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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

# Texas Department of Transportation

## *Freight Travel Time and Travel Time Reliability at the Southern Border*

### 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 Texas Department of Transportation (TxDOT) project included the following tool:

#### DATA COLLECTION

##### **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.

### BACKGROUND

TxDOT, together with the Texas A&M Transportation Institute (TTI), adopted the L02 methodology to design a truck Travel Time Reliability Monitoring System (TTRMS) at the U.S.-Mexico border in El Paso, Texas. TxDOT's primary objective was to better understand and mitigate commercial vehicle traffic delays. Their approach involved enhancing existing traffic data with travel time data for "last mile" trips to and from land border crossings. Their secondary objective was to design a TTRMS system that could provide reliability information to public and private stakeholders, such as the El Paso Metropolitan Planning Organization (EPMPO), and freight carriers and shippers.

The project, concluded in 2020, used the Ysleta Land Port of Entry (POE) in the El Paso-Ciudad Juárez binational region

(figure 1) as a test case. The POE access routes are Loop 375 (LP-375)—Cesar E. Chavez Border Highway, LP-375—N/S Americas Avenue, and I-10 (figure 2). In the future, TxDOT could use their TTRMS designs to implement a TTRMS system that provides useful data to stakeholders, while providing network analytics to TxDOT.



**Figure 1. Map. Ysleta POE in El Paso, TX. Source: TxDOT. Map Data © 2020 Google.**

### PRODUCT IMPLEMENTATION

The project team used the L02 methodology to help design a cross-border TTRMS for commercial vehicles. This included:

- Examining data sources and gaps.
- Obtaining stakeholder input.
- Developing a concept of operations.
- Producing an implementation plan.



**Figure 2. Map. Project boundaries—Ysleta POE Freeway Access in El Paso. Source: TxDOT. Map Data © 2020 Google.**

**Data Sources and Gaps**

TTRMS systems require a significant amount of input data to properly function – including data that describe transportation network performance (e.g., traffic data, such as travel times and volumes), and data that describe conditions and variables that could influence network performance (e.g., non-traffic data, such as road weather and special events). For a TTRMS system to function properly, these data need to be complete for the entire network.

The team identified available and missing data. TTRMS uses traffic and non-traffic data for travel times and traffic congestion sources, respectively. Table 1 summarizes the available data. A key data source was the Border Crossing Information System (BCIS), which uses roadside units to read radio-frequency identification (RFID) numbers and calculate travel time. The available data were useful; however, a few key data elements were missing.

The most significant challenge was overcoming data gaps. Existing data sources were insufficient; they were missing locations, data fields, and elements needed for a complete picture of the transportation network. Implementing TTRMS would require additional sources for travel time data, increased deployment of roadside data collection units, and increased data acquisition from Mexican authorities.

The team identified two major gaps in traffic data used to calculate travel times:

- TransVista, El Paso’s TxDOT traffic management center, did not cover all routes serving the POE. The number of Bluetooth® sensors was insufficient to accurately measure travel times, as not every interchange had instrumentation.
- The BCIS did not measure commercial vehicle travel times in the southbound direction due to lack of RFID sensors.

The team also noted gaps related to non-traffic cross-border data used to identify congestion sources, including Texas agencies’ inability to access the number of open Mexican customs inspection booths in the southbound direction. Texas also lacked access to the number of open toll booths operated by the Mexico-side border bridge trust, Fideicomiso de Puentes Fronterizos, in the northbound direction.

**Table 1. Ysleta POE TTRMS Data Types and Sources.**

Data Types	Data Sources
<b>Traffic Data</b>	
Freeway annual average daily traffic	Loop detectors
POE volumes	LED sensors, and U.S. Customs and Border Protection (CBP)
POE wait time/crossing time	BCIS RFID sensors
Travel times	Bluetooth sensors, ATRI®, Google®, INRIX®, HERE®, and National Performance Management Research Data Set (NPMRDS)
<b>Non-traffic Data</b>	
Number of US POE inspection booths operating	CBP
Freeway transportation incidents	El Paso Police Department, El Paso Fire Department, TransVista, ATRI, Google, INRIX, HERE, NPMRDS
POE transportation incidents	Fideicomiso de Puentes Fronterizos, CBP, ATRI, Google, INRIX, HERE, NPMRDS
Weather	National Weather Service (NWS)
Work zones	TransVista
POE work zones	CBP
Special events	Visit El Paso and Visita Ciudad Juárez web sites

Having determined data needs using the principles in the L02 Guide, TxDOT identified the steps it could take to increase the travel time data available to TransVista and other El Paso region travel models and systems. TxDOT planned to complete the following actions:

- Install approximately nine Bluetooth sensors on LP-375, Bob Hope Drive to Montana Avenue.
- Apply INRIX data already purchased by the El Paso District to TTR potentially with the TTI's assistance.
- Work with TTI to link travel time information to Lonestar™, its intelligent transportation systems (ITS) management software, which will enable system users to receive alternate route information and travel times.

With these improvements, TxDOT determined it would be possible to meet traffic data requirements for implementing TTRMS at the border.

### Stakeholder Input

The EPMPO is an important stakeholder since the agency is both a provider and user of the TTRMS data. EPMPO currently uses INRIX and Metropia® traffic data as input for its travel demand models, but these data sets do not include enough statistical detail to improve EPMPO's ability to forecast congestion and identify projects to eliminate or reduce congestion.

EPMPO recommended that TTI and City of El Paso International Bridges Department meet to coordinate regarding the City's plans to obtain more comprehensive freight traffic travel data for the Ysleta POE from Metropia.

### Concept of Operations

The project team produced a conceptual map of the TTRMS, which included the following modules:

- The data manager obtains, cleans, and stores data.
- The computation engine characterizes highway sections by operating conditions and nonrecurring events and calculates travel time probability distribution functions for those sections at a given point in time.
- The report generator responds to user inquiries through a user interface.

### Implementation Plan

The implementation plan described a two-phased POE TTRMS having an incremental version with traffic data and a full version with both traffic and non-traffic data. The incremental system can

monitor TTR but will not identify factors generating traffic congestion. This approach allowed TxDOT and EPMPO to identify and obtain the resources necessary to complete the full TTRMS. The plan concluded by recommending early steps for extending the TTRMS beyond the Ysleta POE to an El Paso region-wide system.

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

The L02 Guide provided the framework for TxDOT to explore the detailed data and stakeholder requirements for a cross-border TTRMS at the Ysleta POE. The project revealed data gaps that local agencies can prioritize and fill incrementally. The project's findings of potential TTRMS benefits to its users supported expanding the TTRMS concept beyond the Ysleta POE to the entire El Paso region. Overall, TxDOT found the L02 Guide to be a structured and useful tool that helped guide their efforts.

EPMPO acknowledged the challenges in developing an El Paso TTRMS, including funding availability, project sponsorship, inconsistent travel time data from Ciudad Juárez to the Ysleta POE, and nonrecurring event identification (including crossings and operations at the POE). Through its participation in the L02 project, the TxDOT El Paso District is aware of the importance of these data for calculating reliability measures and continues to increase the coverage of its Bluetooth sensor infrastructure.

## IMPACTS ON BUSINESS PRACTICES

As a result of this experience, TxDOT now has a concept of operations and a plan for implementing a useful commercial vehicle TTRMS system in El Paso.

The project generated broader interest within TxDOT and other stakeholders in measuring border wait times and TTR performance measures, and in beginning to develop a system encompassing commercial vehicle traffic conditions before, during, and after crossing the border.

Stakeholders indicated an interest not only in wait time information at the border, but also in queuing and travel times after trucks depart a POE. TxDOT is also exploring how to use mobility performance measures from Bluetooth sensor output and INRIX data to improve the ITS program in the El Paso district.

## CONCLUSION

Both EPMPO and TxDOT see the benefits of a TTRMS and are working toward gathering more traffic data to complement their goals related to TTR. A TTRMS aligns with TxDOT’s goal to improve its intelligent transportation systems (ITS) program by collecting more traffic data on its highway systems. EPMPO sees a regional TTRMS as a valuable tool to improve its travel demand model.

## FOR MORE INFORMATION

TxDOT Website

<https://www.txdot.gov/>

Texas A&M Transportation Institute: Freight Travel Time and Travel-Time Reliability at the Border

<https://tti.tamu.edu/featured-project/freight-travel-time-and-travel-time-reliability-at-the-border/>

SHRP 2 Solutions

<https://www.fhwa.dot.gov/goshrp2>

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