Construction Traveler Information Systems
For I-35 Widening in Central Texas

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ABSTRACT

This paper provides an overview of the first phase of the construction traveler information system being developed for Interstate 35 in the Waco District of the Texas Department of Transportation (TxDOT). Nicknamed “Main Street Texas”, the Central Texas portion of I-35 stretches from San Antonio to Hillsboro. More than two-thirds of travel on the corridor is through traffic and approximately forty-five percent of the Texas population lives within fifty miles of I-35. The diverse users of I-35 create substantial demand, with many sections of I-35 seeing over 200,000 vehicles a day. Given this context and the fact that more than 1,000 businesses front I-35 within the District, the challenges of reconstructing 100 miles of roadway from 2 lanes to 3 lanes in each direction are significant. TxDOT is employing a comprehensive approach using best practices, mobility coordination, and the subject of this paper, a construction traveler information system. Differing from a typical traffic management center (TMC) solution the challenges of collecting and dissemination comprehensive traveler information across 14 different construction projects spaced over 100 miles should not be discounted. The first phase capabilities include a comprehensive lane closure database, public lane closure dissemination, predictive analysis of lane closure impacts, en-route travel time dissemination and social media support. These capabilities are supported by an extensive array of ITS equipment, including Bluetooth readers, volume and classification counters and portable changeable messages signs. The paper identifies critical capabilities of the system and highlights lessons learned from the Phase I deployments and development.
BACKGROUND

In the United States, Interstate 35 has a southern terminus at Laredo, Texas and a northern terminus in Duluth, Minnesota. The interstate travels more than 1500 miles, across Texas, Oklahoma, Kansas, Missouri, Iowa, and Minnesota, ending on the shores of Lake Superior. Within Texas, Interstate 35 (often abbreviated as I-35 or IH-35) runs roughly North–South from Laredo near the United States-Mexico border to the Oklahoma border at the Red River. Along its route, it passes through the major cities of San Antonio, Austin, and Waco. At Hillsboro, it splits into two routes, I-35E and I-35W. Interstate 35E runs Northeast passing through Dallas, while Interstate 35W runs Northwest passing through Fort Worth. The two routes meet again in Denton, reforming a single section which runs to the border. From Laredo to Hillsboro, I-35 is approximately 368 miles in length. Due to the mix of rural and urban environments, traffic levels and congestion vary greatly within the corridor. Figure 1 shows the route of I-35 in Texas.

Figure 1 Interstate 35 in Texas (1).

Texas contains more miles of the overall length of Interstate 35 than any other state, almost one-third of the entire length (2)(3). I-35 is one of the primary travel and commerce corridors in the state of Texas. Within Texas, connections exist to Interstates 10, 20, 30, 37, and 45, leading to all major population areas. On an annual basis, more than 30 million travelers pass through this corridor. The Central Texas portion of I35, nicknamed “Main Street Texas”, stretches from San Antonio to Hillsboro. More than two-thirds of the corridor travel is through
traffic and approximately forty-five percent of the Texas population lives within fifty miles of I-35. The diverse users of I-35 create substantial demand, with some sections of I-35 seeing over 200,000 vehicles a day. In fact, sections of I-35 made up 11 of the 100 Most Congested Roadways in Texas for 2010. Trucks make up a significant percentage of the vehicle stream, averaging 25-30 percent overall and up to 75-80 percent at night, in some sections.

**PLANNED IMPROVEMENTS TO I-35 IN CENTRAL TEXAS**

The Texas Department of Transportation (TxDOT) is currently constructing planned improvements on the 100 miles of the I-35 corridor through the Waco, from Georgetown to Hillsboro (see Figure 1). Within the 100 miles, more than 1,000 businesses are located adjacent to I-35. Representing nearly $2 billion in construction costs, the freeway is being expanded from four-lane freeway sections to six-lane sections in rural areas and to eight-lane sections in the urban areas of Temple and Waco.

Overall, the improvements enhance safety by:
- bringing the interstate to current design standards,
- upgrading exits and entrance ramps,
- converting to one-way frontage roads along the entire length for both access and diversion,
- adding crossing points as well as U-turns at selected crossings,
- adding safety rest areas, and
- reducing congestion through the expansion of capacity.

The construction project's length, rural environment, and influence on multiple jurisdictions create a unique challenge to traffic operations and traveler information. As shown in Figure 2, the expansion encompasses 14 different projects, which are being constructed with multiple contractors and different area offices overseeing the projects. TxDOT has set numerous contractor construction parameters to mitigate construction impacts, including:
- Access to businesses must be maintained,
- 6 day work week,
- Use of blackout dates, such as Christmas, New Years, and dates with major corridor activity,
- Freeway lane closure limited to evening,
  - Sunday from 10:00 pm – 7:00 am
  - Monday through Friday from 7:00 pm – 7:00 am
- Contractor assessed lane rental fees, and
- Incentives for completing construction ahead of schedule.
Overall, the Department has committed to treating the individual construction projects as one coordinated project, providing local and long distance travelers with real-time traveler information about construction, work zones, and lane closures. TxDOT has embraced the use of Intelligent Transportation Systems (ITS) to provide innovative traveler information during this 5-year reconstruction effort.

PLANNING A CONSTRUCTION TRAVELER INFORMATION SYSTEM

While it is envisioned that permanent ITS infrastructure will be deployed as part of the construction efforts, the majority of the infrastructure will not be available until after construction is substantially complete. Additionally, the few existing resources, such as
Dynamic Message Signs (DMS) have been removed during construction activities. Although the Waco District corridor is anchored on the northern end by the Dallas Transportation Management Center (TMC) and by the Austin TMC on the southern end, no established TMC exists in the District.

The lack of existing traveler information infrastructure posed a significant challenge in reaching out to travelers. In addition, there is a complex set of information that was desired to be communicated to travelers, including travel times, speeds, delays, and lane closure information. In response to the unique challenges of this construction, the Texas Transportation Institute (TTI) was contracted to collaborate with the Waco District in developing and implementing a traveler information system for I-35 corridor.

**Previous Construction-Based ITS Efforts in Texas**

In October 2006, TxDOT implemented an ITS system in a construction work zone in Hillsboro, Texas. The purpose of the system was to monitor conditions and improve mobility and safety through the work zone along I-35, 35W, and 35E in Hillsboro County. This was one of the first sections of I-35 to be upgraded as part of the promise to enhance ‘Main Street’. TxDOT designed the system to provide motorists with real-time information on downstream conditions and to provide alternate route guidance during times of heavy mainline congestion. TxDOT sought to warn motorists of speed variability issues and to lessen traffic delays caused by capacity reductions and rubber-necking in the work zone (4).

Overall, the system performed as designed. Furthermore, some evidence did exist to suggest that the system was able to encourage diversion from I-35 during lane closures and incidents that blocked lanes and increased congestion. A few challenges did arise in terms of procuring the equipment, and it was found that congestion sometimes extended upstream beyond the limits of vehicle detection, which reduced the capabilities of the system and the information it could present to motorists.

**Traveler Information Survey**

While past experiences were critical inputs into the project team planning, a survey of I-35 travelers was constructed to obtain additional input. The survey was administered via the Internet in the Fall of 2011 using press releases and social media for recruitment. Respondents were not paid for their participation. The primary objectives of the survey were to find out:

- what types of traveler information are considered most useful by motorists;
- when they would prefer to receive various types of traveler information;
- what methods/tools/information channels motorists typically use to obtain traveler information.

Nearly 900 responses were collected for the 16-question survey. More than half of the respondents indicated an awareness of the I-35 construction projects which were currently underway. More than fifty percent of the respondents stated they drove the corridor more than once per week, with more than seventy-five percent stating they drove it at least once every 3 months. Respondents were almost equally split between stated trip purpose of business (51%) or
personal (45%). The remaining four percent encompassed commercial delivery or “other” trip purpose.

The survey was extremely useful in establishing a trip matrix of respondent’s starting and ending points. Nearly eighty percent of the respondents stated a typical starting and ending point, with only twelve percent stating an answer of “varied”. While the full origin-destination matrix is too large to reproduce here, nearly sixty-five percent of the trips were accounted for by origin points of San Antonio, Austin, Round Rock, Georgetown, Waco, Dallas, and Forth Worth. This number excludes the intra-city trip destinations (Ex: Waco to Waco), speaking to the significant lengthy corridor travel that takes place on I-35 and correlating earlier studies showing approximately two-thirds through traffic.

Perhaps the most useful outcome of the survey was determining the information desired by travelers on I-35. Table 1 identifies the types of information and the weighted response. Respondents were asked to rank their responses from Most Desired (1) to Least Desired (8), so the weighted response is the aggregation of all the respondents.

Table 1 Information Desired by I-35 Travelers.

<table>
<thead>
<tr>
<th>Type of Information Travelers Want</th>
<th>Weighted Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expected delays between major points along I-35 when I plan to travel</td>
<td>3.28</td>
</tr>
<tr>
<td>Current travel times between major points along I-35</td>
<td>3.65</td>
</tr>
<tr>
<td>Current locations of incidents</td>
<td>3.71</td>
</tr>
<tr>
<td>Locations and times for freeway lane closures</td>
<td>4.07</td>
</tr>
<tr>
<td>Projected travel times between major points along I-35 when I plan to travel</td>
<td>4.70</td>
</tr>
<tr>
<td>Current speeds on each segment of I-35</td>
<td>5.15</td>
</tr>
<tr>
<td>Detour routes/maps</td>
<td>5.29</td>
</tr>
<tr>
<td>Snapshots of freeway conditions at selected points along I-35</td>
<td>6.15</td>
</tr>
</tbody>
</table>

The other key finding is that most respondents wanted this information either right before their trip or during their trip. Table 2 identifies the percentages of travelers that responded when the information is desired, for a subset of information that can be delivered, namely travel times, lane closure information, and delay. In this particular set of questions, respondents were allowed to select more than one answer (other possibilities included days before trip and never), so the overall response total of the individual choices exceeds one hundred percent.

Table 2 When Would I-35 Travelers Use Information (Percentage)?

<table>
<thead>
<tr>
<th>When Is Information Desired?</th>
<th>Travel Times</th>
<th>Lane Closures</th>
<th>Delays/Detours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours or days ahead of time (so I can plan a trip)</td>
<td>38</td>
<td>57</td>
<td>66</td>
</tr>
<tr>
<td>Right before leaving on my trip</td>
<td>66</td>
<td>52</td>
<td>54</td>
</tr>
<tr>
<td>During my trip</td>
<td>54</td>
<td>46</td>
<td>39</td>
</tr>
<tr>
<td>I would not use this information</td>
<td>1</td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>
Establishing Goals and User Needs

Based on the previous experiences, the survey results, and the project team experience and planning, goals and user needs were developed to guide the deployment of a comprehensive construction traveler information system. The distinction of the word ‘construction’ is important, recognizing that this is not a deployment with typical incident management detection and mitigation roles. While an overall objective is to leave the equipment and capabilities behind for the District to continue to grow the system beyond the construction phase, the critical information capabilities and user needs are firmly centered on the construction viewpoint. In fact, the system vision was established as:

During the 100-mile I-35 widening project, provide an innovative capability, to present traveler’s information on current and projected travel conditions (local, regional, and corridor-wide), across multiple construction zones, in a timely, accurate, and useful manner for a more safe and predictable travel experience on I-35.

The system goals were established as:

- Utilize a systems engineering process to build solutions to satisfy corridor user needs.
- Create a traveler information monitoring capability in the corridor.
- Create a work-zone impacts assessment capability to examine impacts of lane closures.
- Actively monitor planned lane closures in the corridor.
- Create a traveler information dissemination capability.
- Operate and maintain the system.
- Evaluate the effectiveness of the system.

While user needs were specifically identified for each of the three major traveler groups (local, corridor, commercial), the aggregated user needs were established as:

- Provide for travel time monitoring and forecasting of travel conditions along the affected portion of the I-35 corridor and selected alternative routes.
- Provide for an operational impacts assessment of planned lane closures in the construction zones.
- Provide end of queue notification and real-time monitoring of planned lane closures in the construction zones.
- Provide for the real-time monitoring and travel time information systems to feed:
  - The delivery of pre-trip traveler information to assist travelers in making route choices based on travel time estimates prior to trip departure.
  - The delivery of on-route traveler information to provide travelers updated travel time and route delay information.
  - Existing traffic management centers integral to user choice in the corridor.

Additional user needs aimed more at the District level to help manage and operate the projects were also established.
• Continuously collect and retain information in a data warehouse for refining operations and traveler information projections, as well as performance metrics.

• Periodically calculate and publish a small library of metrics examining performance of the overall system and dissemination of traveler information.

• Create metrics suitable for both agency and public use.

BUILDING A CONSTRUCTION TRAVELER INFORMATION SYSTEM

The development phase of the construction traveler information system followed a systems engineering process. The identification of stakeholders is a key component of the process and resulted in nearly 40 specific groups being recognized as needing a level of information or interacting with the project. The subsequent system design utilized a dozen subsystems, each interacting with specific stakeholders for the exchange of data or control relevant to fulfilling one or more user needs.

The actual systems development effort was separated into two builds. The first build, with a completion date of June, 2012, fulfilled the first set of user needs, which included pre-trip traveler information, travel-time monitoring, initial forecasts of travel conditions, and en-route traveler information. The second build will expand on that deployed equipment base and information generated from Build 1 to disseminate the forecasted travel conditions en-route to the traveling public.

Lane Closure Database

A critical starting point for information in the corridor is advance notice of the planned lane closures. While TxDOT had a process in place to collect and broadcast this information to affected TxDOT personnel, systems had to be designed and built to collect information beyond the current systems. Although a separate system was designed and implemented, the starting point for information was the TxDOT process. Enhancements to the process were then made to collect additional information such as the geometric characteristics of the closure area and the type of work zone activity. The output of this database is used in two primary roles.

The first is a completely automated email distribution system for corridor travelers that inform them of upcoming closures. Travelers can choose to subscribe to a daily update, a 7-day forecast, or an abbreviated report that contains information about high-impact closures only. (Note: High-impact closures are defined as those work activities where all travel lanes of the freeway in one direction are closed). The second role for the lane closure database is to provide the base data for a process which evaluates each lane closure for the queue and delay that will develop, based on the entrance volumes into the section, the work-zone capacity, and the type of work zone activities. Table 3 illustrates the evaluation results from a 10-hour lane closure on April 23, 2012, in a three-lane section, where two lanes were closed. This was in a predominantly rural section with lower volumes and therefore did not generate substantial queues or delays.
### Table 3 Predicted Queue and Delay Resulting from Closure.

<table>
<thead>
<tr>
<th>From</th>
<th>To</th>
<th>Expected Queue (mi)</th>
<th>Expected Delay (min/veh)</th>
<th>Worse Case* Queue (mi)</th>
<th>Worse Case* Delay (min/veh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>09:00 PM</td>
<td>10:00 PM</td>
<td>0.7</td>
<td>5.4</td>
<td>1.4</td>
<td>8.9</td>
</tr>
<tr>
<td>10:00 PM</td>
<td>11:00 PM</td>
<td>0.3</td>
<td>3.7</td>
<td>1.5</td>
<td>9.5</td>
</tr>
<tr>
<td>11:00 PM</td>
<td>12:00 AM</td>
<td>0.0</td>
<td>0.0</td>
<td>1.3</td>
<td>9.0</td>
</tr>
<tr>
<td>12:00 AM</td>
<td>01:00 AM</td>
<td>0.0</td>
<td>0.0</td>
<td>0.9</td>
<td>6.9</td>
</tr>
<tr>
<td>01:00 AM</td>
<td>02:00 AM</td>
<td>0.0</td>
<td>0.0</td>
<td>0.2</td>
<td>3.4</td>
</tr>
<tr>
<td>02:00 AM</td>
<td>03:00 AM</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>03:00 AM</td>
<td>04:00 AM</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>04:00 AM</td>
<td>05:00 AM</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>05:00 AM</td>
<td>06:00 AM</td>
<td>0.0</td>
<td>0.0</td>
<td>0.1</td>
<td>3.2</td>
</tr>
<tr>
<td>06:00 AM</td>
<td>07:00 AM</td>
<td>0.7</td>
<td>5.4</td>
<td>1.5</td>
<td>9.4</td>
</tr>
</tbody>
</table>

### ITS Infrastructure

A variety of ITS infrastructure was developed and put in place to complete Build 1 of the construction traveler information system. The main goals of the infrastructure were to:

- Continuously monitor travel times along the entire corridor
- Continuously monitor volumes at strategic points along the corridor
- Communicate travel conditions through travel time dissemination on PCMS

### Travel Time Monitoring

TTI was one of the early players in the use of Bluetooth (BT) Media Access Control (MAC) addresses for the calculation of probe-based, segment travel times. A MAC address is a unique identifier of a BT device. Matching the same address across two locations at different timestamps produces a travel time. Termed Anonymous Wireless Address Matching (AWAM), this technology was employed on the I-35 project as a relatively quick, low-infrastructure, low-power solution to provide bi-directional corridor travel times. The field installation of the AWAM equipment was typically configured in one of two types depending on power availability: 1) stand-alone solar-powered, or 2) in-cabinet AC-powered. When possible, existing infrastructure (ITS, loop, Closed Circuit Television, etc.) cabinets were used, but due to the rural nature of some required sites, solar-power installs were necessary at a majority of locations. Figure 3 and Figure 4 show typical AWAM installations on I-35. Internal to the cabinet, the installations contain the AWAM reader, a cellular modem, and batteries and charging devices to convert and store the solar energy.
Figure 3  Typical AWAM installation at a stand-alone, AWAM-only site.

Figure 4  Typical AWAM installation at site with additional roadside equipment.
Volume and Classification Monitoring

TTI has deployed Wavetronix classification counters at seventeen strategic points along the corridor. The roles of these deployments are two-fold. First, the data is used in real-time for the work zone analysis process that forecasts queue and delay. At the onset of the construction traveler information system, this process used historical volumes. Collection of volume and classification information (percent trucks) in real-time means that the forecasted impacts are based on the most recently available data. The query process contains routines to compare current data with recent historical data and adjust for outlier data, as necessary. Additionally, in Build 2 of the system, the real-time volume and classification data will play a critical role in the prediction of corridor construction delay.

Portable Changeable Message Signs (PCMS)

Currently, 21 PCMS are deployed along 200 direction miles of I-35 in the Waco District to provide travel times. The use of PCMS is critical to the successful dissemination as the DMS installed on various projects will not be available until near the end of individual construction projects. TxDOT wrote contractor procurement of some PCMS into individual projects with TTI doing rental procurements for the additional signs. The number of signs required will vary throughout the lifetime of the construction projects as other infrastructure becomes available. The varied procurement processes introduces some configuration issues into the system, to ensure that all signs are configured consistently, and that capabilities utilized are supported across all vendors. All of the signs operate on the public cellular network as do all of the data collection devices.

Integration to TxDOT Management Center Software

Although the Waco District does not have a Transportation Management Center, the existing Closed Circuit Television (CCTV) and DMS infrastructure was controlled via the TxDOT statewide software solution, named LoneStar. LoneStar is a comprehensive TMC software environment designed to collect, monitor, analyze, and disseminate information about various roadway conditions. TTI and TxDOT recognized that the best opportunity to leverage resources existed by integrating, to the extent possible, the construction traveler information system functions into LoneStar. To that end, while TTI collects and analyzes the BT data external to LoneStar, the message to display on the PCMS is transmitted to LoneStar using the Center-to-Center (C2C) protocol and LoneStar handles all communications with the PCMS. This integration path will continue throughout the lifespan of the construction projects, as LoneStar continues to gain capabilities. Additionally, the goal of all the deployments is to leave them behind to form the basis for the Waco District traffic management center functionality at the conclusion of the I-35 construction.

USAGE OF CONSTRUCTION TRAVELER INFORMATION SYSTEM

Pre-Trip Lane Closure Dissemination
Figure 5 shows a copy of a typical email distribution for lane closure information. This has been a popular avenue for information dissemination and currently sends approximately 10K emails per week to the subscriber base across all the lists. The District initiated this information dissemination on a manual basis at the start of the projects and experienced a sixty percent growth in subscriptions once the automated feeds were developed and advertised.

![Figure 5 Lane Closure Email Distribution.](image)

**En-Route Travel Time Dissemination**

**Portable Changeable Message Signs (PCMS)**

Figure 5 shows a screen capture of the travel time monitoring system. This image shows the 21 active PCMS, consisting of their name within the LoneStar environment, the date and time of the system query, and the message, which consists of a travel time destination, a distance, and a time. Each PCMS has an 8 character by 3 line display capability. The PCMS are not displaying travel time messages in phases, as TTI and TxDOT preferred to keep the content display as simple as possible. The character limitation, which would not come into play using a DMS, does affect some destinations. An example is HILLSBORO which is 9 characters and is abbreviated as HLLSBORO. To date, no negative comments have been received pertaining to any abbreviations. The overall travel time message design and content was evaluated using a human factors study at multiple locations within the corridor prior to deployment. Results from that study were used to guide the final message design. The travel times on each sign are updated every 5 minutes. In the event of a data or communication loss, the message will stay active for a maximum of 20 minutes, and then default to a stored information message.
The developing infrastructure in the corridor affords the Waco District the opportunity to examine traffic impacts in multiple situations. While forecasted delay information will be disseminated to drivers en-route in Build 2 of the system, the current BT deployments allow for significant insight to be gained into the early construction activities. For example, Figure 7 shows the travel time data collection during the timeframe of the lane closure event shown in Figure 5. (Note that the lane closure email uses common names known to the corridor travelers, whereas the BT monitoring system utilizes the official roadway designation.) The BT data clearly shows that the lane closure had essentially no impact on travel speeds during the time of the closure. From the standpoint of evaluating construction activities and understanding the impacts on the traveling public, this is invaluable information.
By way of comparison, Figure 8 shows the impact of an incident that occurred on 6/15/2012 at approximately 2:30 pm and shut down one of the two lanes in the northbound direction. The queue exceeded 3.5 miles and speeds dropped more than 40 mph over the timeframe of the traffic recovery, which took approximately 3.5 hours even though the on-scene clearance took 30 minutes.
Social Interaction

The information gained from the BT interface and the real-time mapping of the segment travel times allows the Waco District Public Information Officers (PIOs) to be proactive in disseminating information to a wide portion of the traveling public in addition to the en-route PCMS. Using the Facebook and Twitter social media avenues, the PIOs can quickly disseminate information about incidents and delays. Additionally, the BT management interface has a built-in Twitter interface so that the system can automatically send twitter messages about slowdowns on different segments of the system, without needing PIO intervention. This capability is currently in Beta testing to assess methodologies that provide sufficient information, but do not overwhelm the communications channel with repeated information.

LESSONS LEARNED

The development of the Build 1 capabilities have provided numerous lessons learned.

- Lane Closure Information
  - Although desired 7 days in advance, lane closure information typically arrives on a shorter timeframe to reduce the issue of phantom or frequently cancelled closures.
Due to the public dissemination and the use in forecasted impacts, accurate lane closure information is more important than a time-window exceeding several days.

- **Infrastructure Deployment**
  - Due to the changing nature of the construction area, deployments should be thought of as temporary. The use of wooden poles, solar power, and cellular communications as a basic deployment model significantly increases the locations where equipment can be deployed.
  - Careful review of the construction plans and consultation with the project managers and construction supervisors can make it possible in many situations to locate field equipment sites where they will not need to be moved for 18-24 months.
  - Moving field equipment is a necessity at some point in time and systems should be designed to be easily portable. Software solutions should employ global positioning system (GPS) locations to track equipment whenever possible.
  - Due to the length of use and maintenance considerations, rental procurements for some equipment, such as PCMS, should be carefully examined.
  - BT detectors can be spaced 5-8 miles in the rural sections of the corridor with no loss in fidelity of the data. In the more urban sections of the corridor, detectors should be spaced 2-3 miles apart.
  - Depending on the software environments in use, integration can be a critical task. Concepts of data exchange, information handshaking, update intervals and protocol and security requirements should all be identified, discussed, and agreed upon prior to writing code.

- **Information Dissemination**
  - The public prefers lane closure information to be specific and comprehensive, including cross streets and directional information, so systems must be capable of significant levels of detail.
  - While automated reporting from the database is easy to accomplish, significant attention must be paid to the presentation (colors, fonts, style, icons, etc.) and the use of natural language phrases, resulting in the time to build the dissemination far exceeding the time required to build the actual database.
  - The public does utilize the lane closure notices and notifies TxDOT when information is out-of-date or unclear. This has led to several refinements in the wording used in the notices.
  - Finding appropriate travel time destinations for varied user groups (local and through travelers) in a rural corridor can be challenging. Local travelers prefer more discreet and closely spaced information while through travelers desire city name destinations at wider spacings.
FUTURE EFFORTS

As the project capabilities continue to develop, numerous additional work efforts are planned. Significant targets include:

- Follow-up surveys to assess the impact of the traveler information outreach (Nov 2012)
- Deployment of the real-time traveler information map (Oct 2012)
- Deployment of communication via social media to enhance outreach (Jan 2013)
- Deployment of Build 2 corridor delay forecasts (Summer, 2013)

REFERENCES


