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## RELIABILITY DATA AND ANALYSIS TOOLS (L02/L05/L07/L08/C11)

*A tool suite to help transportation planners and engineers improve data monitoring and analysis to achieve more consistent, predictable highway travel.*

## CASE STUDY

# West Virginia Department of Transportation

### *Statewide Travel Time Reliability Modeling Toolbox*

#### ABOUT THIS CASE STUDY

The second Strategic Highway Research Program (SHRP2) developed data and analysis tools to improve the measurement and management of travel time reliability by transportation practitioners. The SHRP2 Program provided funding to help agencies test the tools and incorporate reliability into their business practices. The West Virginia Department of Transportation (WVDOT) project included the following tools:

##### DATA COLLECTION AND INTEGRATION

###### **L02 Guide to Establish Monitoring Programs for Travel-Time Reliability**

Guidebook, visualization tools, and methods for integrating data to analyze reliability, including causes and locations of unreliable performance and identification of potential mitigating strategies.

##### ANALYSIS

###### **L07 Reliability by Design**

Spreadsheet-based treatment analysis tool to assess how different design improvements affect reliability, delay, safety, and benefit vs. cost over the lifecycle.

##### DECISION-MAKING

###### **L05 Handbook for Incorporating Reliability Performance Measures into Transportation Planning and Programming**

Guide to the institutional arrangements and technical steps needed for State Departments of Transportation (DOTs) and metropolitan planning organizations (MPOs) to incorporate reliability into their decision-making.

#### BACKGROUND

WVDOT worked with a consultant to integrate the L02 Guide, L05 Handbook, and L07 Tool into the most recent updates of WVDOT's statewide travel demand and simulation model guidance. West Virginia's mountainous topography often causes non-recurring congestion, hampering travel time reliability (TTR) among freight vehicles and commuters alike. West Virginia's current traffic modeling efforts are fragmented.

WVDOT uses wide-area and segment-level microsimulation models to inform their planning efforts. Additionally, each of the State's eight MPOs uses its own microsimulation model. These models vary in spatial granularity, geographic coverage, and how they address TTR. Some models do not incorporate reliability at all, largely because they have found the National Performance Management Research Data Set (NPMRDS) difficult to handle. Transportation planners in West Virginia lack information on reliability in many rural areas because the existing models do not provide enough detail.

To address these problems, WVDOT completed a project in 2020 that developed a toolbox for standardized traffic modeling throughout the State, including a uniform approach to modeling TTR. WVDOT's uniform traffic modeling toolbox will enable WVDOT and MPOs to forecast the reliability impacts of their planning and construction management efforts across the State.

The toolbox integrates with TransCAD®, and any State entity with an active TransCAD license will be able to access it. The toolbox allows analysts to:

- Import and preprocess archived travel time data.
- Analyze traffic within corridors, subregions, and origin-destination pairs on the road network.
- Generate reliability metrics and other performance metrics required by the Moving Ahead for Progress in the 21st Century Act (MAP-21) and display them on an interactive map.

preprocessing the data, the toolbox allows users to visually explore NPMRDS data for the previous year on an interactive map.

The project team programmatically incorporated the TTR metrics from the L05 Handbook and the L07 Tool into the new toolbox. They used the formulas for these metrics in the L05 Handbook and the L07 spreadsheet to calculate reliability in TransCAD. The toolbox easily integrates with Excel and geographic information systems (GIS) by exporting results in spreadsheet and shapefile formats. The toolbox also visualizes the performances measures using an interactive map. State agencies already use TransCAD regularly, making the toolbox easier for WVDOT to distribute and easier for users to adopt into their business practices than a standalone tool. The team plan to produce user documentation and a summary report of lessons learned to assist agencies in implementing the new software.

### ASSESSMENT OF THE TOOLS: BENEFITS, CHALLENGES, AND RECOMMENDATIONS

WVDOT staff found that the new toolbox incorporates and streamlines big geospatial datasets, such as NPMRDS, into project prioritization and long-range planning processes. The project team hosted an online workshop for WVDOT staff and received positive feedback on the toolbox.

Users find that the toolbox is easy to use because of its integration with TransCAD, Microsoft Excel<sup>1</sup>, and ArcGIS®. WVDOT anticipates introducing the toolbox to more users through additional online or in-person training and collect more stakeholder feedback.

WVDOT faced several challenges with the data inputs to the tool. Due to a change in vendor, the toolbox currently lacks NPMRDS data for one year. Furthermore, the toolbox only includes National Highway System (NHS) routes, but WVDOT eventually plans to expand it to all roads in West Virginia.

### IMPACTS ON BUSINESS PRACTICES

The project team hosted several workshops on the toolbox and will conduct in-person trainings to support the integration of the new toolbox into business practices at WVDOT, MPOs, and other State agencies. WVDOT hope the toolbox will help agencies to integrate reliability measures into statewide and

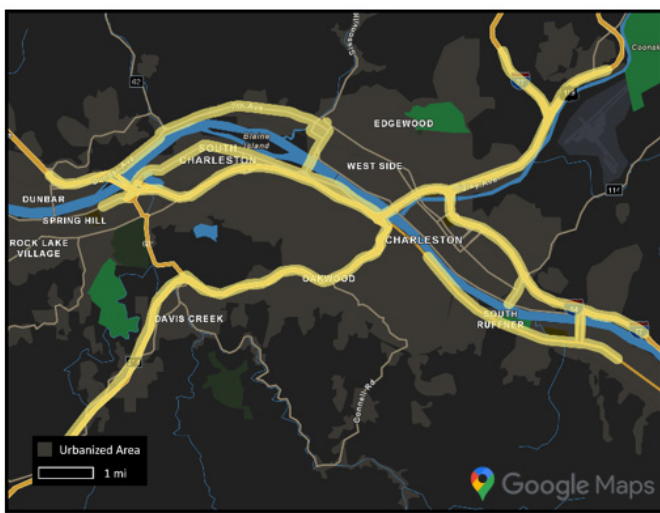


Figure 1. Map. Major Freeway Passages in Charleston, WV. Source: WVDOT. Map Data © 2020 Google.

## PRODUCT IMPLEMENTATION

### Data

Prior to the pilot, WVDOT did not have a Statewide road network dataset. To remedy this, the project team produced a geospatial dataset of West Virginia’s road network. They then calibrated and validated the network dataset to ensure its accuracy across the State and used the NPMRDS dataset for segment-level travel time data.

### Integration of Reliability Measures

WVDOT used the L02 Guide to identify the datasets needed for TTR analysis. The L02 Guide also informed the automated preprocessing capabilities of WVDOT’s toolbox to ensure that analysts can easily load and analyze the required datasets. After

<sup>1</sup> Microsoft and Excel are trademarks of the Microsoft group of companies.

regional planning and programming efforts by making the NPMRDS data more accessible and by providing detailed coverage of rural areas.

## CONCLUSION

WVDOT created the State’s first toolbox to model TTR and other performance measures statewide. The project team integrated the data collection processes and performance measures from L02, L05, and L07 into TransCAD for use by staff at WVDOT, MPOs, and other State agencies. The new application makes it significantly easier to display and analyze NPMRDS data. It also visualizes TTR and other performance measures for the entire State, including rural areas and smaller MPOs. WVDOT believes the new toolbox will help agencies in their planning and project prioritization processes.

## FOR MORE INFORMATION

Performance and Data in Transportation Decision Making  
<http://onlinepubs.trb.org/onlinepubs/Conferences/2019/PerformanceData/Gehan.pdf>

West Virginia Department of Transportation  
<https://transportation.wv.gov/Pages/default.aspx>

SHRP 2 Solutions  
<https://www.fhwa.dot.gov/goshrp2>

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