



# Research Digest

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## ***Item 1***

### **Electronic Appraisal Development Study**

*UNIVERSITY OF TEXAS AT AUSTIN. CENTER FOR TRANSPORTATION RESEARCH (CTR)  
CTR 1523-1 • 2006*

The acquisition of Right-of-Way is one of the major tasks involved in most of the highway projects. It is a highly complicated process requiring multiple stages, various participants, and large amounts of data and information. It is the duty of the State Departments of transportation to ensure that the property owner is fully compensated for the loss of land and resulting damages incurred due to the acquisition of his/her land. This involves valuation of the property being acquired. Normally, an independent fee appraiser is hired by a state Department of Transportation to determine the compensation that must be paid to the property owner. There is a substantial divergence in values of the appraised properties that are similar in nature by two different fee appraisers. A variety of factors are responsible for these inconsistencies. In spite of the recent technological advances made by the states, the problems still persist.

The objective of this research is to develop an Electronic Appraisal System (EAS) that is capable of capturing, transmitting, storing, managing, and analyzing the appraisal data, thereby improving the appraisal process and reducing the likelihood of inconsistent appraisal values. A prototype of the proposed EAS has been developed to demonstrate the applicability and features of the new system.

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## ***Item 2***

### **A Probabilistic Analysis of the Frequency of Bridge Collapses due to Vessel Impact**

*UNIVERSITY OF TEXAS AT AUSTIN. CENTER FOR TRANSPORTATION RESEARCH (CTR)  
CTR 4650-1 • 2006*

The collapse of the Queen Isabella Causeway in 2001, caused by a vessel collision, sent an alarming message to the state of Texas that vessel impact on bridges is a serious issue and that the possibility of such accidents needs to be considered in the design and evaluation of any bridge spanning a waterway. The Texas Department of Transportation (TxDOT) funded this research project at The University of Texas at Austin seeking to re-evaluate the current vessel collision calculations (both on the load and resistance side), create a database of vessel traffic in the state of Texas, and design a stand-alone computer program to perform the vessel collision risk calculations.

Currently the 2004 American Association of State Highway and Transportation Officials (AASHTO) Load and Resistance Factor Design (LRFD) design code regulates vessel collision analysis. Bridges are designed to meet a specified annual frequency of collapse based on a probabilistic model. While the basis for the computation of the probability of aberrancy and geometric probability are well justified, little research has been performed on barge to pier collisions to support the AASHTO LRFD method for probability of collapse. Using two models, one that determines the force imparted on a bridge pier by a vessel and another that determines what the ultimate lateral strength of a pier is, an enhanced method for determining probability of collapse was developed.

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## **Item 3**

### **Design of Retrofit Vehicular Barriers Using Mechanical Anchors**

*UNIVERSITY OF TEXAS AT AUSTIN. CENTER FOR TRANSPORTATION RESEARCH (CTR)  
CTR 4823-CT-1 • 2007*

Retrofit barriers can be used to replace highway barriers damaged by vehicular collisions. The purpose of TxDOT Research Project 0-4823 is to develop retrofit designs of current TxDOT highway barriers using mechanical anchors. The retrofit designs should meet the TxDOT performance criteria for retrofit barriers as well as NCHRP Report 350 requirements.

Investigators for this project developed an impact pendulum test setup to represent a surrogate vehicle for Test Level 3 of NCHRP Report 350. They also developed retrofit designs for T203 and T501 barriers using mechanical anchors. Using the impact pendulum, tests were conducted on stand-alone cast-in-place and retrofit T203 and T501 barrier specimens. A quasi-static test was also conducted on the retrofit T203 barrier design. These designs met TxDOT performance criteria and NCHRP Report 350 requirements for Test Level-3.

Finite element models of the cast-in-place and retrofit T203 and T501 barrier specimens were developed using LS-DYNA, and they were validated using the pendulum impact tests. Using those models, vehicular crash simulations were conducted to NCHRP Report 350 Test Level-3 and Test Level-4 standards to predict the performance and robustness of the retrofit T203 and T501 barrier designs when subjected to large impact forces.

The retrofit barriers with mechanical anchors, while slightly inferior in performance to the cast-in-place barriers, did meet AASHTO and TxDOT requirements for new construction and are suitable for implementation by TxDOT.

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## **Item 4**

### **Effectiveness of the Combined Transportation and Utility Construction Strategy**

*UNIVERSITY OF TEXAS AT AUSTIN. CENTER FOR TRANSPORTATION RESEARCH (CTR)  
CTR 4997-1 • 2007*

Because more and more highway projects are located in congested metro settings, more projects require adjacent utilities be adjusted to make room for new or expanded highway facilities. The adjustment of utilities prior to highway construction is a challenging operation from many perspectives. Because of its complexity, managing utility adjustment is fraught with risk and uncertainty. One major strategic approach that has emerged over the past 15 years is to combine utility adjustment work with the highway contractor's scope of work. Because it allows for better coordination between involved parties, this approach theoretically eliminates or reduces some of the associated complications and risks and is referred to in this research as the Combined Transportation and Utility Construction (CTUC) approach. Given the complications of the issues involved, there is a significant need for a decision support tool to provide guidance to TxDOT and utility decision makers as to when the CTUC approach should be applied. This research aims to document CTUC advantages-disadvantages trade-offs, to better understand those project circumstances with which the benefits of CTUC can be leveraged, and to provide a decision support tool to assist both TxDOT and utility decision makers in identifying significant issues to be addressed for a given utility adjustment. Related topics such as how CTUC affects the actual project performance are also addressed.

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## **Item 5**

### **Conversion of Volunteer- Collected GPS Diary Data into Travel Time Performance Measures: Algorithm for Extracting Travel Diary Data from GPS Streams and GPS-TDG Software Design**

*UNIVERSITY OF TEXAS AT AUSTIN. CENTER FOR TRANSPORTATION RESEARCH (CTR)*

*CTR 5176-2 • 2005*

Conventional travel-survey methodologies require the collection of detailed activity-travel information, which imposes a significant burden on respondents, thereby adversely impacting the quality and quantity of data obtained. Advances in global positioning system (GPS) technology have provided transportation planners with an alternative and powerful tool for more accurate travel-data collection with minimal user burden. The data recorded by GPS devices, however, do not directly yield travel information; the navigational streams recorded by GPS devices have to be processed and the travel patterns derived from them. The focus of this research project is to develop software to automate the processing of raw GPS data and to generate outputs of activity-travel patterns in the conventional travel-diary format. The software will identify trips and characterize them by several attributes, including trip-end locations, trip purpose, time of day, distance, and speed. Within the overall focus of the research, this report describes the algorithm developed for the detection and characterization of trips from GPS navigational streams. The software design details are also presented.

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## **Item 6**

### **Conversion of Volunteer- Collected GPS Diary Data into Travel Time Performance Measures: Final Report**

*UNIVERSITY OF TEXAS AT AUSTIN. CENTER FOR TRANSPORTATION RESEARCH (CTR)*

*CTR 5176-3 • 2006*

Conventional travel-survey methodologies require the collection of detailed activity-travel information, which imposes a significant burden on respondents, thereby adversely impacting the quality and quantity of data obtained. Advances in the global positioning system (GPS) technology have provided transportation planners with an alternative and powerful tool for more accurate travel-data collection with minimal user burden. The data recorded by GPS devices, however, do not directly yield travel information; the navigational streams recorded by GPS devices have to be processed and the travel patterns derived from them. This research project developed prototype software to automate the processing of raw GPS data and to generate outputs of activity-travel patterns in the conventional travel-diary format. The software identifies trips and characterizes them by several attributes, including trip-end locations, trip purpose, time of day, distance, and speed. This final report documents the entire research performed as part of this project. Specifically, we present the conceptual overview of the software, the detailed algorithm for extracting travel diaries, the software implementation procedures, and the testing and validation of the software.

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## *Item 7*

### **An Investigation of the Tensile Strength of Prestressed AASHTO Type IV Girders at Release**

UNIVERSITY OF TEXAS AT AUSTIN. CENTER FOR TRANSPORTATION RESEARCH (CTR)

CTR 5197-2 • 2007

The intention of the research presented in this report was to determine the source of flexural cracking of AASHTO Type IV girders. Cracking was observed in the end regions of the beams at the time of prestress transfer. Seven full-scale AASHTO Type IV beam specimens were fabricated and tested. Strains were measured in the end regions of each beam; resulting in 14 separate tests. Beams with an extreme fiber tensile stress greater than 4.5 f 'c exhibited cracking at the time of release. In addition to the full-scale beam tests, an extensive amount of material data was collected through testing and literature review. Split cylinder and modulus of rupture tests did not accurately represent the tensile strength of concrete in a Type IV beam specimen. Limiting the extreme fiber tensile to 4 c f 'c will prevent cracking at release.

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## *Item 8*

### **Freight Performance Measures Guide**

UNIVERSITY OF TEXAS AT AUSTIN. CENTER FOR TRANSPORTATION RESEARCH (CTR)

CTR 5410-P3 • 2007

To help guide the development of FPM strategies, this brief synopsis first demonstrates that the time is right for transportation agencies to start considering freight performance measures. A national emphasis and implementation of FPM has paved the way for the usage of freight indicators, which can provide useful information to transportation planners given the charge to implement FPM. In addition, this overview introduces the areas that will most likely affect the development of FPM in Texas.

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## *Item 9*

### **Capabilities/Limitations and Recommendations for Transporting TxDOT's Heavy-Duty Off-Road Construction and Maintenance Equipment Fleet**

*TEXAS TECH UNIVERSITY (TECHMRT)*

*TechMRT 4575-1 • 2007*

This research study reviewed TxDOT's Off-road, heavy-duty construction and maintenance equipment transport requirements and assessed TxDOT's current equipment transport knowledge base and practices. We used web-based surveys to identify the load-trailer-truck combinations used in the Districts and to forecast the types of off-road equipment to remain in TxDOT's fleet over the next five years. We developed and submitted a survey questionnaire to a statistically-representative sample of TxDOT relative to equipment transport. Employees ascribe importance to all aspects of the equipment transport process, and their overall knowledge of equipment transport is high. In particular, knowledge and capabilities relative to equipment transport and procedures, trailer hitches and hitching systems, and load securement, chains and tie-downs, and equipment transport safety is very strong. However, equipment transport knowledge and capabilities relative to load distribution concepts and practices, training, and compliance with laws and regulations are not as strong. Follow-up interviews with Division and District maintenance personnel confirmed the themes identified in the questionnaire. By far, the one thing that field personnel stated would most improve equipment transport in TxDOT was training. They want more training, better training, and refresher training. Second to training, respondents stated that they needed newer, better equipment haul trailers and trucks.

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## *Item 10*

### **Further Development for Binder Quality Assurance Program**

TEXAS TECH UNIVERSITY (TECHMRT)

TechMRT 4681-1 • 2007

The current TxDOT binder QC/QA system uses two asphalt binder supplier categories; suppliers who have an approved quality control plan (QCP) on file with TxDOT and those who do not. Suppliers who maintain a current QCP can obtain approval to supply binders either on a monthly- or a quantity-basis, while for others, each load of asphalt must be tested for specification compliance. Recently, a few binder supplier-grade combinations have experienced higher failure rates than in the past. Many TxDOT practitioners indicate an approved binder source does not always provide acceptable quality binders, and that a more robust QC/QA system is needed to ensure the supply of binders that both meet specifications and maintain a consistent level of quality. This research project was launched to develop a quality management system that utilizes the latest QC/QA principles by sharing the quality management burden between the supplier and the client (TxDOT). First, TechMRT researchers undertook a constructability review of binder quality for TxDOT operations. TxDOT districts, along with binder suppliers, and several contractors were interviewed to solicit their viewpoints on the existing binder quality management program, binder usage, quality problems and possible solutions. The Researchers also performed a comprehensive statistical analysis of binder test data. Three years of TxDOT test results (QA data) and several years of supplier (QC) data were analyzed using several statistical quality control methodologies. A sound binder supply quality management scheme requires the cooperation between binder suppliers and TxDOT. The burden of producing an asphalt binder that both meets specifications and maintains a consistent level of quality lies primarily with the supplier. TxDOT has the responsibility to provide clear and specific guidelines for suppliers to follow, and to conduct random quality assurance tests. Based on this premise, the research product titled A Framework for TxDOT Binder Quality Management has been developed.

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## *Item 11*

### **Constructability Review of Surface Treatments Constructed on Base Courses**

TEXAS TECH UNIVERSITY (TECHMRT)

TechMRT 5169-1 • 2007

It is common practice for TxDOT to construct surface treatments (1-, 2- or 3- course) directly over base courses. There are also many other highway agencies, both in the United States and in other countries that use surface treatments directly over base. The decision to use surface treatments is based on a number of factors including low life-cycle cost, low initial construction cost, inexpensive maintenance, historically favorable experience, availability of experienced contractors, and availability of sound local materials. These surface treatments have a significant influence on pavement performance. Problems associated with surface treatments include flushing/bleeding in the wearing courses, debonding at the interface with the base layer, poor ride quality, loss of aggregate (raveling) and ineffective sealing of the pavement. When a surface treatment is used as an underseal, its failure may lead to accelerated failure of the overlying surface layer. A formal statewide constructability review of surface treatments over base has not been conducted either by TxDOT or by other state highway agencies in the recent past. Recently concluded TxDOT research project 0-1787: Seal Coat Constructability Review, resulted in a number of operational changes in seal coat practices including updates to the specifications and the seal coat inspector training manual. A similar study on surface treatments placed on prepared base can lead to surface treatment construction operations becoming more effective and creating longer lasting and higher quality pavements. The objective of this research project was to conduct a comprehensive constructability review of surface treatment as practiced by TxDOT districts and to identify best practices. A comprehensive survey of existing surface treatment practices was conducted, both by interviewing highway professionals and by visiting construction projects. Interviews were conducted with TxDOT district personnel, contractors, material suppliers and other State DOT personnel. Information collected from the constructability review was used to develop a district training workshop. The workshop was delivered by the researchers at eight regional locations, and each workshop was attended by TxDOT professionals from at least 3 districts. This interim report highlights the key findings from the constructability review.

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## ***Item 12***

### **Case Study Analysis of Mid-Size Urban/Rural Area Toll Road Options - Year 2 Report**

*TEXAS A&M UNIVERSITY. TEXAS TRANSPORTATION INSTITUTE (TTI)*

*TTI 4055-01-3 • 2007*

This report documents the second year of the research implementation project 5-4055-01, Case Study Analysis of Urban/Rural Toll Road Options. The primary purpose of the research implementation project is to transfer research findings and best practices to the toll development process for Tyler Loop 49, given the unique nature of the project as a rural, low-volume toll facility. The secondary purpose of the effort is to document the processes used in evaluating and developing Loop 49 as a toll project so that other districts in the Texas Department of Transportation (TxDOT) can draw from lessons learned from Tyler's experiences.

During the second year of the implementation project the research team focused on technology transfer associated with Loop 49 public outreach and documentation of the Regional Mobility Authority (RMA) formation and environmental reevaluation process. In addition, the team formulated lessons learned from the Loop 49 experience into a one-day workshop to facilitate the sharing of information with other TxDOT district offices. These lessons drawn from the Tyler experience can be used in the development of other tolling projects in Texas, particularly in a smaller urban or rural setting. The report documents best practices that have been learned so far and summarizes them at the close of the report.

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## ***Item 13***

### **Establish Guidance for Soils Properties-Based Prediction of Meander Migration Rate**

*TEXAS A&M UNIVERSITY. TEXAS TRANSPORTATION INSTITUTE (TTI)*

*TTI 4378-1 • 2007*

Meander migration costs the Texas Department of Transportation (TxDOT) millions of dollars to protect affected bridges and highway embankments, as illustrated by the case histories accumulated by this research team in phase 1 of this work. These histories include the SH 105 bridge over the Brazos River, the US 90 bridge over the Nueces River, the SH 105 bridge over the Trinity River, the US 59 bridge over the Guadalupe River, and the SH 80 bridge over the Guadalupe River. One recent meander migration threat (FM 787 at the Trinity River) required a \$300,000 emergency countermeasure and a \$5.6 million replacement bridge.

Several solutions for predicting the movement of meanders have been proposed in the past. This report shows these solutions to be unreliable. The solution outlined in this report considers soil erodibility as an independent parameter influencing meander migration. Other conventional parameters such as flow velocity, meander radius of curvature, river width, and others are part of the proposed solution. Through a combination of well-instrumented large-scale flume tests, quality numerical simulations, and fundamental laboratory erosion tests, a simple and reliable solution is developed.

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## **Item 14**

### **System for the Evaluation of Moisture Damage Using Fundamental Material Properties**

TEXAS A&M UNIVERSITY. TEXAS TRANSPORTATION INSTITUTE (TTI)

TTI 4524-1 • 2007

Moisture damage in asphalt mixtures can occur within the mastic (cohesive fracture) or at the aggregate-mastic interface (adhesive fracture or failure). Whether or not a cohesive or adhesive failure occurs depends on the nature of the mastic and the relative thickness of the mastic. This report is part of a project that focused on fundamental understanding of the moisture damage process by carefully considering the micro-mechanisms that influence the adhesive interface between aggregate and asphalt and the cohesive strength and durability of the mastic. The first phase of the project focused on the validation of the surface energy measurements and the dynamic mechanical analysis (DMA) of mastics through the evaluation of the moisture susceptibility of materials with known field performance. The results of the first phase of this project were documented in TxDOT report 0-4524-2. The second phase of the project, which is documented in this report, focused on the evaluation of the surface energy and moisture susceptibility of wide combinations of aggregates and asphalts. The analysis approach of moisture damage that was used for the evaluation of mastics in phase 1 was extended in phase 2 to analyze full asphalt mixtures. Also, the influence of binder modifications made by the manufacturer, aging of the asphalt binder, addition of liquid anti-strip agents to the asphalt binder, and changing of the pH of the water at the asphalt-aggregate interface on surface energy and moisture susceptibility was investigated. The energy ratio ER parameter developed under NCHRP 9-37 was used as a screening parameter for evaluating the compatibility of asphalt binders and aggregates in terms of the resistance to moisture damage. The ER combines the cohesive and adhesive bond energies into a single term. A comprehensive system was developed for the evaluation of moisture damage. The first step in the system is to examine the compatibility of an asphalt-aggregate combination by evaluating the surface energy components and the ER. The second step in the system is to conduct DMA of a mastic specimen made of the asphalt binder and fine aggregate portion of the mix. If the DMA results are favorable, the third step, which is the evaluation of the moisture susceptibility of the full mixture, is conducted in order to examine the suitability of mixture design and volumetrics in resisting moisture damage.

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## **Item 15**

### **Evaluation of Ride Specification Based on Dynamic Load Measurements from Instrumented Truck**

TEXAS A&M UNIVERSITY. TEXAS TRANSPORTATION INSTITUTE (TTI)

TTI 4863-2 • 2007

The Texas Department of Transportation is implementing a ride specification that uses profile data collected with inertial profilers for acceptance testing of the finished surface. This specification is based primarily on ride quality criteria. The objective of the present project is to establish whether the current specification permits frequency components of surface profile to pass that are potentially detrimental to pavement life based on the induced dynamic loading. To carry out this objective, researchers in this project conducted measurements of surface profiles and vehicle dynamic loads on recently completed TxDOT paving projects. For these tests, researchers instrumented a truck with sensors for measurement of dynamic loads and put together an inertial profiling system for measurement of surface profiles. This research report documents the instrumentation and test programs carried out by researchers as well as the analyses of the test data and the findings thereof.

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## **Item 16**

### **Ramp Reversal Projects: Guidelines for Successful Implementation**

TEXAS A&M UNIVERSITY. TEXAS TRANSPORTATION INSTITUTE (TTI)

TTI 5105-1 • 2007

Many urban freeways in Texas experience congested traffic conditions during peak periods. Freeway system expansion is very expensive and time-consuming. Consequently, alternatives other than construction of new facilities are desired. The Texas Department of Transportation has been implementing comparatively inexpensive methods to improve existing freeways such as grade-separated (I.E., braided) ramps and modified ramp configurations via X-ramp interchanges and ramp reversals.

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## **Item 17**

### **Guidelines for Evaluation of Existing Pavements for HMA Overlay**

TEXAS A&M UNIVERSITY. TEXAS TRANSPORTATION INSTITUTE (TTI)

TTI 5123-2 • 2007

This report discusses the application of nondestructive test (NDT) tools for evaluating existing pavements for hot-mix asphalt (HMA) overlays. The NDT tools covered in this report include ground penetrating radar (GPR), falling weight deflectometer (FWD), and rolling dynamic deflectometer (RDD). The GPR is used to estimate the thickness of existing pavement layers, and identify section breaks and potential trapped moisture problems. The FWD is used to evaluate the structural capacity of the existing pavement, and the in-situ layer modulus can be back-calculated from FWD data. In addition, for existing concrete pavements, the FWD can be used to determine load transfer efficiency (LTE) at joints and/or cracks.

The application of the RDD to evaluate existing concrete pavements is also discussed. The major advantage the RDD has over other discrete NDT devices (e.g., FWD) is that it provides continuous deflection profiles of the pavement, which can be used to identify joints with poor LTE. However, no software is available to automatically interpret the RDD data. After reviewing RDD data collected on several different concrete pavements, the researchers developed some basic interpretation criteria for the RDD data. Based on the measured RDD deflection data and the monitored field reflective cracking performance on IH20, threshold values for RDD Sensor 1 deflection and the differential deflection between Sensors 1 and 3 are recommended. If either the Sensor 1 deflection or the differential deflection between Sensors 1 and 3 is larger than the proposed thresholds, the corresponding joint and/or cracks is recommended for pretreatment before placing a new HMA overlay. Finally, general guidelines for evaluating existing pavements for HMA overlays are proposed in this report.

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## ***Item 18***

### **Development of Guidelines for Data Access for Texas Traffic Management Centers**

*TEXAS A&M UNIVERSITY. TEXAS TRANSPORTATION INSTITUTE (TTI)*

*TTI 5213-1 • 2007*

This document provides guidelines and recommended action items for Texas Department of Transportation in the pursuit of the most appropriate way to handle the administrative concerns of ownership of traffic management center (TMC) information, revenue opportunities associated with the data, and contractual agreements among agencies involved in the collection and dissemination of traffic management center data.

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## ***Item 19***

### **Concepts for Managing Freeway Operations During Weather Events**

*TEXAS A&M UNIVERSITY. TEXAS TRANSPORTATION INSTITUTE (TTI)*

*TTI 5278-1 • 2007*

The goal of this research was to help TxDOT develop a structured, systematic approach for managing traffic during weather events. Our focus in this research project was on common weather events – such as fog, high winds, heavy rains, and snow and ice storms – that impact traffic operations day-to-day. First, we conducted a survey of selected Texas Department of Transportation (TxDOT) districts to determine what information traffic management center (TMC) operators need to manage traffic operations during weather events. Through a review of the existing literature, we assessed systems and technologies that other states have deployed to manage traffic during weather-related events. We reviewed the current state of weather-related detection and monitoring technologies. Using historical traffic detector and weather information, we assessed the magnitude of the impact of different weather events on traffic operations. Using all this information, we developed concepts of operations for how TMC operators should respond to different types of weather-related events, including limited visibility conditions, ponding and flash flooding, high winds, severe thunderstorms, tornados, and winter storms. We developed a catalog of advisory, control, and treatment strategies (or ACTS) that operators could use to manage traffic operations during weather events. Specific criteria outline when TxDOT TMC operators should implement different types of responses. We proposed messages that TxDOT TMC operators can use on dynamic message signs (DMSs) to achieve different advisory and control strategies for different types of weather events. Finally, we provided a framework TxDOT can use to integrate weather information from the National Weather Service and other private weather providers into its TMC operations software.

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## ***Item 20***

### **Regional Transit Coordination**

*TEXAS A&M UNIVERSITY. TEXAS TRANSPORTATION INSTITUTE (TTI)*

*TTI 5345-P2 • 2007*

This project is intended to develop recommendations, methodologies, and guidelines for regional transit coordination in Texas.

The research focuses on three topics:  
transit coordination guidelines,  
analysis of Medical Transportation Program (MTP) service data, and  
analysis of travel demand along intercity corridors.

Full-text PDF of this report is available for free download from

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## ***Item 21***

### **Asset Management Literature Review and Potential Applications of Simulation, Optimization, and Decision Analysis Techniques for Right-of-Way and Transportation Planning and Programming**

*TEXAS A&M UNIVERSITY. TEXAS TRANSPORTATION INSTITUTE (TTI)*

*TTI 5534-1 • 2007*

This report documents the work performed during phase one of Project 0-5534, “Asset Management—Texas Style.” The overall purpose of the research is to develop state-of-the-practice asset management methodologies for the Texas Department of Transportation (TxDOT). These methodologies will support current decision-making processes for allocating funds to the different asset categories managed by TxDOT. During the first year of this project, the specific research focus area was resource allocation decisions regarding advance acquisition of right-of-way and the construction of new highway capacity facilities. Simulation, optimization, and decision analysis methodologies were explored for examining the trade-offs between using funds for these two alternative purposes.

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## *Item 22*

### **TexSys: Guide for Selecting HMA for Texas Flexible Pavements**

UNIVERSITY OF TEXAS AT EL PASO (UTEP)

UTEP 4824-P1 • 2007

The guide for selecting mixtures for flexible pavements will provide the designers with recommendations for selecting mix types based on factors such as traffic, speed and expected performance. The guide covers mixes such as regular dense mixes Item 340 and 341, permeable friction course (PFC) Item 342, performance design mixes Item 344 and stone matrix asphalt mixes (SMA) Item 346.

This guide is intended to provide general recommendations based on the Texas experience. This guide was developed based on the survey conducted under the project 0-4824 (Guidelines for Selecting Asphalt Mixtures and Evaluation of Polymer-Modified Mixes). In the end, an expert system (<http://pavements.ce.utexas.edu/TexSys>) has been developed that can be used for selecting mix types. The purpose of the expert system is to provide guidance on selection of HMA types for different applications after HMA thickness has been determined from FPS 19 or other available flexible pavement design guides.

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