FLORIDA DEPARTMENT OF TRANSPORTATION | *Transportation Statistics Office*

SHRP 2 Reliability Pilot Testing - Florida

Implementation in Programming and Planning

final report

Mobility Performance Measures Program

December 2016

report

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Implementation in Programming and Planning

prepared for

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1.0 Introduction

In 2005, Congress, as part of the SAFETEALU Act of 2005 — Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users — authorized the Transportation Research Board (TRB) to administer the second Strategic Highway Research Program (SHRP2) in order to conduct research to address some of the most pressing needs of the nation's highway system.

Products stemming from this research, named SHRP2 Solutions, were made available to transportation agencies by the Federal Highway Administration (FHWA) and the American Association of State Highway and Transportation Officials (AASHTO) through a funding initiative program to encourage testing, application, and refinement. With a wide array of products ready for refinement, testing, and implementation, FHWA, in collaboration with AASHTO, developed Implementation Assistance Program (IAP) to help State departments of Transportation (DOTs), metropolitan planning organizations (MPOs), and other interested parties deploy SHRP2 Solutions.

As a longtime transportation research leader, the Florida Department of Transportation (FDOT) has been an active participant in SHRP2 research and implementation. Over the course of seven rounds of IAP, FDOT was awarded multiple projects.

FDOT has been developing congestion and reliability measures for many years, at both the Central Office and District levels. Central Office activities deal with system wide performance while Districts conduct performance monitoring primarily at the facility level. Historically, the Central Office's performance monitoring was based on applying predictive models to gauge changes in performance as well as a simple method for forecasting reliability. Since 2015, FDOT has been actively engaged in switching from predictive models to measured data for performance monitoring. This means that an accurate method of predicting the travel time reliability impact of improvements is needed. The initial testing of the SHRP2 Reliability and Capacity products indicates that one or more of them could be used for this purpose. This project provides the opportunity to accomplish the integration.

This report summarizes the work and results accomplished through the grant awarded to Florida DOT for the Reliability Data and Analysis Tools Proof of Concept Pilot Study under the fourth round of the SHRP2 Implementation Assistance Program (L38) in November 2014.

1.1 Purpose

The objective of this project was to incorporate travel time reliability as a factor in FDOT's planning and programming decisions for highway projects. Through this project, the following SHRP 2 implementation products/tools were considered:

- L05 – Handbook for Incorporating Reliability Performance Measures into Transportation Planning and Programming;
- L07 – Evaluating Cost-Effectiveness of Highway Design Features;
- L08 – Incorporating Travel-Time Reliability into the Highway Capacity Manual; and,
- C11 – Tools for Assessing Wider Economic Benefits of Transportation.

1.2 Scope

The objectives of this project have been accomplished through multiple subtasks as listed below. The SHRP2 tools tested are also indicated.

- Subtask 1: Consideration of Operations and Reliability Prediction in FDOT's Strategic Investment Tool (SIT) – C11 and L07
- Subtask 2: Incorporating Reliability into FDOT and MPO Planning Processes – L05
  - Subtask 2.1 – Incorporating Reliability into FDOT's Planning Processes – L05
  - Subtask 2.2 – Incorporating Reliability into MPO Planning Processes – C11
- Subtask 3 - Incorporating Reliability Prediction into the Project Development and Environmental (PD&E) Management and Corridor Planning Processes – L08
  - Subtask 3.1 – PD&E Studies
  - Subtask 3.2 – Corridor Planning

During the course of the project, some modifications were made to the scope as follows:

- Subtask 1: Upon close evaluation of the methods already used within the SIT tool, it was decided by the project team that replacing the current method with the C11 or L07 methods would not substantially improve the reliability estimates. Instead, the task was refocused to replace the modeled travel time reliability figures with reliability figures based on probe data, create new travel time reliability segmentation for non-limited access roadways, and provide categorization for the impact of travel time reliability.
- Subtask 2.1: In addition to the planned deliverables, another relevant product was developed: Planning for Travel Time Reliability Guide.
- Subtask 3.2: After consultation with FDOT staff, it was decided that a new Corridor Planning tool was not necessary. Instead of developing a new tool, the SHRP 2 reliability prediction tools for L05, L08, and C11 will be adapted for use with the standard traffic models in use at FDOT, as specified in FDOT's Traffic Analysis Handbook. The traffic tools are applied to different scales of analysis during the project development process including generalized planning, conceptual planning, preliminary engineering and design, and operations. The recommendations for adapting existing tools are included in a Planning for Travel Time Reliability Guide.

2.0 Results

This section summarizes the work accomplished, products developed (case studies, reports), and tools evaluated. Tangible results were documented in the form of gaps and recommendations for improvement of the tools/products for other states.

Consideration of Operations and Reliability Prediction in FDOT's Strategic Investment Tool (SIT)

Summary of Work Accomplished

The Strategic Investment Tool (SIT) is used in the selection of FDOT's Strategic Intrastate System (SIS) highway projects in support of Florida's Transportation Plan. It uses numerous criteria to prioritize projects, including reliability. Travel Time Reliability Index (TTRI) is the measure used by SIT as a measure of predictability to help system users adequately anticipate normal travel time. Currently, the TTRI is determined by a predictive model, which incorporates the probability of recurring congestion, incidents, weather, special events and construction. The SIT categorizes the SIS highways based on the value of TTRI as follows: High Congestion (TTRI > 1.261); Medium Congestion (TTRI between 1.061 and 1.260); and Low Congestion (TTRI between 1.000 and 1.060).

The C11 and L07 tools and equations were evaluated for applicability to the SIT tool.

This subtask utilized techniques from SHRP2 L05 to account for travel time reliability in FDOT's planning practices. The objective of this subtask was to further incorporate travel time reliability into the FDOT's project prioritization process. The results of this subtask will replace the modeled travel time reliability figures with reliability figures based on probe data, create new travel time reliability segmentation for non-limited access roadways, and provide categorization for the impact of travel time reliability on Strategic Intermodal System (SIS) facilities. This will occur in 2017.

Since 2015, FDOT has been actively engaged in switching from predictive models to measured data for performance monitoring. Specifically, FDOT used HERE probe data in minute speed bins for calculating the travel time reliability measure. As a part of this subtask, travel time reliability thresholds were developed for SIS freeways and SIS arterials, two lane and multilane highways. The revised SIT methodology based on measured data categorizes SIS freeways based on the value of Planning Time Index (PTI) as follows: High Congestion (PTI > 1.22); Medium Congestion (PTI between 1.14 and 1.22); and Low Congestion (TTRI between 1.00 and 1.14).

Products

The following reports summarized the findings:

- Technical Memo – February 9, 2016 – Implementation of the Strategic Highway Research Program 2 (SHRP2) C11 Procedure in Florida
- Report – December 12, 2016 – Task 2.1 Final Report

Evaluation of Tools

The SIT is used in the selection of FDOT's Strategic Intrastate System (SIS) highway projects in support of Florida's Transportation Plan (FTP) as a prioritization tool that ranks annual projects based on multiple criteria. It does not perform forecasting but works off current conditions. Reliability has been incorporated as a ranking criterion. Reliability measures have been developed using a model developed by the University of Florida. After discussion with FDOT personnel responsible for the SIT, it was decided by the project team that replacing the University of Florida method with the C11 or L07 methods would not substantially improve the reliability estimates. Furthermore, it is FDOT's intent to improve the University of Florida's method via a future research grant.

Therefore, this subtask was refocused to reevaluate freeway thresholds for High, Medium and Low categories within the SIT based on consultation with FDOT's Systems Planning Office and Transportation Statistics Office.

Outstanding Gaps in Usability of Tools

Gaps in the C11 tools were not identified in this task given that the equations already in place (and under development) in FDOT's SIT tool were determined to be more appropriate.

As a part of this subtask, the arterial, two lane, and multilane highway thresholds were tested on short reliability analysis segments developed in 2014. Travel time reliability was computed for the short non-limited access segments using HERE data. Through the SHRP2 implementation, new non-limited access reliability segments were defined but travel time reliability has not been calculated for the new segments. Travel time reliability for the newly defined arterial, two lane, and multilane highway segments will have to be computed in 2017 using the HERE data. After reliability is calculated, the non-limited access segments will have to be evaluated to determine which SIT category (i.e. high, medium, low) defines them. This quantitative information will then be loaded into the SIT and used in prioritizing Florida's SIS projects.

Applicability to Other States

The activities conducted in this subtask can be used by other states to incorporate travel time reliability into their project prioritization processes. Florida's SIT tool and travel time reliability (TTR) equations may be of interest to other States in terms of selecting projects at the planning stage.

Incorporating Reliability into Florida Department of Transportation's Planning Processes

Summary of Work Accomplished

The SHRP 2 Project L05 Guidebook identifies points in the project programming and development process where both reliability measures can be used and operations projects can be considered. An impediment in Florida to incorporating reliability and operations appears to be the categorical funding of projects; a more seamless process where improvements of all types are matched to deficiencies is preferred. This TWO addressed some of the key gaps in the use of reliability in planning and programming processes in FDOT. The work under this subtask included:

- Researching how to incorporate reliability in key policy statements.
  - Two key policy plans where travel time reliability should be considered were researched – Florida Transportation Plan (FTP) and Strategic Intermodal System (SIS) Policy Plan.
- Identifying funding mechanisms for operations projects.
  - Extensive research was conducted to develop a memorandum describing funding mechanisms available for operations projects and included the following activities:
  - Definition of operations projects;
  - Description of funding sources and eligibility;
  - Current methods for programming arterial and freeway operations projects; and
  - Gaps and recommendations.
- Investigating how travel time reliability can be more effectively incorporated in planning processes at the District and Central office levels.
  - At the Central office, Systems Planning office conducts planning of SIS corridor level projects. SIS funding represents a large funding source for these major projects and projects must be defined as adding capacity to be considered for this source. This subtask investigated the definition of "capacity" to determine if there was a gap related to allowing operations projects to be funded.
  - Using District 7 as an example, this subtask investigated if there are any guidelines in the use of reliability as a measure or in incorporating operations projects in corridor planning activities at the District office level.

In addition to the tasks outlined above, the Planning for Travel Time Reliability Guide was developed to provide FDOT employees and consultants with tools to better understand how travel time reliability is incorporated in FDOT's planning process for capacity expansion. This guide also describes the planning process for operational improvements, where there are opportunities for collaboration and tools for

incorporating travel time reliability, and how to fund improvements that address travel time reliability. It includes the following sections:

Section 1 – Introduction - Sets the context in which this Guide is developed, addresses its intended audience, and explains the purpose of this Guide.

Section 2 – Performance Measures - Presents the different performance measures that address travel time reliability, summarizes the Mobility Performance Measures Program and how it incorporates travel time reliability. It also describes the performance monitoring efforts by the FDOT Operations Office.

Section 3 – Planning Processes - Describes FDOT's planning and programming processes that are in place to add capacity and operational improvements, identifying where and how travel time reliability can be better incorporated.

Section 4 – Funding Sources - Explains the intricate funding mechanisms available to fund projects, with a focus on funding for operational improvements. Findings are that these processes are complicated and although there are eligible funding sources, there does not appear to be consistent awareness by Department personnel of the funds available or application of funding availability. In addition, funding Operations and Maintenance (O&M) has been a challenge for some districts. At the time of this writing, Central Office is working on securing more consistent O&M funding sources.

Section 5 – Tools - Presents methods for adapting FDOT's current traffic analysis toolset to produce reliability estimates and to account for the effect of operations projects. It addresses the relationship between reliability and capacity expansion, explores capacity equivalencies for operational improvements, and introduces various analytical tools.

Products

The following products were produced:

- Technical Memorandum – March 14, 2016 – Incorporating Travel Time Reliability into Planning and Programming – Policy Planning
- Technical Memorandum – April 1, 2016 – Incorporating Travel Time Reliability into Planning and Programming – Capacity Definition
- Technical Memorandum – July 17, 2016 – FDOT Operations Projects Funding White Paper
- Report – July 28, 2016 – Task 2.2.1 Final Report
- Guide – December 29, 2016 – Planning for Travel Time Reliability Guide

Evaluation of Tools

The L05 Guide was appropriate and very useful in the conduct of this task.

Outstanding Gaps in Usability of Tools

None. The L05 Guide was appropriate.

Applicability to other States

This subtask focused specifically on incorporating reliability into FDOT's planning processes. However, the activities undertaken in this subtask – review of policy statements, funding mechanisms and review of planning processes at Central Office and District Office levels – can be conducted for other states as well. In particular, the Planning for Reliability Guide would be useful for other states.

Incorporating Reliability into MPO Planning Processes

Summary of Work Accomplished

Under previous work funded by FDOT to assess the SHRP 2 L38 Reliability tools for application in Florida, a subtask was developed to implement the TTR Sketch Planning Tool procedures as a post-processor to an MPO's travel demand forecasting (TDF) model. Hillsborough County Planning Commission (the Tampa MPO) was selected as a pilot to conduct the subtask. The MPO was at a critical point in the update of its Long Range Transportation Plan (LRTP) and needed to incorporate both operations and safety projects into it, and wanted to add reliability as a performance measure for assessing alternatives. This meant that methods for forecasting reliability and safety needed to be created.

Because the LRTP development depends on results from the travel demand forecasting model (the Tampa Bay Regional Planning Model (TBRPM) based on the Cube software), it was decided that the most direct way to perform reliability and safety forecasting was to construct a postprocessor that uses the model outputs. For reliability prediction, the SHRP 2 Project TTR Sketch Planning Tool procedure was chosen because it operates at a sketch planning level with a minimum of data inputs. For translating, the effect of operations projects into the independent variables in the TTR Sketch Planning Tool procedure; relationships from the Highway Economic Requirements System (HERS) model were used. Capital, operating, and maintenance costs of operations projects were obtained from the TOPS BC documentation. For safety prediction, safety performance functions (SPF) in the Highway Safety Manual (HSM) were chosen. Crash reduction factors (CRF) were compiled from FHWA's Desk Reference. Locally developed costs were used for the safety costs of projects.

The work accomplished in this subtask is summarized as follows:

- A travel demand model post-processor was developed so that the C11 methodology could be applied at a regional level rather than at a project level as it was originally envisioned. The post-processor works with the loaded network file from the model output. It estimates reliability statistics by user-defined corridors. Because all Florida MPOs use the same travel demand software (CUBE), all of them can use the post-processor.

- The reliability prediction relationships used by C11 were reformulated using NPMRDS data for Florida. The relationships include reliability prediction equations specific to signalized arterials, which the original C11 tool does not have.

- Safety prediction was also added to the post-processor. The safety prediction is based on recently developed safety performance functions (SPFs) developed for FDOT by the University of Central Florida. The SPFs are fully specified so they can be applied directly to the data without crash modification factors for the base case.

- A list of operations and safety improvements were compiled along with default impact factors and project costs (e.g., crash modification factors for safety). Users have the option to bundle improvements.

Products

The following products were produced:

- Technical Memorandum – April 22, 2016 – SHRP 2 C11 Post-Processor Tool Enhancements
- Post Processor Tool
- PPT File
- Technical Manual – December 30, 2016

Evaluation of Tools

The FDOT approach to the C11 tool was not to use the existing tool but to adapt, customize, and extend it for use with the travel demand forecasting models used by Florida MPOs. Therefore, the majority of the effort was devoted to improving on the original C11 tool. An earlier version of the revamped C11 tool was developed under an earlier FDOT contract and used by the Hillsborough County Planning Commission to add reliability, operations, and safety to their long-range plan update; this activity was very successful and led to interest in making the C11 tool available to all Florida MPOs. The Implementation grant improved on the C11 tool by:

- Development of an interface to allow users easy access to the travel demand forecasting files;
- Updated safety performance functions (SPFs) and crash modification factors (CMFs);
- Expanded list of potential project types;
- Updated impact factors and costs for operations and ITS strategies; and
- Florida-specific relationships for predicting reliability.

The Hillsborough County Planning Commission is currently evaluating the new C11 tool. After that testing, it will be available to all Florida MPOs.

Outstanding Gaps in Usability of Tools

The project team believes that the usability of the C11 tool has been greatly enhanced by the FDOT effort. By tying it to travel demand forecasting models and building a user-grade interface, it is now directly linked to the planning process. The original tool was limited to examining a single project and had to be operated in isolation from existing planning models.

Technically, the C11 tool currently only accounts for recurring and incident delay. Adding traffic variability and perhaps weather would provide a more complete picture of reliability.

MAP-21 performance measures should be added to the C11 tool.

Applicability to other States

Applicability of the post-processor developed in this subtask to other agencies depends on the travel demand software being used by those agencies. If states and MPOs use CUBE, the post-processor should be directly transferrable. If other software were used, a mapping of the data items in that software to the CUBE data items would have to be performed first.

Based on the findings from Hillsborough County Planning Commission, when this post-processor is developed for other agencies, the following can be noted:

- Approximately 4 hours of user training was required for users to get comfortable with the post-processor. Additionally, for each travel demand model run, it takes approximately one hour to set the parameters for the post-processing tool.
- Hillsborough County Planning Commission previously did not have a way to calculate reliability and safety measures nor could they evaluate operations and safety improvements. Because this was an adjunct to current processes, it did not interfere with normal activities.
- With the original implementation of the procedure, the Hillsborough County Planning Commission was able to demonstrate the tradeoffs between traditional capacity improvements and safety and operations projects. They developed a separate tool to allow the public to test different cases of investment versus performance. The results were incorporated into their LRTP update.
- The implementation process was greatly aided by the enthusiasm of the Hillsborough County Planning Commission, which was eager for this capability. The post-processor filled a real need in their planning process.

Incorporating Reliability Prediction into the Project Development and Environmental (PD&E) Management and Corridor Planning Processes

Summary of Work Accomplished

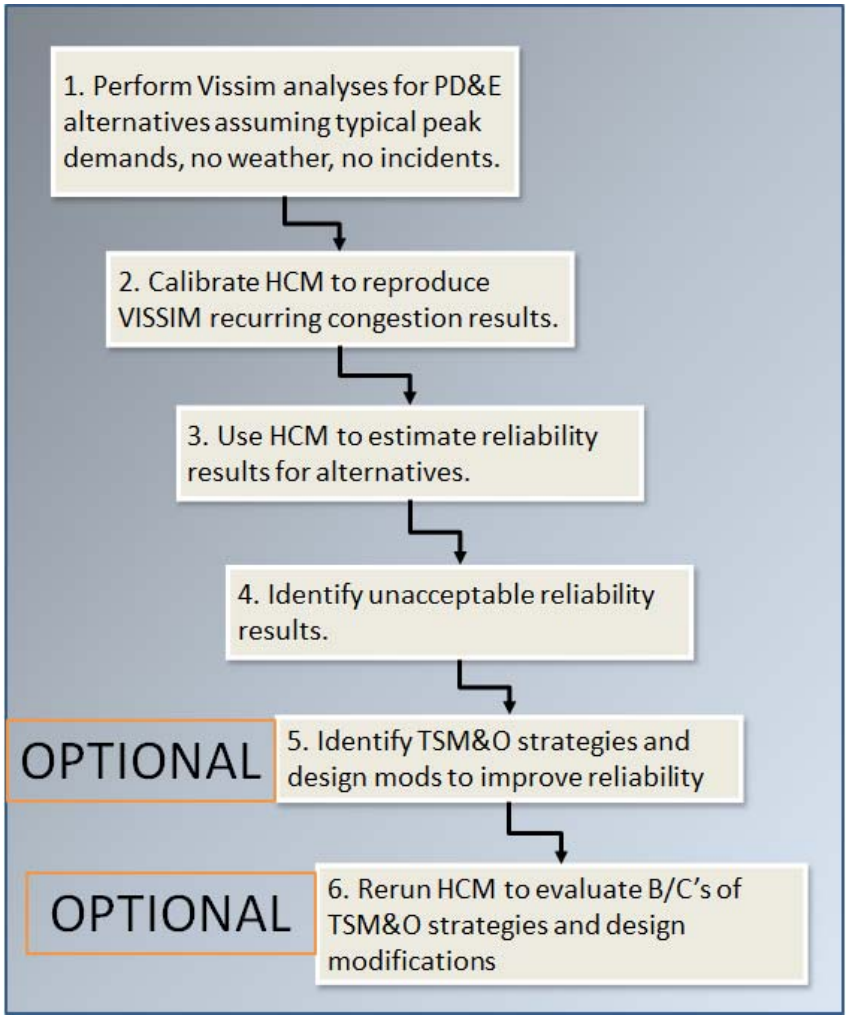
Travel Time Reliability is an important performance measure for FDOT because it is one of the few measures that can reflect the impacts of nonrecurring congestion such as incidents, weather and work zones. Travel time reliability analysis can be included in FDOT's Project Development and Environmental (PD&E) process to identify design features that may extend the service life and increase the performance robustness of their designs under challenging conditions including demand surges, incidents, crashes, weather, and work zones. The PD&E study is FDOT's process for complying with the National Environmental Policy Act (NEPA). A PD&E study provides a framework to achieve compliance with federal and state laws, regulations, and requirements.

The objective of this subtask was to examine the use of TTR predictive tools in FDOT's PD&E studies and develop a methodology framework for using TTR measures as one of the operational performance measures of effectiveness (MOEs) in alternative analyses conducted for PD&E studies. This subtask was accomplished by demonstrating how TTR analyses can be performed by traffic analysts post-processing results from microsimulation tools with theoretical extensions developed under the SHRP2, specifically project L08 (Incorporation of Travel Time Reliability into the Highway Capacity Manual).

First, a comparison of analytical tools used to predict travel time reliability was conducted. The tools reviewed were – Economic Impact Tools (C11), Planning and Preliminary Engineering Applications Guide (included in NCHRP Report 825), Effectiveness of Highway Design Features (L07), Travel Time Reliability in the Highway Capacity Manual (HCM) (L08) and University of Florida reliability predictive model. The assessment concluded that SHRP2-L08 HCM reliability methods are sensitive to most design decisions related to geometry of the facility (such as: number of lanes, merge lengths, shoulder widths, grade, lateral clearances, and design speed).. The SHRP2-L08 HCM reliability methods are the most precise of all the travel time reliability predictive models and because they are HCM based there is consistency with other FDOT traffic analysis tools.

The proposed methodology framework for predicting the TTR for evaluating project alternatives uses results from VISSIM analyses to calibrate a standalone HCM reliability model. Using the calibrated model, the Sixth Edition HCM methods are used to predict the TTR for each alternative. The six steps proposed in the methodology framework are illustrated in **Figure 1**.

Figure 1: Proposed PD&E Reliability Evaluation Framework



The proposed freeway travel time reliability analysis framework was tested on two freeway PD&E studies. The case studies were performed for the purposes of testing the proposed freeway travel time reliability analysis framework under near real-world conditions. The test process revealed that the methodology developed is sound and can be applied to evaluate travel time reliability in PD&E studies.

Products

The following products were produced:

- Technical Memorandum – June 8, 2016 – Subtask 3.1 Reliability Analysis in PD&E – Summary of Meetings
- Technical Memorandum – August 3, 2016 – Subtask 3.1 Reliability Analysis in PD&E – Benefits
- Final Report – October 2016 – Incorporating Travel Time Reliability into FDOT's PD&E Process

The project team also conducted two case studies and created case study reports. The two case study projects selected were:

- Hillsborough I-75 Capacity Improvement Project North PD&E – This project extends 12.1 miles of the I-75 freeway from US 301 to north Fletcher Avenue. This section includes seven interchanges.

- Broward Interstate 95 Express Lanes Project PD&E – The limits for this project are along I-95 from North of Oakland Park Boulevard (SR 816) to South of Glades road (SR 808).

An overall comprehensive project report was created at the conclusion of the project. A separate document was developed to provide systematic guidance on using the L08 based HCM predictive tool. The report provided recommendations to FDOT to assist with implementing the proposed methodology:

- FDOT will find it valuable to include reliability analysis in traffic analyses for major PD&E studies involving freeway improvement projects for these reasons:
  - Reliability analysis provides additional insights into how the proposed improvements will operate under challenging conditions like poor weather and incidents.
  - The added insights may suggest consideration of additional TSM&O measures.
  - The available data and tools for performing reliability analysis are ready for use in professional practice.

- The proposed reliability analysis framework was found to be complete and reasonable guide for the steps for performing a reliability analysis. The HCM reliability analysis methodology produced predictions of delay and reliability that were consistent with expectations.
  - The case studies' results showed the increased congestion resulting from poor weather and incident conditions and how they influence TTR.
  - The case studies results showed the expected benefits of TSM&O strategies such as hard shoulder running on travel time reliability.

- The case studies suggest the value of using site-specific weather, and crash data for the reliability analysis, however; extensive new data collection is not required. Florida and county specific defaults are available for weather, and facility specific crash rates are readily available. Florida and local data should be used instead of any national defaults whenever possible.

Evaluation of Tools

The project team evaluated both HCM-CALC TTR ATDM and FREEVAL. The HCM-CALC tool has a user interface similar to the LOSPLAN software currently used in Florida. It is viable software implementing the HCM Freeway Facilities methodology and its application for Active Transportation and Demand Management (ATDM) strategies and travel time reliability.

FREEVAL is much more efficient and arguably more capable of analyzing the multitude of scenario combinations than attempting to do something similar using microsimulation packages such as VISSIM or

CORSIM. Additionally, the aforementioned adjustment factors to capacity, free-flow speed, etc., based on the HCM, can be entered directly and managed easily.

Outstanding Gaps in Usability of Tools

The one apparent shortcoming of the HCM-CALC/ TTR and ATDM Utility suite is the lack of graphics; specifically, a schematic diagram of the freeway study section and its individual components – basic segments, on-ramps, off-ramps, overlap segments, and weaving segments. For short, simple study sections, this may not be problematic, but this functionality would be extremely helpful for longer and/or complex freeway facility study sections.

There are limitations to FREEVAL that mirror the limitations to the methodology in the Sixth Edition of the Highway Capacity Manual. Some of the limitations are:

- The method assumes a multiplicative effect when two or more factors (weather and incident) affect speed or capacity. This assumption has not been sufficiently tested empirically, and may overstate the deleterious effects of combined non-recurring congestion effects.
- Weather events that have a small effect (<4%) on segment capacity reduction are not addressed. A given weather event (e.g., rain, snow) is always assumed to occur at its mean duration value. Sun glare is not accounted for.
- The method assumes that incident occurrence and traffic demand are independent of weather conditions, although all are indirectly tied to each other through the specification of demand, incident, and weather probabilities on a calendar basis. However, the analyst is able to adjust incident frequencies by month based on local data.
- The method estimates incident occurrence as a function of segment demand and month of the year. It does not consider potentially elevated incident rates in segments with low demands. Some segments may be overly prone to incidents due to poor visibility, poor geometry, a short weaving segment, or a host of other factors that are not considered by the reliability method.
- The method does not consider full facility closures in the scenarios. In the course of assigning incidents to the segments, at least one lane should therefore remain open. The scenario generation methodology does not assign incidents that result in full-segment closure, but re-assigns those probabilities to other (less severe) incidents. This is also true for work zones, where at least one travel lane has to remain open.
- The travel time reliability analysis assumes similar effects of demand variation and weather conditions on general purpose and managed lanes, when a managed lane facility is included in the analysis.
- Work-zone events are only allowed to be modeled in general purpose lanes; no managed-lane work zone effects are considered.
- The traffic-demand adjustment assumes a proportional demand effect across the entire facility, meaning that all inputs and outputs (across time and space in the base scenario) are increased or decreased by the same factor.

Applicability to Other States

As a part of the NEPA process, state DOTs have to establish the purpose and need for the proposed study. In instances where the need is to combat non-recurring congestion, the proposed methodology from this subtask is suitable. During project development, if a project's purpose is to improve travel time reliability, then this methodology accomplishes that purpose.