7 existing interchanges upgraded. This will improve traffic flow through the corridor for now and in the future. To support this work, a total of 16 bridges, including the American Legion Bridge, will be replaced and 8 new bridges constructed to today’s standards. A major culvert system for the Thomas Branch stream is being reconstructed for 2 miles. To support multimodal transportation, 3 miles of accessible sidewalks, 3 miles of accessible shared use paths, and 2 miles of bike lanes are being constructed or reconstructed to connect communities separated by the interstate. To mitigate community noise impacts, 11 existing noise barriers will be replaced, rehabilitated, or extended and 6 new noise barriers will be constructed.

The elements within the I-495 & I-270 project that do not currently meet controlling design criteria for the National Highway System include the following⁷.

- **Lane Width** - Travel lanes on the I-270 West Spur, both northbound and southbound, near Westlake Terrace are currently 11 feet in width. The project will improve these travel lanes to 12 feet in width to meet current standards.

Figure 3. Current Lane Width



⁶ <https://mobility.tamu.edu/mip/strategies-pdfs/active-traffic/technical-summary/Queue-Warning-4-Pg.pdf>

⁷ <https://www.fhwa.dot.gov/design/standards/160505.cfm>

- **Shoulder Width** - The shoulder widths on the I-270 West Spur, both northbound and southbound in the vicinity of Westlake Terrace will be improved to meet the minimum shoulder width criteria of 10 feet.

Figure 4. Current Shoulder Width



- **Shoulder Width** - While the Interstate Design Standards allow for 4-foot reduced shoulders on long bridges such as the American Legion Bridge, the left and right shoulders on the bridge today are between 2 and 3.5 feet in width. The shoulders on the approaches to the bridge also do not meet the minimum width requirements for roadways. The project will improve the shoulders on both the bridge and its approaches to meet minimum shoulder criteria of 10 feet in width.

Figure 5. Current Bridge Approach Shoulder Width



- **Horizontal Curve Radius** - Investigations are ongoing to identify opportunities to improve or provide enhanced mitigation for the horizontal curve radius of I-495 where it crosses over the I-270 West Spur, which currently meets a 50-mph speed.

Figure 6. Existing Horizontal Curve Radius



- **Stopping Sight Distance** - In a number of locations throughout the project, stopping sight distance criteria for a 60-mph design speed is not met on the inside edges of horizontal curves. Stopping sight distance will be improved to meet the design speed criteria at the following locations:

Table 1. Stopping Sight Distances

Roadway	Location	Shoulder	Current Design Speed	Proposed Design Speed
NB I-495	Seven Locks Road/ Cabin John Pkwy	Left	55 mph	60 mph
NB I-495	I-270 West Spur	Right	45 mph	50 mph
SB I-495	I-270 West Spur	Left	45 mph	50 mph
NB I-270	I-495 Outer Loop	Left	45 mph	60 mph
SB I-270	I-495 Outer Loop	Right	50 mph	60 mph

- **Vertical Clearance** - At MacArthur Boulevard, the existing vertical clearance of the I-495 structure over the roadway does not meet requirements for the functional classification of the roadway. The vertical clearance will be raised to a minimum of 16 feet 9 inches.

Figure 7. Existing Vertical Clearance - MacArthur Boulevard



Source: Google Streetview

Manual for Assessing Safety Hardware (MASH) (2016) Standard Compliance for Traffic Barrier W Beam and Concrete Barrier - The majority of the rigid (concrete) and semi-rigid (metal) traffic barriers within the corridor are not MASH (2016) compliant. These non-compliant barriers will be replaced to meet MASH criteria.

The American Legion Bridge, which provides the connection between Virginia and Maryland over the Potomac River on I-495, was opened in 1962 and widened in 1992. The bridge will be replaced to modernize it to state of good repair and to today's standards and to accommodate traffic existing and future needs. The bridge is rated in fair condition for both the superstructure and the substructure. The inspection report notes painted over section loss and rust holes, cracking in lateral bracing gusset plates, and arrested fatigue cracks as well as bearing, anchor bolt, and bearing pedestal condition concerns. For the substructure, the inspection report notes large areas of cracked, spalled, and delaminated concrete with exposed reinforcing steel⁸. In addition, replacement of the bridge deck is needed. The bridge is anticipated to drop into "poor" condition within a three-year period unless the deck is replaced and the concrete deterioration is addressed.

As traffic has increased over the years and revisions have been made to the approach roadways to accommodate that increase, the current American Legion Bridge is striped to carry traffic from parapet to parapet with 2 to 3.5 foot shoulders, which is not consistent with Interstate Design Standards. The American Legion Bridge is a bottleneck for traffic and frequently causes congestion which impacts the network efficiency, as well as the mobility of goods and people. In addition to improved mobility, the modernization of the core infrastructure, such as the American Legion Bridge, will lower future maintenance costs.

The American Legion Bridge replacement will ensure that the design follows SHA's current policies regarding evaluation of scour at bridges including locating piers to minimize obstructions to flood flows and thereby minimize the scour potential, and designing structures to be stable for worst-case conditions for the scour design flood and verifying that they remain stable for conditions of the scour check flood.

Bridges, such as the American Legion Bridge, constructed prior to the use of epoxy-coated steel reinforcement and higher strength concrete for bridge decks, continually need repairs due to traffic wear and tear. Reconstructing the bridge will lead to a longer lasting bridge deck using Bridge Deterioration Preventative Measures set forth in SHA's guidelines and procedures. Reconstructing the bridge also provides the opportunity to employ modern protective coatings for steel structures further reducing maintenance costs.

Throughout the project limits, improvements will be made to stormwater management and drainage facilities, bringing them up to current standards. Existing drainage and erosion issues will be addressed as part of the project with drainage facilities updated, removing the undersized and deteriorating pipe, and replacing with concrete or more durable material. Existing stormwater management facilities will also be refurbished or replaced. This project comprehensively addresses

⁸<https://data.theadvertiser.com/bridge/maryland/montgomery/is-495-over-potomac-river/24-100000150100010/>

the infrastructure needs, brings the facilities into compliance with the state's regulations and requirements, and ensures their state of good repair.

Criterion 3: Economic Impacts, Freight Movement, and Job Creation

Maryland's transportation infrastructure is a critical element supporting the strong and growing economy of the state and is also crucial to the national economy. Freight mobility is a key component of these economies and trucking is the largest contributor of all freight modes. The roadway network provides the vital connections allowing the movement of products and goods within and through the region to local markets, as well as large markets along the I-95 corridor. According to the FHWA Freight Analysis Framework (FAF), there are significant truck volumes that move through the project area as commodities being transported along the I-95 corridor and these volumes are projected to continue to increase by 53% in volume and 108% in value by 2050⁹. Truck volumes within the project area range between 10,000 and 20,000 trucks per day¹⁰. In addition, the Metropolitan Washington Council of Governments [2022 Congestion Management Report](#) identified the junction of I-495 at I-270 Spur as one of the top ten bottlenecks in the region.

By addressing congestion with the addition of the HOT lanes and easing congestion in the general-purpose lanes, and also addressing the significant bottleneck, the corridors within the project area will operate more efficiently and provide better mobility for the freight movements through the region. The travel demand model analysis shows a 20% decrease in hours of delay along the corridors in 2045. As shown in the Benefit Cost Analysis, the project results in almost \$200,000,000 in operational cost savings for trucks over the twenty-year analysis period. This enhanced freight mobility will support the economic vitality of the nation, state, and region.

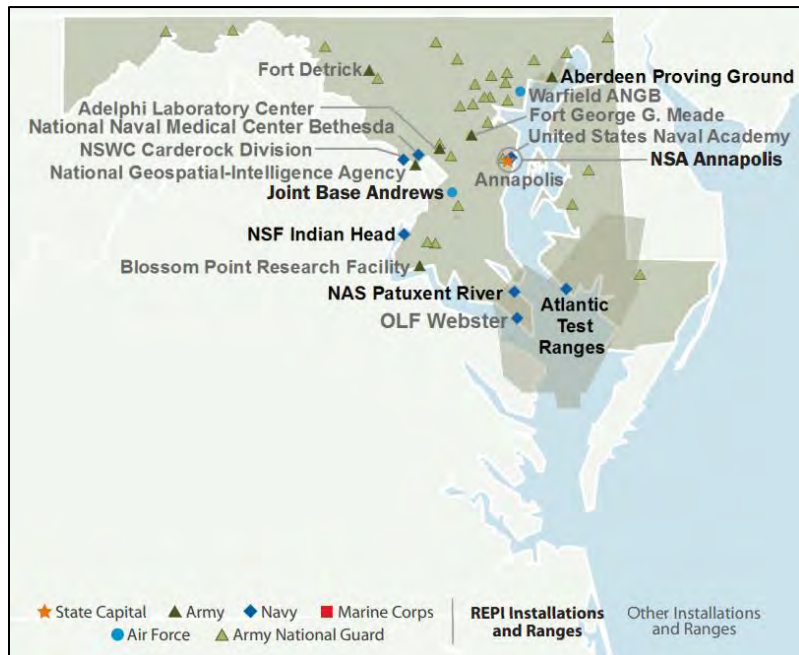
The aerospace and defense sector is a significant component of the state and regional economy. The defense spending creates economic activity through the attraction and support of related industries and investments, generating important state and local revenues. According to the US Department of Defense (DOD), as of 2021 there were a total of over 96,000 DOD active, reserve, and civilian personnel in Maryland. The defense spending comprised almost 6% of the state's Gross Domestic Product, generated over \$8 billion in payroll, and almost \$18 billion in contracts awarded¹¹. There are numerous US and state military installations in the state, as shown in Figure 9. In addition to the installations in Maryland, there are also numerous military installations in Virginia, as shown in Figure 10.

⁹ https://www.mdot.maryland.gov/OPCP/MDOT_State_Freight_Complete_2022_12_06.pdf

¹⁰ <https://www.mwcog.org/documents/2010/07/28/national-capital-region-freight-plan-freight/>

¹¹ https://www.repi.mil/Portals/44/Documents/State_Fact_Sheets/Maryland_StateFacts.pdf

Figure 8. Maryland Military Installations



Source: US DOD

Figure 9. Virginia Military Installations

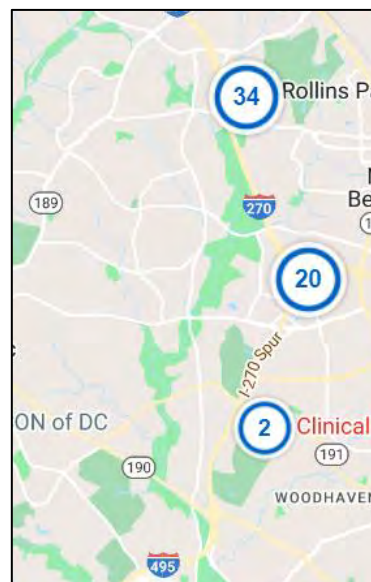


Source: US DOD

I-495 and I-270, both designated as STRAHNET facilities, provide vital connections between the military installations for the movement of personnel, supplies, and equipment. The efficient connectivity between these installations in the region is of vital importance to national security.

I-495 and I-270 also provide vital connections to economic development opportunities. The Maryland Department of Commerce maintains a database of economic development properties for a wide range of potential industries. The number of available properties that are directly adjacent to the two corridors within and north of the study area and dependent on them for access and connectivity are shown in Figure 11. These properties range from office space to industrial sites and, when developed, will increase the employment opportunities for residents of the region; as shown in the Montgomery County zoning map, the most prevalent land use in the study area outside of intersection/interchange areas is residential.¹² Efficient access is a key element in determining site locations for development and the project will support the operational efficiency of the corridors providing the connection to the sites.

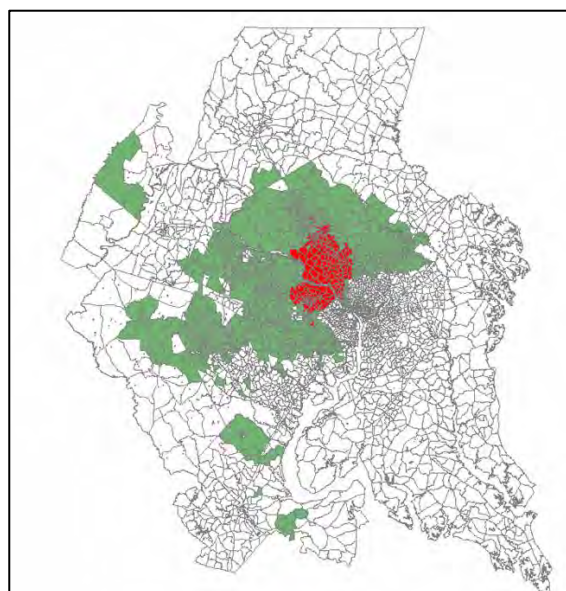
Figure 10. Economic Development Properties



Source: MD Dept. of Commerce

An analysis for job accessibility was undertaken using the regional travel demand model. This accessibility analysis focused on the AM peak period and showed that with the project in place, there was improved accessibility for traffic analysis zones (TAZ) in both Maryland and Virginia. The TAZs in Figure 12 shown in red indicate the study area and the TAZs shown in green have improved job accessibility with the project in place. The analysis also shows a reduction of 35,000 hours in delay across the region on both the arterial and freeway system.

Figure 11. Improved Job Accessibility



Source: MW Travel Demand Model

In addition to improving freight mobility, supporting economic vitality, and national security, the project also improves the multimodal transportation systems within the region. Transit mobility is enhanced with transit vehicles allowed free use of the HOT lanes, providing an increase in speed of travel and trip reliability for transit trips, as well as connections to the regional Metrorail system and local bus service on arterials directly connecting to urban and suburban activity and economic centers¹³.

The multimodal improvements included within the project provide a transportation connection with better access to activity centers. The improvements also create a connected multimodal system between Virginia and Maryland via a share use path across the American Legion Bridge, providing

¹² <https://mcatlas.org/zoning/>

¹³ https://oplanesmd.com/wp-content/uploads/2022/06/MLS_FEIS_00_ExecutiveSummary_June-2022p-2.pdf

additional access to federal and local park lands, including a direct connection to the Chesapeake and Ohio Canal. This direct connection minimizes the impact to National Park Service lands, as well as to natural resources.

Criterion 4: Climate Change, Resiliency, and the Environment

As part of the project environmental study, an updated version of the Metropolitan Washington Council of Governments travel demand model was used to analyze the affected network. The affected network included the interstates and the immediate roadway within the project area. The analysis examined both Greenhouse Gas emissions (GHG) at both the project level and at the broader regional level.

The traffic analysis shows less than a 1% increase in vehicle miles traveled for the project overall, with traffic transitioning from the local roadway network onto the interstate roadways due to the increased operational efficiency with the proposed improvements. These improvements result in a more resilient system with the ability to recover from incidents. The GHG analysis shows that emissions are expected to decline in the opening and the design years for all GHG pollutants when compared to the existing conditions. For CO₂, there is a 13% reduction in the opening year, with a 9% reduction in the design year. These reductions occur regardless of the projected increase in VMT¹⁴.

Maryland is fully committed to the reduction of GHG to prepare for the impacts of climate change. The Maryland Commission on Climate Change (MCCC) has worked cooperatively with experts from state and local agencies, environmental groups, and academic institutions to quantify and understand potential impacts of programs and policies on future emissions. The statewide analysis indicates the HOT lanes will not impede the ability to meet the state's GHG reduction goals but will support achieving the goal¹⁵. The project is also part of the approved regional air quality model.

SHA coordinated extensively with partner agencies to minimize and mitigate environmental impacts from the project. The project completely avoids significant stream valley parks, as well as historic parks of national significance. The project also avoids all business and residential displacements and the historic Morningstar Tabernacle No. 88 Moses Hall and Cemetery, and minimizes impacts to parks, NPS lands, Maryland National Capital Park and Planning Commission properties, wetlands, floodplains, waterways, and forest canopies¹⁶.

Water quality improvement measures will be provided for all new impervious area, and 50% of the existing disturbed area, thereby resulting in a net benefit to the water quality as a result of the project. Peak runoff rates are controlled to existing for most storms, and more frequent storms

¹⁴ https://oplanesmd.com/wp-content/uploads/2022/06/25_MLS_FEIS_AppK_FinalAirQualityTechnicalReport_June-2022p.pdf (Section 3.4)

¹⁵ https://oplanesmd.com/wp-content/uploads/2022/06/MLS_FEIS_05_Environmental_June-2022p-2.pdf (Section 5.8.3 B)

¹⁶ https://oplanesmd.com/wp-content/uploads/2022/06/MLS_FEIS_05_Environmental_June-2022p-2.pdf (Page 5-2)

should see a reduction of rates as a result of the water quality being provided. In addition, several existing eroded or unstable channels will be stabilized¹⁷.

Criterion 5: Equity, Multimodal Options, and Quality of Life

As part of the project, SHA undertook a comprehensive outreach effort to ensure that all populations had equal access to the study information and to identify and address potential impacts to traditionally disadvantaged populations. This robust public engagement effort utilized concentrated outreach efforts to the identified communities to ensure that all project information and potential community impacts were fully communicated.

The outreach and engagement plan was developed to exceed federal policies and standards for engagement with Environmental Justice populations within and adjacent to the study area. Supplemental outreach specific to the EJ communities was undertaken to ensure meaningful opportunities for engagement regarding the project. Efforts included a survey that was distributed multiple ways, including on-line, local pop-up events at local specialty markets, and face-to-face interviews/discussions with participants.

In addition, an Environmental Justice Working Group was established to support the EJ analysis and outreach efforts. The goals of the EJ Working Group were to:

- Develop potential mitigation measures if high or disproportionate impacts occur to EJ communities
- Identify potential commitments to EJ and public health community enhancement measures related to social/health vulnerability indicators
- Identify recommendations for additional engagement opportunities

The results of the analysis showed that project impacts occur consistently throughout the project and are primarily borne by non-EJ populations.¹⁸

From the outreach efforts to both EJ and non-EJ populations, community concerns were raised regarding improved sidewalks and bicycle facilities, better lighting, and traffic calming. To address these concerns, SHA committed to working with the City of Rockville, the City of Gaithersburg, and Montgomery County to do the following to improve the community and quality of life for residents:

- Identify locations on state roadways where safer pedestrian crossings are needed
- Identify locations where additional pedestrian or bicycle improvements, upgrades, and ADA compliance are needed
- Identify locations on state roads where upgrades are needed for existing pedestrian facilities and lighting
- Construct or fund a new parking lot for the historic Gibson Grove Church and Morningstar Tabernacle No. 88 Moses Hall and Cemetery

¹⁷ https://oplanesmd.com/wp-content/uploads/2022/06/MLS_FEIS_03_PREFERRED-Alternative_June-2022p-1.pdf (Section 3.1.6)

¹⁸ https://oplanesmd.com/wp-content/uploads/2022/06/MLS_FEIS_00_ExecutiveSummary_June-2022p-2.pdf

- Provide a new sidewalk along Seven Locks Road under I-495 to restore the historic connection between Gibson Grove Church and Morningside.

The project will correct a variety of deficiencies related to the Americans with Disabilities Act (ADA) compliance, including reconstructing an estimated 22 deficient sidewalk ramps. ADA compliant access will be provided to seven bus stops that do not currently have such access. Non-compliant sidewalks with cross slope and vertical rise deficiencies will be replaced.

The project is also consistent with the SHA Bicycle Policy criteria, as well as the Montgomery County Complete Streets criteria. Several cross streets do not meet the current Complete Streets standards and will be addressed through the project, including:

- Persimmon Tree Road - A nine-foot-wide side path, six-foot-wide sidewalk, street buffers and closed curb sections will be provided.
- Seven Locks Road - A six-foot-wide sidewalk, eight-foot-wide side path, and street buffer will be provided.
- Democracy Boulevard - Buffers will be provided and the sidewalk width improved.
- Westlake Terrace - Six-foot street buffers and eight-foot sidewalks will be provided.

Additional bicycle and pedestrian accommodations include the following:

- Existing pedestrian and bicycle facilities will be replaced or upgraded where impacted by the project and will be consistent with local master plans and identified priorities.
- A new pedestrian and bicycle shared use path will be incorporated on the American Legion Bridge to connect the existing multiuse paths on the Virginia and Maryland sides of the Potomac River.
- New shared use paths will be constructed across MD 190 over I-495.
- The existing shared use path along Seven Locks Road under I-495 will be widened.
- A new sidewalk will be constructed along the west side of Seven Locks Road under I-495 to re-establish the historic connection between First Agape African Methodist Episcopal Church and Morningstar Tabernacle No. 88 Moses Hall and Morningstar Cemetery.

To further enhance multimodal mobility options and quality of life, the additional focus areas include:

- Free use of the new HOT lanes for transit vehicles, carpools, and vanpools with 3 or more occupants
- Working with the local governments to expand transit fare subsidies for low-income riders
- Support new transit connections to include the Fairfax Connector Route 798, beginning service in 2024, and WMATA's proposed Better Bus all day and overnight services
- Improving accessibility to employment, educational and other services with expanded bicycle and pedestrian improvements, including new and upgraded facilities
- Upgrading existing transportation facilities by replacing or rehabilitating all existing bridges on or over I-495 and I-270 within the project area
- Rehabilitating/resurfacing existing general-purpose lanes

Additionally, the Biden Administration in May chose Baltimore, among five US cities, to launch a new workforce hub to train workers to step into good-paying jobs in the growing clean energy and infrastructure industries. This new workforce hub will provide high-quality training,

apprenticeship programs, technical education programs, and supportive services to Maryland area workers, particularly students and people from underrepresented groups, and will help to support this critical infrastructure project.

Criterion 6: Innovation Areas: Technology, Project Delivery, Financing

This project will be delivered using the innovative method of design-build. With design-build, the owner manages a single contract with the design-build entity including a unified project team where the designer and the contractor work together as a team to better fit the owner's schedule and budget. Potential changes are comprehensively addressed through a collaborative effort by the full team.

In addition to the project delivery method, innovation occurs on this project on multiple levels. During the Managed Lanes Study, there were several innovations that were undertaken during the process. An American Legion Bridge Strike Team was created specifically to investigate alternative bridge designs and construction techniques because of the Potomac River and the adjacent park lands adjacent to the corridor. This Strike Team reviewed design approaches and identified an innovative design to reduce the footprint of the replacement bridge and to incorporate stormwater management facilities that provide both water quantity and quality treatment within the same footprint. This innovative design approach was undertaken in response to the coordination that occurred between SHA and the National Park Service and other agencies.

SHA also identified an innovative technique for installing needed culverts throughout the project area. Trenchless technology will be used for culvert installation, allowing culverts to be installed underground without disturbing the existing roadway and disrupting travel.

Innovations were also incorporated into the public engagement efforts. Much of the outreach occurred during Covid, resulting in a variety of engagement techniques. Online/virtual public meetings were held to review the project information. For those unable to attend the virtual meetings, the options for reviewing project materials were held at the typical meeting locations, such as local libraries, however, in the parking lots rather than inside. These drive-up meetings were available weekdays and weekends with both daytime and evening opportunities¹⁹.

The innovative implementation of HOT lanes includes the incorporation of technology throughout the corridor in order to provide needed information to users. Tolls will be collected electronically using overhead gantries so there are no toll plazas or toll booths. Fiber will be installed throughout the corridor for communication purposes, as well as ITS and toll systems. Typically, there are redundant runs to ensure no loss of communications. The fiber also prepares the corridor for future uses as connected and automated vehicles are integrated.

The HOT lanes incorporate congestion pricing where the toll rates in the HOT lanes increase at the times when more drivers want to use the roadway, which typically occurs in the AM and PM peak periods. The toll rate may vary within each highway segment and is calibrated to manage

¹⁹ https://oplanesmd.com/wp-content/uploads/2022/06/MLS_FEIS_08_PI-Agency-Coord_June-2022p-1.pdf
(Section 8.2)

the demand at levels that lead to more reliable travel times. The higher pricing at peak hours can also encourage more carpooling, transit usage, and alternate travel times.

A hard cap and a soft cap pricing structure is also included. The hard cap is the maximum per mile toll rate that can be set within any toll segment along the managed lanes. The hard cap was established through a toll rate estimation process that accounted for all segments within the Selected Alternative. The toll rate estimation process evaluated the modeling results of all time periods and took the peak toll rate from the model and applied a seasonal factor, a day-to-day unique events factor, and an hourly factor to identify the maximum toll rate, which became the hard cap rate. This hard cap rate will be adjusted yearly by a real escalation assumption that includes an inflation-based escalation factor and a “real growth” escalation factor. It is estimated that the hard cap toll rate will rarely be met and will not impact the ability to manage congestion in the HOT lanes.

The soft cap is the per mile toll rate that can only be exceeded during times of deteriorating performance and when necessary to provide users of the HOT lanes a faster and more reliable trip at or above 45 miles per hour. The soft cap was set to address average traffic conditions with the assumption that the toll rate at the soft cap could be exceeded when either traffic volumes exceeded 1,600 passenger car equivalent vehicles per hour per lane or when speeds dropped below 50 miles per hour during a five-minute period. When the soft cap rate is exceeded due to deteriorated conditions, it may only be increased in 5-minute increments and will go back down to the soft cap or lower once the traffic conditions improve. Like the hard cap rates, the soft cap will be adjusted yearly by the same real escalation factors. Maryland will be the second state to implement a soft cap and the first state to use a hard cap in conjunction with the soft cap.



AMERICAN LEGION BRIDGE + I-270 MULTIMODAL IMPROVEMENTS

Project Readiness

MDOT MARYLAND DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION

Location: Montgomery County, Maryland

MDOT UEI: [REDACTED]

Contact: [REDACTED] 7201 Corporate Center Drive, Hanover, MD 21076

**FY 2023
MPDG GRANT
APPLICATION**

AMERICAN LEGION BRIDGE + I-270 MULTIMODAL IMPROVEMENTS: PROJECT READINESS

Technical Capacity

The Maryland State Highway Administration (SHA) is the responsible agency for this project which aligns with the agency’s vision of providing a “*safe, well-maintained, reliable highway system that enables mobility choices for all customers and supports Maryland’s communities, economy, and environment*” as well as their four core priorities include innovation, modernization, communications, and customer experience.

As the agency responsible for maintaining and improving the state’s numbered highways, SHA has a long history of managing complex projects from concept development/preliminary engineering, through final design, right of way acquisition, and construction. The agency is responsible for over 17,000 lane miles of roads and ramps, over 2,500 bridges, and a total budget of over \$1.5 billion, of which \$713.4 million are federal dollars¹. SHA has the institutional knowledge of how to manage and administer federal funding, established protocols and procedures for meeting applicable federal requirements, including project feasibility, constructability and compliance with Title VI/Civil Rights requirements, ADA, Buy American, Relocation Assistance and Real Property Acquisition Policies under the Uniform Act, and the technical capability to manage the delivery of this complex project.

Financial Completeness

The funding plan for this project includes 60% from the MPDG (Mega/INFRA) program (\$2,419.0 million), 20% from the BIP grant program (\$806.5 million), and 20% (\$806.5 million) from the state match. The dollar values for these funding sources are shown below.

Funding Sources	Total Dollars (in millions)	Percentage
MPDG/MEGA/INFRA Grants	\$ 2,419.0	60%
Other Federal Source(s)	\$ 806.5	20%
State Match	\$ 806.5	20%
Total Project Funding	\$ 4,032.0	100%

The cost estimate above has been developed in accordance with the CSRA process.

- Final design and construction costs are informed by market pricing information the state receives from its project bids including design-build contracts, inflation estimates that are regularly updated by SHA, and updated quantities based on a design of thirty percent or greater for the various design elements. These numbers include anticipated design-build contractor contingency and markup based on market precedent.
- Right-of-way acquisition costs are inclusive of the expected needs from the limits of disturbance included in the Final Environmental Impact Statement and incorporate mitigation needs as well.

¹ [https://www.roads.maryland.gov/OC/Year in Review 2022.pdf](https://www.roads.maryland.gov/OC/Year%20in%20Review%202022.pdf)

- SHA has undertaken a detailed risk analysis as part of the CSRA. The outcome of that process resulted in the CSRA Risk shown in Table 2. These contingencies reflect a comprehensive figure meant to provide clarity on the potential risk exposure for unanticipated costs that would not be covered through design-build contracts.

Local/State Match: SHA is committed to meeting the 20% required match for future eligible costs for the project, through issuing debt backed by toll revenues generated by the project or other state sources. The exact composition and maximum amount of this debt is still under consideration and subject to risks. Indicative estimates suggest that it is possible to fulfill all non-Federal funding needs through toll revenue-backed debt issuances with reasonable assumptions such as interest rate movements, market appetite for revenue-backed debt and availability of Transportation Infrastructure Finance Innovation Act (TIFIA) loans. Project debt is expected to be issued after the design-build contract(s) are awarded, allowing potential investors to review the contractual provisions protecting them from certain project risks, such as schedule delays.

Any additional non-federal funding need will be met through contributions from the state, the exact source of which is dependent upon the scale of funding needed.

In addition to applying for federal grants, SHA is exploring scenarios where additional federal funding may be needed to close potential funding gaps, which involves seeking state legislative authorization to issue grant anticipation revenue vehicles (GARVEEs) against future formula funding for this project. In addition, SHA will explore the use of the Transportation Infrastructure Finance Innovation Act (TIFIA) Program to borrow funds that would be repaid with state funding from toll revenues.

Environmental Review

The I-495 and I-270 Managed Lanes Study was undertaken by the SHA to address mobility challenges along the corridors. Table 1 depicts the timeline of the project activities since that Notice of Intent to initiate the NEPA study was issued.

Table 1. I-495 & I-270 Managed Lanes Study Timeline

Notice of Intent to Initiate NEPA Study Scoping Open Houses 45-Day Comment Period	Spring 2018
Range of Alternatives Defined Purpose and Need Developed Preliminary Range of Criteria Developed Screening Criteria Public Workshops	Spring 2018 – Summer 2018
Alternative Analysis and Environmental Technical Analysis Selected Alternatives Retained for Detailed Study Completed Technical Analysis Public Workshops	Fall 2018 – Spring 2019

Development of Draft Environmental Impact Statement (DEIS) Issuance of DEIS Began Comment Period Public Hearings	Summer 2019 – Summer 2020
DEIS Comment Period and Consideration of Comments End Comment Period Reviewed/Considered DEIS Comments Identified Preferred Alternative	Fall 2020 – Spring 2021
Development of Supplemental DEIS Published Supplemental DEIS Began Comment Period Public Hearings	Spring 2021 – Fall 2021
Development of Final Environmental Impact Statement and Record of Decision End Comment Period Reviewed/Considered Supplemental DEIS Comments Issued Final Environmental Impact Statement and Record of Decision	Fall 2021 – Summer 2022

The NEPA documents can be accessed through the following links:

- <https://oplanesmd.com/deis/>
- <https://oplanesmd.com/sdeis/>
- <https://oplanesmd.com/feis/#FEIS>
- <https://oplanesmd.com/rod/>

Other documents can be found under the Environmental Tab at <https://oplanesmd.com/environmental/>.

The NEPA study resulted in a Record of Decision in August 2022 for the Selected Alternative, a two-lane High Occupancy Toll (HOT) managed lanes network on I-495 and I-270.

The federal permitting process is still ongoing. The 401 Water Quality Certification was issued in May 2023². The 404 Clean Water Act permit is anticipated to be issued by August 2024.³

The project will be implemented through two concurrent design-build contracts, with the first contract covering the southern portion of the Project limits from south of the George Washington Memorial Parkway on I-495 in Virginia to south of Cabin John Parkway.

² https://mde.maryland.gov/programs/water/WetlandsandWaterways/Documents/WQC/22-WQC-0023_w.%20attachments.pdf

³ <https://www.permits.performance.gov/permitting-project/dot-projects/i-495i-270-managed-lanes-study>

The second design build-contract will be from south of Cabin John Parkway on I-495 in Maryland to north of Westlake Terrace on the I-270 West Spur. Table 2 provides the schedule for both design-build contracts.

Table 2. Schedule

South of GWMP to South of Cabin John Parkway		South of Cabin John Parkway to North of Westlake Terrace	
RFQ Advertisement	July 2024	RFQ Advertisement	April 2025 Begin Construction
DB Contract Award and Notice to Proceed	July 2025 Begin Final Design and Construction	DB Contract Award and Notice to Proceed	April 2026 Begin Final Design and Construction

The anticipated project schedule meets the date required for funding obligation and the timeframe for construction activities to begin.

Risk Assessment

As with any complex project of this magnitude, there are project risks. The major risks are outlined in Table 3. The table includes the specific risks and description, and the mitigation strategies to successfully manage each identified Project risks.

Table 3. Risks and Mitigation Strategies

Risk	Risk Description	Mitigation Measures
NEPA litigation	Litigation is underway on the NEPA decision and could potentially delay construction.	SHA has developed a strong Administrative Record on behalf of FHWA. It is anticipated that a decision will be rendered on the litigation in Spring 2024 and will not delay start of construction in July 2025.
Affordability	Unanticipated project cost increases, interest rate increases exceed available funds.	SHA is advancing various project readiness activities to mitigate project costs uncertainties such as scope, schedule and cost risk uncertainties, permitting, securing governmental and third-party approvals, performing geotechnical site investigations, advancing utility coordination, and preparing for right-of-way acquisition prior to beginning procurement. SHA has also included contingency in the cost estimate based on CSRA guidance.
Funding	Failure to secure needed bonds, grants, etc. for a 2024 procurement, such as the Large Bridge Grant through IJA.	SHA is identifying available funding sources and is applying to secure funds to meet anticipated funding needs

Lack of competition	Risk exposure is too great for potential proposers to bid on large design-build contracts.	SHA is utilizing multiple smaller design-build contracts to mitigate project risks related to scope, schedule, contract terms, and pricing risks such as materials, skilled labor, inflation, and supply chain delays. SHA will further engage industry in pre-procurement partnering meetings to further engage industry to maximize competition and balance risks.
Interface risk and delay during construction	Multiple adjacent projects increase the likelihood that one project could delay the opening of another and delay commencement of revenue collection.	SHA has experience managing projects such as \$2.4 B Intercounty Connector ⁴ that used multiple contracts and will seek to utilize best practices and lessons learned from those experiences to minimize and mitigate problems that could lead to delays in opening and cost overruns, such as the increased likelihood that the actions of one contractor could lead to delay and/or additional costs for the other contractor due to failures in coordination at interface points.

⁴ https://www.fhwa.dot.gov/ipd/project_profiles/md_icc.aspx



AMERICAN LEGION BRIDGE + I-270 MULTIMODAL IMPROVEMENTS

Project Requirements

MDOT MARYLAND DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION

Location: Montgomery County, Maryland

MDOT UEI: [REDACTED]

Contact: [REDACTED] 7201 Corporate Center Drive, Hanover, MD 21076

FY 2023
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AMERICAN LEGION BRIDGE + I-270 MULTIMODAL IMPROVEMENTS: PROJECT REQUIREMENTS

The project meets the requirements and these requirements are detailed in the tables below.

Mega Project Requirements	INFRA Large Project Requirements
#1: The project will generate national or regional economic, mobility, or safety benefits	#1: The project will generate national or regional economic, mobility, or safety benefits

I-495 and I-270 are key elements of the regional and national infrastructure, with both routes designated as part of the National Highway System, National Highway Freight Network, and Strategic Highway Network. Safety is a major focus of the project, and results in a 20% decrease in fatal and injury crashes and a 26% reduction in property damage only crashes. on the freeway mainlines.¹ The project supports the economic vitality of the region with increased mobility, particularly for freight movement. According to the FHWA Freight Analysis Framework (FAF), there are significant truck volumes that move through the project area as commodities being transported along the I-95 corridor and these volumes are projected to continue to increase by 53% in volume and 108% in value by 2050². Truck volumes within the project area range between 10,000 and 20,000 trucks per day³. The I-495 at I-270 West Spur is identified by the Washington Metropolitan Council of Governments 2022 Congestion Management Report⁴ as one of the top ten bottlenecks in the region which will be addressed by the project. The project also supports multimodal mobility with the free use of the HOT lanes for transit vehicles, carpools, and vanpools with 3 or more occupants; supporting new transit connections, including the Fairfax Connector, beginning service in 2024; working with local governments to expand transit fare subsidies for low-income riders; and the implementation/enhancement of bicycle and pedestrian facilities on the American Legion Bridge and local roadways.

Mega Project Requirements	INFRA Large Project Requirements
#2: The project will be cost effective	#2: The project will be cost effective

This project is cost effective, with a Benefit Cost Ratio of 1.62.

Mega Project Requirements	INFRA Large Project Requirements
No statutory requirement	#3: The project will contribute to the accomplishment of one or more of the goals described in 23 U.S.C. §150

Safety: *To achieve a significant reduction in traffic fatalities and serious injuries.* The safety analysis showed a high proportion of crashes occurring in the project area were rear-end and sideswipe collisions, with a high occurrence of these crashes in the peak travel periods, indicating a strong correlation between the existing congested conditions and safety performance. The project

¹https://oplanesmd.com/wp-content/uploads/2022/06/02_MLS_FEIS_App-B_MDOT-SHA-Draft-App-IAPA-AppA-E_June-2022p.pdf - (Section 7)

² https://www.mdot.maryland.gov/OPCP/MDOT_State_Freight_Complete_2022_12_06.pdf

³ <https://www.mwcog.org/documents/2010/07/28/national-capital-region-freight-plan-freight/>

⁴<https://www.mwcog.org/documents/2022/07/08/congestion-management-process-cmp-technical-report-congestion-management-process/>

reduces the magnitude and duration of congestion along I-495 and reconfigures interchanges to reduce weaving segments, merges/diverges, and other conflict points.

A predictive crash analysis shows a decrease in crashes along the I-495 mainline freeway and ramps in the project area, as well as at the hotspot of I-495 at MD 190/Cabin John. The analysis shows a 6% reduction in fatal and injury crashes and a 9% reduction in property damage crashes at the interchange, with a 40% reduction in fatal and injury crashes and a 33% drop in property damage crashes on the ramps. On the freeway mainline, there is a decrease of 20% in fatal and injury crashes and a 26% reduction in property damage only crashes⁵.

Infrastructure Condition: To maintain the highway infrastructure asset system in a state of good repair. A key purpose of this project is modernizing and improving efficiency of transportation of people, goods, and services in the corridor. Most of the infrastructure in the corridor was originally constructed more than 60 years ago and cannot support today's transportation needs nor is up to today's current design standards. The current substandard elements within the project that will be addressed with the implementation of the project include travel lane width, shoulder width, horizontal curve radius, stopping sight distance and vertical clearance.

The project will address other elements including traffic barriers within the corridors are not compliant with current standards; ADA deficiencies; bicycle facilities and streets not in compliance with bicycle and complete streets policies and guidance.

The project includes the replacement of the American Legion Bridge, which is anticipated to drop into the "poor" condition within a three-year period unless the deck is replaced and the significant concrete deterioration is addressed. The American Legion Bridge replacement will also bring the bridge into compliance with current design standards. The remaining bridges within the project limits will also be replaced and brought up to current standard.

Congestion Reduction: To achieve a significant reduction in congestion on the NHS. An operational assessment was performed to determine the conditions in Build and No Build scenarios. In a 2027 interim year, with the project in place, speeds, densities, and Level of Service are improved throughout the network, including serving more vehicles during peak periods.⁶ For the horizon year of 2045, the speeds, densities, and Level of Service continue to be improved throughout the network, enhancing both safety and mobility. With the Build condition, during the AM peak period, 16% more vehicles are accommodated, with all vehicles accommodated by the end of the analysis period. During the peak PM period, the Build conditions result in serving 67% more vehicles with 80% less unserved vehicles by the end of the analysis period.

System Reliability: To improve the efficiency of the surface transportation system. By addressing congestion with the addition of the HOT lanes and easing congestion in the general-purpose lanes, the corridors within the project area will operate more efficiently. As part of the project analysis, an operational assessment was performed to determine the conditions in Build and No Build scenarios. In a 2027 interim year, with the project in place, the speeds, densities,

⁵ https://oplanesmd.com/wp-content/uploads/2022/06/02_MLS_FEIS_App-B_MDOT-SHA-Draft-App-IAPA-AppA-E_June-2022p.pdf (Section 7.2.4)

⁶ https://oplanesmd.com/wp-content/uploads/2022/06/02_MLS_FEIS_App-B_MDOT-SHA-Draft-App-IAPA-AppA-E_June-2022p.pdf - (Executive Summary – Section C)

and Level of Service are improved throughout the network, including serving more vehicles during peak periods.⁷

Freight Movement and Economic Vitality: To improve the NHFN, strengthen the ability of rural communities to access national and international trade markets and support regional economic development. I-495 and I-270 are both designated as part of the National Highway Freight Network (NHFN). The roadways carry significant freight volumes, which are projected to increase by 53% in volume and 108% in value by 2050⁸, and the I-495 at I-270 West Spur is identified regionally, as well as nationally, as a freight bottleneck. By easing congestion in the general-purpose lanes, and also addressing the American Legion Bridge, which is a significant bottleneck, the corridors within the project area will operate more efficiently and provide better mobility for the freight movements. The travel demand model analysis shows a 20% decrease in hours of delay along the corridors in 2045 and enhanced freight mobility will support the economic vitality of the nation, state, and region.

The aerospace and defense sector is a significant component of the economy, with over 96,000 Department of Defense active, reserve and civilian personnel in Maryland, comprising almost 6% of the State's Gross Domestic Product. There are numerous US and state military installations in Maryland, as well as in Virginia, and the facility is in close proximity with the Pentagon. I-495 and I-270, both designated as Strategic Highway Network facilities, provide vital connections between the military installations for the movement of personnel, supplies, and equipment. The efficient connectivity between installation is critical to national security and economic vitality.

Environmental Sustainability: To enhance the performance of the transportation system while protecting and enhancing the natural environment. An environmental analysis was undertaken for the project area, examining both Greenhouse Gas emissions (GHG) at the project level and at the regional level. The GHG analysis shows that emissions are expected to decline in the opening and the design years for all GHG pollutants when compared to the existing conditions. For CO₂, there is a 13% reduction in the opening year, with a 9% reduction in 2045. These reductions occur regardless of the projected increase in VMT⁹.

The project completely avoids significant stream valley parks, as well as historic parks of national significance. The project also avoids all business and residential displacements and the historic properties, and minimizes impacts to parks, NPS lands, Maryland-National Capital Park and Planning Commission properties, wetlands, floodplains, waterways, and forest canopies¹⁰. Water quality improvement measures will be provided for all new impervious area, and 50% of the existing disturbed area, thereby resulting in a net benefit to the water quality.

Reduce Project Delivery Delays: To reduce project costs, promote jobs and the economy, and expedite the movement of people and goods by accelerating project completion through eliminating delays in project development and delivery process, including reducing regulatory burdens and improving agency work practices. This project will be delivered using the innovative

⁷https://oplanesmd.com/wp-content/uploads/2022/06/02_MLS_FEIS_App-B_MDOT-SHA-Draft-App-IAPA-AppA-E_June-2022p.pdf - (Executive Summary)

⁸ https://www.mdot.maryland.gov/OPCP/MDOT_State_Freight_Complete_2022_12_06.pdf

⁹ https://oplanesmd.com/wp-content/uploads/2022/06/25_MLS_FEIS_AppK_FinalAirQualityTechnicalReport_June-2022p.pdf (Section 3.4)

¹⁰ https://oplanesmd.com/wp-content/uploads/2022/06/MLS_FEIS_05_Environmental_June-2022p-2.pdf (Page 5-2)

method of design-build. With design-build, the owner manages only one contract with the design-build entity including a unified project team where the designer and the contractor work together as a team to better fit schedule and budget. Potential changes are comprehensively addressed through a collaborative effort by the full team, saving both time and money with more efficient and cost-effective project delivery.

Mega Project Requirements	INFRA Large Project Requirements
No statutory requirement	#4: The project is based on the results of preliminary engineering

The range of preliminary activities for the project have been undertaken and are either completed or substantially completed. The table includes the activities and status¹¹.

Preliminary Engineering Activity	Status
Environmental assessments	Record of Decision issued and permitting process underway
Topographic surveys	Completed: 5/2021
Metes and Bounds Surveys	Estimated Completion: 10/2023
Geotechnical investigations	Estimated Completion: 7/2024
Hydrologic analysis	Estimated Completion: 7/2024
Utility engineering	Estimated Completion. 7/2024
Traffic studies	Completed: 10/2022
Financial plans	Under development
Revenue estimates	Completed: 6/2023
Hazardous materials assessment	Completed: 1/2023
General estimates of types and quantities of materials	Completed

Mega Project Requirements	INFRA Large Project Requirements
#3: With respect to non-federal financial commitments, one or more stable and dependable funding or financing sources are available to construct, maintain, and operate the project, and contingency amounts are available to cover unanticipated cost increases	#5: With respect to non-federal financial commitments, one or more stable and dependable funding or financing sources are available to construct, maintain, and operate the project, and contingency amounts are available to cover unanticipated cost increases.

¹¹ <https://www.permits.performance.gov/permitting-project/dot-projects/i-495i-270-managed-lanes-study>
<https://oplanesmd.com/feis/>
<https://oplanesmd.com/wp-content/uploads/2022/11/MDOT-SHA-Application-for-IAPA-August-2022.pdf>

Mega Project Requirements	INFRA Large Project Requirements
#4: The project is in significant need of federal funding.	#6: The project cannot be easily and efficiently completed without other federal funding or financial assistance available to the project sponsor.

Mega Project Requirements	INFRA Large Project Requirements
#5: The applicant has, or will have sufficient legal, financial, and technical capacity to carry out the project.	No statutory requirement

The funding plan for this project includes 60% from the MPDG program, 20% from other federal sources such as the BIP program, and 20% from the state match. The dollar values are shown below. Because of the size and complexity of this project, the grant funding for this critical project is a key component for implementation. If grant funds are not received, resources to the corridor would need to focus solely on state of good repair, such as the greater than \$1.6 billion replacement of the American Legion Bridge. This would both forgo upgrading the transportation efficiency of the corridor and delay the ability to generate new revenues from tolling.

Funding Sources	Total Dollars (in millions)	Percentage
MPDG/MEGA/INFRA Grants	\$ 2,419.0	60%
Other Federal Source(s)	\$ 806.5	20%
State Match	\$ 806.5	20%
Total Project Funding	\$ 4,032.0	100%

Local/State Match: SHA is committed to meeting the 20% required match through issuing debt backed by toll revenues generated by the project or other state sources.

Mega Project Requirements	INFRA Large Project Requirements
No statutory requirement	#7: The project is reasonably expected to begin construction not later than 18 months after the date of obligation of funds for the project.

The project schedule shows that construction will begin within the required 18-month timeframe after the obligation date of the funding, with construction beginning on the first contract in July 2025 and on the second contract in April 2026.

Mega Project Requirements	INFRA Large Project Requirements
#6: The application includes a plan for the collection and analysis of data to identify the impacts of the project and accuracy of forecasts.	No statutory requirement

A performance-based measurement plan to monitor the outcomes of the project is included in the Appendix. The SHA has performance focused tools, monitoring programs, and performance measurement processes in place that are utilized as the framework for this plan.



AMERICAN LEGION BRIDGE + I-270 MULTIMODAL IMPROVEMENTS

BCA Technical Memo

MDOT MARYLAND DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION

Location: Montgomery County, Maryland

MDOT UEI: [REDACTED]

Contact: [REDACTED] 7201 Corporate Center Drive, Hanover, MD 21076

FY 2023
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AMERICAN LEGION BRIDGE + I-270 MULTIMODAL IMPROVEMENTS: BENEFIT COST ANALYSIS TECHNICAL MEMORANDUM

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BENEFIT COST ANALYSIS TECHNICAL MEMORANDUM

Introduction

The project corridor is one of the most congested in Maryland which impedes the efficient flow of people, goods, and services including limiting interstate transit. The corridor also includes the American Legion Bridge which can no longer accommodate daily traffic levels and is limited in its ability to support efficient transit and alternative transportation options. While the bridge is safe, it will require repairs to rehabilitate its deck within the next decade – a disruptive construction activity that would further stress congestion on the already constrained bridge.

I-495 and I-270, located in the Washington, DC metropolitan area, are key elements of both the national and regional transportation infrastructure system and are two of the most heavily traveled routes in the National Capital Region and in the nation. The routes are designated as part of the National Highway System, the National Highway Freight Network, and as part of the Strategic Highway Network (STRAHNET), which provides defense access, continuity, and emergency capabilities for movements of personnel and equipment in both peace and war, as well as access for our national supply chain.¹ The routes carry hundreds of thousands of travelers each day to access employment and services. The routes are also significant freight corridors, connecting regional, as well as national markets along the I-95 corridor. As STRAHNET routes, the corridors play a vital role in connecting the numerous military installations in both Maryland and Virginia. Maintaining the efficient operations of these routes is of both national and regional significance, supporting economic vitality, freight mobility, and homeland security.

The current average annual daily traffic along the I-495 corridor is 253,000 with a projected increase to 289,000 by 2045. Along I-270, the average annual daily traffic is 259,000, projected to increase to 308,000 by 2045. The Metropolitan Washington Council of Governments 2022 Congestion Management Report identified the ten top regional bottlenecks in the region, one of which is I-495 at I-270 West Spur.

The Maryland State Highway Administration (SHA) undertook the I-495 and I-270 Managed Lanes Study to address mobility challenges along the corridors. This NEPA study resulted in a Record of Decision in August 2022 for the Selected Alternative, a two-lane High Occupancy Toll (HOT) managed lane network on I-495 and I-270. This Managed Lanes Study is coordinated with Virginia's 495 NEXT project, which is also focused on the implementation of multimodal strategies along I-495 and is currently under construction. This coordination provides a comprehensive approach to improving mobility within the National Capital region.

SHA has identified the first project to be implemented is the segment from south of the George Washington Memorial Parkway (connecting to the 495 NEXT project) to north of Westlake Terrace (the project). The location is shown in Figure 1.

¹ https://www.sddc.army.mil/sites/TEA/Functions/SpecialAssistant/STRAHNET/_STRAHNET%20101.pdf

Figure 1: Project Location



Source: Maryland Department of Transportation State Highway Administration

This document outlines the methodologies, assumptions, and values identified within the Benefit Cost Analysis (BCA) and is a supporting technical memorandum (Tech Memo) for the grant narrative. The BCA has been included with the grant submittal as an Excel workbook, and as applicable, has utilized the methodologies and values identified within the USDOT 2023 Benefit-Cost Analysis Guidance for Discretionary Grant Programs (BCA Guidance). To further correlate the analysis with the BCA Guidance, the chapter headers and supporting Excel worksheets have been labeled in accordance with the naming criteria of the BCA Guidance. For example, section 5.1 correlates to Safety Benefits, and 5.2 correlates to Travel Time Savings.

The BCA results are summarized in Table 1, and the supporting methodologies are summarized in the subsequent sections.

Table 1: Benefit Cost Results Summary (2021\$)

Life-Cycle Costs	\$2,175,033,052
Life Cycle Benefits	\$3,518,228,903
Net Present Value	\$1,343,195,851
Benefit Cost Ratio	1.62

Project Outcome Criteria

In accordance with the Notice of Funding Opportunity (NOFO) the six identified Outcome Criteria are summarized below and covered more fully within the grant narrative section.

Criterion #1: Safety

The I-495 and I-270 corridors represent significant areas of movement within the area. These corridors maintain frequently high volumes of traffic and significant numbers of vehicular crashes. As part of the Final Environmental Impact Statement an analysis identified that 4,700 crashes occurred between 2016-2018 and that over the analysis period, crash frequency increased approximately 9% annually. The majority of the crashes (68%) resulted in property damage only; however, there were nine fatalities. The majority of these crashes that occurred along the freeways were rear-end crashes (60%) which is indicative of congested traffic flow². The high proportion of rear-end and sideswipe crash types, along with the high occurrence of crashes during the peak travel periods, show a strong correlation between the existing congested freeway conditions and the safety performance of the corridors. In addition to the congested conditions, weaving movements were also identified as a contributing factor to the number of crashes. A predictive crash analysis was conducted within the FEIS which identified significant crash reductions of all crash severities.³ The values of the reductions will vary based on the project segment; however, averages of these values have been utilized to generate the Benefit Cost Ratio (BCR). This reduction in vehicular crashes has been quantified in the BCA analysis.

In addition to vehicular crashes, bicycle and pedestrian safety will be improved by the project through the addition of a shared use path along the American Legion Bridge and multimodal connections on the cross streets; however, a monetary value for the multimodal safety improvements has not been directly quantified in this analysis.

Criterion #2: State of Good Repair

As outlined in more detail within the grant narrative, a key purpose of this project is modernizing and improving efficiency of transportation of people, goods, and services in the corridor. Most of the infrastructure in the corridor was originally constructed more than 60 years ago and cannot support today's transportation needs nor is up to today's current design standards. Many geometric features do not meet current design standards, roadside barriers are not up to today's safety criteria, bicycle and pedestrian facilities do not meet current standards and complete streets criteria, and the American Legion Bridge is in danger of falling into poor condition while not meeting design standards nor accommodating today's traffic. The project will address the following outdated design standards:

- Bridge design deficiencies
- Travel lane widths
- Shoulder widths
- Curve Radii
- Stopping sight distance
- Vertical clearance

² https://oplanesmd.com/wp-content/uploads/2022/06/02_MLS_FEIS_App-B_MDOT-SHA-Draft-App-IAPA-AppA-E_June-2022p.pdf - (Section 7)

³ https://oplanesmd.com/wp-content/uploads/2022/06/02_MLS_FEIS_App-B_MDOT-SHA-Draft-App-IAPA-AppA-E_June-2022p.pdf - (Section 7)

- Barrier upgrades and compliance
- Americans with Disabilities Act (ADA) compliance
- Stormwater management
- Multimodal and complete streets additions to be compliant with local regulation

Impacts from these features will improve the traffic flow, safety, and longevity of the improvements, which have been included within this BCA.

Criterion #3: Economic Impacts, Freight Movements, and Job Creation

The improvement of two interstate corridors and a major bridge within the National Capital Region is anticipated to greatly benefit criterion 3. As part of the BCA, benefits to the economy and freight movements are quantified through travel time and operation costs savings. Improvements to the interstate corridors is anticipated to boost nearby property values and improve access to employment centers. This increased access will increase the economic viability of the region, as well as on the national level..

Criterion #4: Climate Change, Resiliency, and the Environment

The project is anticipated to increase corridor efficiency that has been quantified through the development of anticipated emissions reductions throughout the region. This planned reduction in emissions is in line with the findings of the Maryland Commission on Climate Change (MCCC) which identified the development of HOT lanes as a feature that supports emissions reductions goals.⁴ The emissions reduction was included within the BCA.

Criterion #5: Equity, Multimodal Options, and Quality of Life

Through development of the project, engagement opportunities and targeted public outreach exceeded federal requirements for engagement. This outreach included the development of an Environmental Justice Working Group that aided in the development of the analysis and outreach. This extensive outreach indicated that non-environmental justice populations were most likely to experience impacts across the corridor.⁵

The project is anticipated to improve equity, multimodal options and the quality of life in the following ways:

- Identify locations on state roadways where safer pedestrian crossings are needed
- Identify locations where additional pedestrian or bicycle improvements, upgrades, and ADA compliance are needed
- Identify locations on state roads where upgrades are needed for existing pedestrian facilities and lighting

⁴ https://oplanesmd.com/wp-content/uploads/2022/06/MLS_FEIS_05_Environmental_June-2022p-2.pdf (Section 5.8.3 B)

⁵ https://oplanesmd.com/wp-content/uploads/2022/06/MLS_FEIS_00_ExecutiveSummary_June-2022p-2.pdf

- Construct or fund a new parking lot for the historic Gibson Grove Church and Morningstar Tabernacle No. 88 Moses Hall and Cemetery
- Provide a new sidewalk along Seven Locks Road under I-495 to restore the historic connection between Gibson Grove Church and Morningstar.
- Free use of the new HOT lanes for transit vehicles, carpools, and vanpools with 3 or more occupants
- Working with the local governments to expand transit fare subsidies for low-income riders
- Support new transit connections throughout the corridors and across the American Legion Bridge, including the Fairfax Connector, beginning service in 2024
- Improving accessibility to employment, educational and other services with expanded bicycle and pedestrian improvements, including new and upgraded facilities
- Upgrading existing transportation facilities by replacing or rehabilitating all existing bridges on or over I-495 and I-270 within the project area
- Rehabilitating/resurfacing existing general-purpose lanes

The project is anticipated to improve travel times for all users of the network and to create a new multimodal connection across the American Legion Bridge promoting additional access.

Criterion #6 Innovation areas: Technology, Project Delivery, and Financing

The project adopts several innovative strategies to improve operations, enhance project delivery, and to result in a project that satisfies the desires of the community. The following indicate the features of this project that address criterion #6:

- Project delivery method of design-build allowing for an accelerated schedule and the optimization of risk on the project
- Development of an American Legion Bridge strike team to identify alternative designs which helped the following:
 - Reducing bridge footprint
 - Stormwater design, management, and treatments
- Trenchless culvert installation
- Drive-up public meetings⁶
- HOT lane development and efficient toll collection methods
 - Congestion pricing and development of maximum toll rates
- Installation of ITS and fiberoptic to support operations

⁶ https://oplanesmd.com/wp-content/uploads/2022/06/MLS_FEIS_08_PI-Agency-Coord_June-2022p-1.pdf
(Section 8.2)

BCA Assumptions, Methodology, and Results

General Project Assumptions

The development of the BCA relies on a series of assumptions and methodologies to quantify the overall benefit of the proposed project. To the extent feasible, assumptions and methodologies have been developed to correlate directly with the information provided within the BCA Guidance as updated for 2023. This Tech Memo describes the methodologies and references the accompanying BCA Excel workbook. The excel workbook contains the results and inputs of the BCA.

Table 2 outlines a series of general assumptions that have been utilized in this analysis.

Table 2: BCA General Assumptions

BCA General Assumptions	
Trucks/Buses allowed on roadway?	Yes
\$ Value Year:	2021\$
Data Base Year:	2021
Analysis Base Year:	2032
Analysis Forecast Year:	2051
Years to Construction:	2
Peak Hours / year:	24%
Non-peak Hours / year:	76%
No Build Annual Traffic Growth Rate:	0.4%
Truck Percentage:	6%
Discount Rate:	7%
Discount Rate CO₂:	3%

5.1 Safety

A safety analysis was conducted for the 6.5-mile corridor which identified vehicle crashes within the project limits. This crash data was identified between January 2016 and December 2018, representing a three-year period of analysis.

The project corridor improvements are anticipated to reduce the overall number of crashes through the implementation of improvements in the following criteria:

- Bridge design deficiencies
- Travel lane widths
- Shoulder widths
- Curve Radii
- Stopping sight distance

- Vertical clearance
- Barrier upgrades and compliance
- Americans with Disabilities Act (ADA) compliance
- Stormwater management
- Multimodal and complete streets additions to be compliant with local regulation

Safety Benefits

Over the three-year period, 4,701 vehicular crashes were recorded along the corridor with the majority (3,210 crashes) being property damage only. There were nine recorded fatal crashes on this corridor between 2016 and 2018.

Table 3 shows the number of crashes and their severity using the KABCO scale.

Table 3: Project Study Area Crashes and Severity (January 2016- December 2018) (Excel tab 5.1)

Crash Severity	Project Corridor
(A) Suspected Serious Injury	80
(B) Suspected Minor/Visible Injury	548
(C) Possible Injury / Complaint	854
(K) Fatal Injury	9
(O) No Injury	3,210
Total Crashes	4,701

Source: Final Environmental Impact Statement

The planned improvements are anticipated to reduce the number of crashes along the corridor. A predictive crash analysis was conducted as part of the environmental impact assessment of this project.⁷ As such the BCA has been developed using averages on these projected reductions.

Table 4 indicates the anticipated reduction in the number of crashes.

Table 4: Proposed CMFs to be Applied to the Project (Excel tab 5.1)

Severity(s)	Crash Reduction Factor
Injury and Fatal	35%
Property Damage Only	29.5%

Source: Final Environmental Impact Statement

⁷ [I-495 & I-270 Managed Lanes Study Final Environmental Impact Statement \(oplanesmd.com\)](http://oplanesmd.com) (Section 7)

The anticipated crash savings over the 20-year period are depicted in Table 5.

Table 5: Anticipated Crash Cost Savings (Excel tab 5.1)

	Crash Cost Savings (2021\$)
I-495/I-270	\$664,771,131

Source: SHA Analysis

5.2 Travel Time Savings

Average Annual Daily Traffic (AADT) Demand Forecast

To estimate future AADT, traffic projections from the Final Environmental Impact Statement were utilized to determine the corridor’s annual no build traffic growth rate of 0.42% and build growth rate anticipated at 0.92%. Count Station S2002150054 from the SHA was also utilized to understand historic traffic volumes along the roadway.

Travel Time Savings (TTS)

Travel time savings were developed based on the known volumes, travel time, and speeds along the corridor in relation to the assumed efficiency improvements related to the project. The following tables outline the assumptions related to TTS beginning with Table 6 which highlights the monetary values associated with vehicle types and the overall volumes along the corridor.

Table 6 through Table 8 depict the values and assumptions utilized to develop the TTS analysis.

Table 6: Travel Time Savings Assumptions (Base Year Traffic Volumes)

Vehicle Travel Time Savings Peak and Non-Peak Hour Assumptions (Base Year No-Build)	
Data Base Year	2021
Analysis Base Year	2032
Years to Construction	2
Analysis Forecast Year	2051
Peak Hour Vehicle Average Volume (Year)	23,361,581
Non-Peak Hour Vehicle Average Volume (Year)	75,026,617
Peak Hour Vehicle Occupancy	1.48
Non-Peak Hour Vehicle Occupancy	1.67
Hourly Value of Travel - Personal Vehicles	\$18.80
Hourly Value of Travel - Commercial Trucks	\$32.40

Source: Final Environmental Impact Statement, BCA Guidance

Vehicle Travel Time Savings

Travel time savings in this analysis were divided into peak hour (24% of the year) and non-peak (76% of the year) to estimate the time and operations savings for this corridor in this analysis. During the peak time periods, vehicle occupancy was estimated at 1.48 person per vehicle, while during non-peak periods it was assumed that vehicles contained 1.67 person per the BCA

Guidance. Truck traffic was identified as a percentage of total volumes (as identified by SHA) and trucks were assumed to have only one occupant. The anticipated vehicular volumes are depicted in Table 7.

Table 7: Estimated Annual Volume (Excel tab 5.2a and 5.2b)

Segment Description	Year	Average Volume (total vehicles/year)	AUTOS: Average Volume (Autos / year)	TRUCKS: Average Volume (Trucks / year)
I-495/I-270	1	98,388,199	92,780,072	5,608,127
	20	106,613,909	100,536,917	6,076,993

Source: SHA, Final Environmental Impact Statement, and SHA Analysis

Automobile and Freight Travel Time Savings

Building upon the volumes identified above, the value of travel time savings (VTTS) for automobiles and trucks was developed and the values have been discounted by 7% to 2021 dollars are depicted in Table 8.

Table 8: VTTS Over the 20-year Horizon (Excel tab 5.2a and 5.2b)

VTTS by Type (2021\$)			
	Autos	Trucks	Total
I-495/I-270	\$2,159,575,440	\$119,082,774	\$2,278,658,214

Source: SHA Analysis

Reliability

Reliability is another metric that was considered within this analysis but was not quantified. It is anticipated that the reduction in crashes, improved travel times, and general roadway improvements being implemented as part of this project will promote consistent and reliable travel times along the corridor.

5.3 Operating Cost Savings

Vehicle operating costs were estimated using the assumed travel time savings and anticipated costs per hour. This analysis utilizes the same sources provided in the BCA Guidance; however operating cost estimates have been developed using vehicle hours traveled instead of vehicle miles traveled. To coincide with the assumed benefits associated with this project, the per hour costs have been utilized as identified within Table 9, while the total values over the 20-year period are depicted within Table 10.

Table 9: Anticipated Operating Costs Per Hour (Excel tab 5.3)

2023 BCA Guidance	Hourly Value of Travel Time Savings
Light Duty Vehicle	\$0.89
Commercial Truck	\$54.21

Source: AAA Driving Costs (2022); ATRI An Analysis of Operational Costs of Trucking: 2023 Update

Table 10: Total Operational Cost Savings (Excel tab 5.3)

Operational Cost Savings by Type (2021\$)			
	Autos	Trucks	Total
I-495/I-270	\$87,815,363	\$199,243,123	\$287,058,485

Source: SHA Analysis

5.4 Emissions Reduction Benefits

The anticipated emissions reductions benefits have been developed based on the projected reduction in travel times related to the development of the project. This reduction in travel time (calculated as a reduction in vehicle idle time) is anticipated to directly reduce the NO_x, CO₂ and PM_{2.5} emissions along the corridor. The anticipated emissions reductions have been discounted to the 2021 base year using a 7% discount rate, with the exception of the CO₂ values, which have been discounted by 3%, per the BCA Guidance. The quantified emissions over the 20-year period are depicted within Table 11.

Table 11: Value and Amount of Emissions Reductions (Excel tab 5.4)

Carbon Dioxide (CO ₂) Avoided*	Value of CO ₂ Avoided (2021\$)	NO _x Avoided*	Value of NO _x Avoided (2021\$)	PM _{2.5} Avoided*	Value of PM _{2.5} Avoided (2021\$)	Total Value (2021\$)
900,805.50	\$15,161,602	1,561.42	\$7,038,125	36.65	\$8,022,371	\$30,222,098

*Values are in Short Ton; Source: SHA Analysis

5.5 Facility and Vehicle Amenity Benefits

Pedestrian and Bicycle Facilities

The project will add pedestrian and bicycle facilities to an area in which they are not currently provided. A multiuse path for pedestrians and cyclists will be constructed across the American Legion Bridge, forming a connection between the Potomac Heritage Trail in Virginia and the Chesapeake and Ohio Canal Trail in Maryland. It is anticipated that these facilities will improve the safety of the corridor, while also encouraging more active transportation through the area. The bicycle and pedestrian infrastructure benefit for this analysis has been quantified using the methodologies within the BCA Guidance and identified below:

- The multi-use path is anticipated to be 10-feet in width
- The total bicycle and pedestrian distance are the sum of the anticipated improvement distance at .38-miles

To estimate bicycle and pedestrian movement within the area, Replica software was used to estimate these movements for a typical Thursday and Saturday day in Fall 2022 on the nearby trails. Due to the American Legion Bridge’s lack of existing bicycle and pedestrian infrastructure, it is anticipated that the number of bicycle and pedestrians using the corridor will double (200%) and then increase along with the proposed traffic rates. This estimate is conservative based on research and data points from other cities.⁸ Using this research it is anticipated that a 20% growth rate maybe be appropriate; however, this analysis went with a lower and more conservative growth rate of .42% to match traffic growth. The identified non-motorized user growth was then discounted by the rule of ½ for the future considerations per the BCA Guidance.

Table 12 depicts the anticipated benefit from the development of bicycle and pedestrian facilities along the corridor.

Table 12: Anticipated Bicycle and Pedestrian Benefit (Excel tab 5.5)

Bicycle and Pedestrian Benefit (2021\$)
\$47,261,444

Source: SHA Analysis

5.6 Health Benefits

The bicycle and pedestrian facility additions to the corridor are anticipated to have positive health benefits to the surrounding community. Using the United States Census Bureau’s American Community Survey (ACS) 2021 5-year estimate, a review of the population that would receive health benefits was developed. Per the BCA Guidance, the following age groups will experience benefits:

- Walking Population between the ages of 20-74
- Cycling Population between the ages of 20-64

To quantify these values, a review of the adjacent Census Tracts was conducted, and the populations within these age ranges were identified. This analysis then related the age ranges to the anticipated walking and cycling populations for the development of a quantified benefit as outlined within the BCA Guidance. Table 13 depicts the anticipated health benefits associated with the development of improved non-motorized infrastructure.

⁸ <https://www.peopleforbikes.org/statistics/economic-benefits>

Table 13: Anticipated Health Benefit (Excel tab 5.6)

Health Benefit (2021\$)
\$1,936,173

Source: SHA Analysis

5.7 Other Benefits

Other benefits include a range of potential benefits, however, these require levels of detail or do not have an accepted state of the practice methodology for inclusion into the BCA. These elements, found in sections 5.7 and 5.71 were considered qualitatively but were not quantified.

Agglomeration Economies

The proposed improvements to I-495 and I-270 are intended to increase the safety and efficiency of travel within the region. As such, it is likely that business clustering and increased development is possible.

Emergency Services

The reduction in vehicular crashes and roadway improvements associated with this project are anticipated to increase access to emergency services. The project design improvements such as the addition of travel lanes and shoulders will increase emergency vehicle access to the corridor and throughout the region.

Stormwater Runoff

The project will be completed in accordance with all necessary stormwater management laws and regulations.

Wildlife Impacts

No monetary benefit has been identified to quantify wildlife impacts.

5.8 Other Issues in Benefits Estimation

Benefits to Existing and Additional Users

The improved corridor is anticipated to benefit existing vehicular users and to encourage additional drivers to utilize the corridor. The BCA includes the assumed induced traffic and growth rates associated with the corridor as identified within the analysis in the travel time savings, emissions reduction, and operational cost improvements.

Health benefits have been identified for the anticipated growth of bicycle and pedestrian movements; however, those have been calculated within the health benefits section.

Modal Diversion

The project is providing increased access to both bicycle and pedestrian infrastructure and is anticipated to increase modal diversion in the area. However, the majority of this modal diversion is anticipated along the cross streets and not along the interstate corridors.

Work Zone Impacts

Work zone impacts resulting from this corridor improvement will be temporary over the timeframe of construction and will not extend over the life of the analysis period and therefore were not quantified.

State of Good Repair

This project will contribute to a state of good repair by upgrading the existing roadway infrastructure, including wider shoulders and a new bridge and barrier separated multiuse path. The project is intended to correct existing geometric and structural deficiencies while using improved materials.

Resilience

This project will improve the ability of the transportation network to withstand adverse events such as extreme weather and flooding through design and material improvements.

Geographic Extent

This project will have regional travel benefits that will extend beyond the two States and project limits. The I-495 and I-270 corridors represent significant portions of the Washington Metropolitan area interstate loop serving the local population and travelers across the nation.

Property Value Increases

It is anticipated that improvements to the corridor will increase access to employment centers and increase regional property value.

6.1 Capital Costs

The design-build of the corridor is anticipated to begin in 2025 with a seven-year work horizon. As such, anticipated costs and risk contingencies have been applied to generate costs in 2021 dollars using a 7% discount rate.

Table 14 depicts the anticipated costs both incurred and to be spent on development of this corridor.

Table 14: Capital Cost (Excel tab 6.1)

Capital Cost (2021\$)
\$2,162,448,153

Source: SHA Analysis

6.2 Operations and Maintenance Costs

This analysis estimated the yearly maintenance costs using statewide system information and future funding projections for roadways and bridges. Using this information, the estimated yearly maintenance costs for the corridor and American Legion Bridge have been identified, with the anticipated total over a 20-year period being identified below.

Table 15 depicts the anticipated operations and maintenance costs of the project over the 20-year horizon period.

Table 15: Maintenance Costs (Excel tab 6.2)

Total Maintenance Costs (2021\$)
\$12,584,899

Source: SHA Analysis

6.3 Residual Value Analysis

The BCA for this project anticipates that the bridge and corridor improvements will have a 75-year service life and as such will surpass the 20-year analysis. This additional and remaining residual value of the project is anticipated to provide additional benefits beyond the 20-year period, utilizing the following formula.

The anticipated residual value is depicted within Table 16.

Residual Value Formula:

$$RV = \left(\frac{U - Y}{U} \right) \times Project\ Cost$$

Where: RV = Residual Value

U = Useful Service Life of Project

Y = Years of Analysis Period Project Operation

Source: Benefit Cost Analysis Guidance for Discretionary Grant Programs, 2023

Table 16: Residual Year Value (Excel tab 6.3)

Residual Year Value Calculation (75-Year Service Life)	
Constant Dollar Value	\$1,585,795,312
Discounted Dollar Value (2021\$)	\$208,321,359

BENEFIT-COST RATIO

The benefit-cost ratio has been developed using the materials described within this Technical Memorandum and shown within the accompanying Excel workbook. Analysis of available data and assumptions identified through the environmental impact statements and supporting materials indicates that the project will have a positive benefit to cost ratio. Though the benefit has been

quantified, it is anticipated that materials discussed qualitatively in this analysis will further increase the regional benefit of this project.

Table 17 depicts the final results of this BCA.

The benefit-cost ratio was developed with the following formula:

$$\text{Benefit Cost} = \text{Total Benefit} / \text{Total Cost}$$

Table 17. Benefit Cost Analysis (in 2021\$) (Excel tab Benefits + Costs Summary)

2023 MEGA Grant: I-495 and I-270 Managed Lanes	
20 Year Benefits Period (2032-2051)	
Values in 2021\$	
Discounted at 7% (3% for CO2)	
Costs (2021\$)	
<i>Total Costs</i>	\$2,175,033,052
Benefits (2021\$)	
Fatalities and Crashes	\$664,771,131
Residual Value	\$208,321,359
Travel Time Savings (Peak)	\$778,889,870
Travel Time Savings (Non-Peak)	\$1,499,768,344
Vehicle Operating Savings	\$287,058,485
Emissions Savings	\$30,222,098
Facility and Vehicle Amenity Benefits	\$47,261,444
Health Benefits	\$1,936,173
Life-Cycle Costs	\$2,175,033,052
Life Cycle Benefits	\$3,518,228,903
BC Ratio	1.62
Net Present Value	\$1,343,195,851