

West Virginia Department of Transportation

The West Virginia DOT (WVDOT) links asset management to planning through its robust trade-off analyses of bridge and pavement performance related to investment levels and funding packages.

Notable Practices

- **Trade-off analyses of asset investments in the State Long Range Transportation Plan.** The long range transportation plan (LRTP) includes a robust trade-off analysis of investment approaches to pavement and bridge preservation as they relate to performance and funding using the pavement and bridge management systems.
- **Use of data and analyses from the Transportation Asset Management Plan are included in the State Long Range Transportation Plan.** The Transportation Asset Management Plan (TAMP) is consistently referenced as a key source of data and analysis to support strategy development and investment planning in the LRTP.
- **Scenario planning and expert input guide investment decisions.** WVDOT uses outputs from scenarios generated by its Pavement Management System (PMS) and Bridge Management System to develop a list of recommended projects for the statewide transportation improvement program (STIP), with input from engineering staff.

About the West Virginia State DOT

West Virginia, with a population of 1.7 million, is composed primarily of rural communities, with the largest municipality in the State, Charleston, serving a population of 50,000. West Virginia has eight metropolitan planning organizations and 18 transit providers. WVDOT owns and maintains a majority of the road network within the State (approximately 90% of public roads), totaling 34,000 miles of the National Highway System (NHS), non-NHS roads, and the WV Turnpike. WVDOT also maintains over 7,200 bridges.^{1 2}

¹ West Virginia DOT. 2019. State Transportation Asset Management Plan.

<https://transportation.wv.gov/highways/programplanning/Documents/2019-Final-TAMP.pdf>

² West Virginia DOT. 2022. State Transportation Improvement Program.

<https://transportation.wv.gov/highways/Programming/STIP/Documents/Workshop%20%232/Draft%20OFFY%202023-2028%20STIP%20Narrative%20%281%29.pdf>



Highway and Transit Assets and Partner Agencies

WVDOT is responsible for monitoring and maintaining the State's roads, bridges, and state-owned vehicles/equipment. Each Division within the DOT takes ownership of the assets they manage and gathers data to track asset conditions. For example, the Highways Division tracks and maintains pavement conditions, bridge conditions, and equipment conditions, while the Division of Public Transit tracks transit assets such as buses and transit facilities. The Highways Division uses an asset management system (AMS) for tracking maintenance operations and assets. Additionally, ESRI's Roads and Highways tool is used for tracking road inventory. To support project management, reporting repair needs, and decisionmaking, the Division uses a projects programming and tracking system (HUB). Utilizing the Deighton dTIMS PMS, the Highways Division can analyze pavement data and identify maintenance and capital improvement projects. This PMS can model and create decision trees that support scenario analysis based on budget and condition benchmarks and produces a list of recommended priority projects. For identifying bridge repair needs, the Highways Division uses the Bentley AssetWise Bridge Inspection System to generate reports on bridge conditions.³ DOH also uses Deighton dTIMS bridge management system (BMS).

The WVDOT Division of Public Transit administers West Virginia's public transportation programs and is the designated state recipient organization of FTA funding. The Division of Public Transit develops the Group Transit Asset Management plan that includes all the State's recipients of FTA Sections 5307, 5311 and 5310 (where applicable), which includes annual performance targets.⁴ This plan identifies transit asset needs as well as potential strategies for efficient management.⁵ The Division of Public Transit Division tracks transit asset condition with the Microsoft Automated Vehicle Inventory System (AVIS), which tracks equipment age, inspections, mileage, useful life met, and state of good repair metrics, among others.^{6 7} Annually, the Transit Division tracks transit asset condition, using a scale rating that evaluates the maintenance condition of the physical asset. The Division conducts an assessment of the physical condition of the asset, its maintenance history, and the safety condition of the asset. The state of good repair (SGR) metric is projected from the asset's conditional evaluation.⁸

³ West Virginia DOT. 2019. State Transportation Asset Management Plan.

<https://transportation.wv.gov/highways/programplanning/Documents/2019-Final-TAMP.pdf>

⁴ West Virginia DOT. 2022. State Transportation Improvement Program.

<https://transportation.wv.gov/highways/Programming/STIP/Documents/Workshop%20%232/Draft%20OFFY%202023-2028%20STIP%20Narrative%20%281%29.pdf>

⁵ West Virginia DOT. 2018. Group Asset Management Plan.

<https://transportation.wv.gov/publictransit/Documents/TAMPFinalVersion.pdf>

⁶ West Virginia DOT. 2018. Group Asset Management Plan.

<https://transportation.wv.gov/publictransit/Documents/TAMPFinalVersion.pdf>

⁷ [Ibid](#)

⁸ [Ibid](#)

WVDOT's Planning Division collects asset data from the Highway and Transit Divisions to develop financial plans, including the Transportation Asset Management Plan (TAMP).

To ensure meaningful measurements from the data collected, the WVDOT collaborates with the State's eight metropolitan planning organizations (MPOs) to determine performance targets. WVDOT holds meetings with stakeholders and determines appropriate targets through an iterative process, which are established by WVDOT and adopted by the MPOs.⁹

Governance

The LRTP is developed by the WVDOT Core Team, staffed by the Planning Division, and is informed by a Leadership Team, and Policy and Technical Team, which consist of relevant WVDOT divisions and state and regional government and industry partners, including the Division of Public Transit, and WV Public Transit Association. The LRTP is approved by the WVDOT Secretary of Transportation

The WVDOT's Programming Division develops the State Transportation Improvement Program (STIP), which is approved by the WVDOT Secretary of Transportation.

Asset Management Relationship to Long Range Planning

Trade-off analyses for asset needs in the LRTP. Facing a significant gap between funding availability and asset preservation needs, WVDOT conducted a detailed trade-off analysis, looking at five scenarios for bridge and pavement investment. The agency used information from the TAMP and bridge and pavement management systems to develop the trade-off scenarios, described below.

Trade-off Scenarios

- **Revenue Constrained** – Baseline investment, assuming bridge and pavement asset management consistent with the TAMP and 30-year revenue availability.
- **Performance-Driven** – Investment level required to maintain bridge and pavement conditions consistent with FHWA-established performance targets.
- **Scenario 1 – Prioritize Pavement Condition:** Investment level required needed to maintain current performance and what is the performance implication to NHS pavement if increased investment non-NHS pavement is applied.
- **Scenario 2 – Prioritize Bridge Condition:** Investment level required to improve bridge performance on both NHS and non-NHS bridges while not seriously constraining performance of other systems, assuming resources can be shifted from other capital programs, primarily the regional mobility program and other expansion programs.

⁹ West Virginia DOT. 2022. State Transportation Improvement Program.

<https://transportation.wv.gov/highways/Programming/STIP/Documents/Workshop%20%232/Draft%20OFFY%202023-2028%20STIP%20Narrative%20%281%29.pdf>

- **Scenario 3– New Funding:** Investment required for each bridge and pavement programs maximize the performance outcomes across its bridge and pavement systems if new revenue sources (identified in the LRTP) become available.

The results of this trade-off analysis were included in the LRTP to inform strategies to maximize asset preservation within a constrained revenue environment while also communicating the need for additional revenue sources and explaining investment decisions.

Quantitative measures from the TAMP used to inform LRTP strategies. With a need to prioritize actions that will best meet the goals of the LRTP, WVDOT developed five portfolios of strategies and actions to achieve the highest short- and long-term impacts on transportation needs: *Preservation, Performance, Innovation, Diversify, Access*. Each portfolio includes approximately five strategies with descriptions of how the strategy will impact performance. Preservation strategies were screened using a combination of quantitative analysis in the pavement and bridge management systems, primarily derived from the TAMP and trade-off analysis in the LRTP, as well as qualitative measures to ensure alignment with the LRTP goals.¹⁰

Asset performance condition and expected funding levels used to set reasonable targets.

WVDOT uses performance condition models and anticipated funding levels to set reasonable targets for FHWA performance reporting.¹¹ These bridge and pavement management systems were also used to estimate realistic investment plans regarding the planned mix of preservation, maintenance, rehabilitation and reconstruction/replacement.

Support for asset management from the State Legislature. Recently, the WV legislator proposed a bill (HB 3214) to create the Road Optimization and Assessment Data (ROAD) Pilot Project. The project aims to incorporate machine learning and artificial intelligence into the WVDOT’s AM data collection and analysis strategies.¹² WVDOT worked with the legislature to rewrite the bill to make the law more applicable to current practices and overall objectives. The bill was passed by the legislature and approved by the Governor on March 28, 2023, and will become effective June 8, 2023.

Decisionmaking for the State Transportation Improvement Program (STIP)

Scenario planning and expert input guide investment decisions. When determining District projects for STIP inclusion, the WVDOT Programs Division runs scenarios in their PMS and BMS to

¹⁰ West Virginia DOT. 2021.2050 Long Range Transportation Plan.

<https://transportation.wv.gov/highways/programplanning/LRTP/Documents/Final-Plan-Signed.pdf>

¹¹ West Virginia DOT. 2021 2050 Long Range Transportation Plan, Needs Assessment.

https://transportation.wv.gov/highways/programplanning/LRTP/Documents/NeedsAssessment_Transit.pdf

¹² H.B. 3214. 2023 Capito, Riley, Williams, Young, Storch and Jennings, 2023 Reg. Sess.

http://www.wvlegislature.gov/Bill_Status/bills_text.cfm?billdoc=hb3214%20intr.htm&yr=2023&sessty pe=RS&i=3214

generate recommended projects. Results from the PMS and BMS scenario exercise show how asset performance compares to targets across a variety of investment scenarios. WVDOT identifies a list of projects using a constrained funding scenario, which is then refined based on feedback from bridge engineers and other experts within the agency who review project proposals.

Adjusting the STIP in response to TAMP update. In 2022, WVDOT’s TAMP was under development when the 2023–2028 STIP was published. The STIP narrative notes that the agency will likely issue a STIP amendment to make any required revisions to the size and scope of the bridge and pavement programs based on findings in the TAMP.

TAMP lifecycle planning analysis for work planning and programming within budget constraints.

The Pavement and Bridge Management groups conduct a lifecycle planning analysis based on the WVDOT annual budget for bridge and pavement maintenance for the TAMP. The analysis identifies short-term project recommendations (beyond committed projects) using long-term deterioration projects and benefit-cost analyses. The output is a recommended 10-year work plan. See Figure 1.

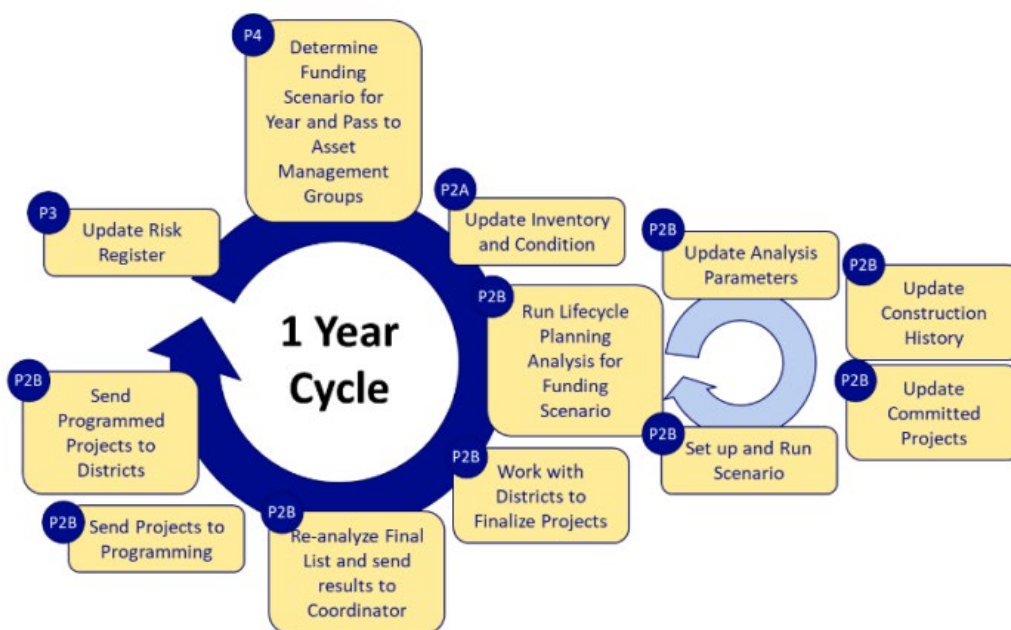


FIGURE 1. WVDOT ONE-YEAR WORKPLAN CYCLE

Challenges and Opportunities

Extreme weather risk data needs. High-quality risk-based asset management relies on substantial amounts of quality data to inform vulnerability and risk analyses. Data collection concerning damage due to extreme weather events is a resource-heavy endeavor but critical to inform useful analyses. Collecting detailed data is critical to understand how weather and climate-related events (particularly flooding) impact assets. The current TAMP’s Risk Register notes that 25 flooding events resulting in damages over \$750,000 per event have occurred in the past 20 years. The WVDOT is currently tolerating this risk by maintaining current standards for design and improving resiliency

during asset reconstruction, but a lack of detailed historical data surrounding flooding events hinders efforts. WVDOT is working toward mitigating the lack of data by implementing a new maintenance management system that will allow documentation of individual flood damage events and locations.

Gap between needs and funding. There is a large gap between the amount of funding needed to meet asset condition targets and the forecasted revenue for preservation programs.

Standard Operating Procedures (SOPs) for integrated asset management. WVDOT is currently working to adopt a set of standard operating procedures for a range of processes including combining field input with BMS and PMS recommendations to enhance project selection for pavement and bridge, performing gap analysis to compare predicted metrics to targets, risk management at the program and asset levels, and undertaking the annual consistency review with FHWA to compare planned and actual expenditures for preservation, maintenance, rehabilitation, replacement, and new construction.