

TEXAS TRANSPORTATION Researcher

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Making the Grade

Tomorrow's Transportation System

Sustainability Checklist

- ☒ Environmental Protection
- ☒ Multimodalism
- ☒ Energy Efficiency
- ☒ Safe Communities
- ☒ Social Equity
- ☒ Economic Vitality



ON THE COVER: Sustainability guides the more traditional transportation concepts of design, construction and usability with a vision of creating a longer-lasting, more environmentally responsible and efficient transportation system.



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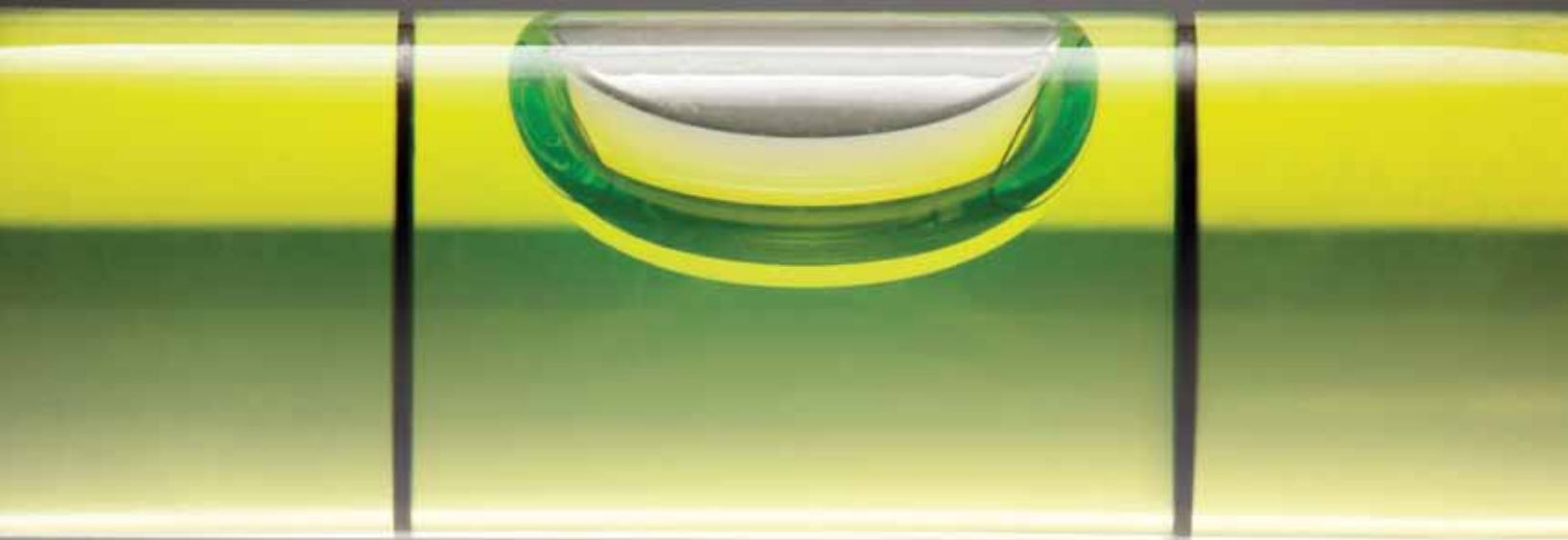
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Making the Most of a Fixer-Upper

Transportation and Sustainability in the 21st Century



Nothing lasts forever.

For researchers in transportation, that particular cliché presents a challenge. If nothing lasts forever, how can we build a better, more efficient, longer-lasting network? Bang for the buck. More from less. As stakeholders in transportation, you no doubt know these phrases by heart.

The key to sustainability in transportation is *balance*. We have to maintain the system we've inherited by getting the most out of it, while also planning improvements that meet future needs: for example, population growth, urban development and market-driven changes in how we get goods to store shelves.

In this issue of the *Texas Transportation Researcher*, we feature a recent project conducted for the National Cooperative Highway Research Program. Texas Transportation Institute (TTI) researchers developed *A Guidebook for Sustainability Performance Measurement for Transportation Agencies*, which offers transportation agencies easy-to-use tools for continuously integrating sustainability into current agency policies. The guide encourages the use of performance measures to help tweak improvements to the transportation system over time, thereby extending its life.

Monitoring how we impact the environment is a principle of sustainability. For example, TTI researchers recently assessed the impact of increases in energy-related activities in Texas — from the development of wind farms to increased heavy-truck traffic from oil and gas sites — and developed geodatabases for the Texas Department of Transportation to use in avoiding potential maintenance problems *before* they arise.

Making bicycle and pedestrian travel more feasible is part of creating an environmentally sustainable transportation network, and TTI's recent work in this area is profiled in these pages. Likewise, decreasing traffic congestion, and thereby pollution, is also important, and our research into using global positioning system and Bluetooth devices to monitor traffic flow will help advance that cause (see page 13).

Sometimes the best of intentions to help the environment — like reusing recycled materials — can have unintended consequences. Such is the case with recycled glass used to improve pavement marking retroreflectivity, an essential property for helping keep drivers safe at night. Turns out, arsenic in the recycled glass beads can leach into the water table, causing an environmental hazard. Using equipment

in TTI's Visibility Laboratory, researchers are assessing the scope of this problem for the Federal Highway Administration.

And, last but not least, TTI Assistant Agency Director Steve Roop is currently developing the Freight Shuttle System, a revolutionary, safe and ecologically sustainable way to move freight from point A to point B without needing gasoline, increasing traffic congestion, or adding to roadway maintenance costs. The environmental benefits of this system are profiled here.

Another old saying might be appropriate in summing up the need for sustainability in our transportation network: "It's not having what you want; it's wanting what you have." Research at TTI is making what we have in our transportation system more useful, more attractive and more sustainable. Because nothing lasts — well, you know. ■



by Dennis Christiansen
Agency Director



TTI Executive Associate Agency Director and Chair of the Technical Activities Committee Katie Turnbull; and research team members Kay Fitzpatrick, Susan T. Chrysler, Vichika Iragavarapu and Eun Sug Park.

The Texas Transportation Institute (TTI) was well represented at the 90th Annual Meeting of the Transportation Research Board (TRB) in Washington, D.C., as dozens of employees presented papers and others were given awards for their work. The meeting was held Jan. 22–26.

A team of TTI researchers — Kay Fitzpatrick, Susan T. Chrysler, Vichika Iragavarapu and Eun Sug Park — received a “best paper” award for their work on crosswalk markings that is influencing national policy decisions on pedestrian crosswalk markings. The foursome received the D. Grant Mickle Award for their paper “Detection Distances to Crosswalk Markings: Transverse, Continental, and Bar Pairs,” which was published in *Transportation Research Record: Journal of the Transportation Research Board*, No. 2250.

“This project was a wonderful example of how colleagues with different

talents can team together and generate an extremely successful product,” Fitzpatrick noted. “We were all willing to improve our portion of the project so that the final product was high quality along with, of course, being usable by the profession.”

Also honored at the TRB Annual Meeting was retired TTI Senior Research Scientist George Dresser, who received the Aviation Group 2012 Francis X. McKelvey Award, named for a long-time researcher in the field of aviation. The award is presented to an individual in recognition of his or her demonstrated commitment to the betterment of the aviation industry.

Dresser retired from TTI in 2004, following a 35-year career, 25 of which he served as manager of the Transportation Planning Program. Early in his career, Dresser worked with the Texas Aeronautics Commission and the Texas Department of Transportation’s Aviation Division, where he developed the methodology for state airport system planning still used today. His work dates back to the early 1970s, when he was instrumental in developing the state’s first *Texas Aeronautical Facilities Plan*.

Dresser helped pioneer the regional planning meeting process, where airport planners visit airports in the system and hold public meetings in the airport communities to discuss the needs of local airports, their role in the community, and how stakeholders can help each other in building and developing the local, regional and state economies. ■



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Left to right: Greg Casto, vice president of AvAirPros; George Dresser, retired TTI senior research scientist; and Peter Mandle, Aviation Group chair from LeighFisher.



Larsen

Graduate Research Assistant Lisa Larsen was named University Transportation Center for Mobility (UTCM) Student of the Year. In part, she was selected based on her performance as a student and her work on a UTCM research project, which considers the equity impacts of a vehicle-miles-traveled

fee. Larsen received the award at TRB’s Annual Meeting in Washington, D.C., at the Council of University Transportation Center’s banquet.



Sperry

Graduate Research Assistant Ben Sperry was named the Outstanding Doctoral Student of the Year of the Southwest Region University Transportation Center. He received the Dr. William J. Harris Award at TRB’s Annual Meeting. Sperry, a graduate of Texas A&M University, conducts research

focused on understanding how existing passenger rail lines contribute to mobility and economic development in intercity corridors.

Alcohol Studies Center Transfers to TTI

The statistics are staggering:

- Thirty-two percent of all fatal crashes involved alcohol-impaired driving (National Highway Traffic Safety Administration [NHTSA], 2007).
- In 2008, there were nearly 12,000 alcohol-impaired fatalities (NHTSA, 2008).
- One in five teens binge drinks. Only 1 in 100 parents believes his or her teen binge drinks (Institute of Medicine, 2003).
- Traffic crashes are the number one killer of teens, and 28 percent of fatal traffic crashes involving teen drivers are alcohol related (NHTSA, 2005, 2006).

These statistics have led Maury Dennis, a retired Texas A&M University professor and a current senior research scientist at the Texas Transportation Institute (TTI), to dedicate his career to educating the public about problems caused by alcohol and drug abuse. Since 1997, Dennis has directed the Center for Alcohol and Drug Education Studies (CADES), which provides education and research related to alcohol and other drugs specifically as they relate to traffic safety.

CADES is also a central resource for collection and distribution of a wide range of literature related to alcohol and drug education. Center personnel engage in research to identify and evaluate approaches to preventing use and abuse of alcohol and other drugs.

CADES remained in Texas A&M's Department of Health and Kinesiology in the College of Education and Human Development after Dennis' retirement from the department in 2006. Since his employment at TTI the following year, Dennis has been successful in acquiring more than \$500,000 in alcohol-related research projects for the center.



Earlier this year, with approval from Texas A&M University System Chancellor John Sharp, administrative responsibility for CADES was transferred to TTI.

"The transfer makes a lot of sense," says Dennis. "I think the center now has a very good chance of expansion because of individual TTI experts in alcohol- and driving-related issues. CADES is a perfect fit for the Institute."

Under Dennis' leadership, CADES developed numerous statewide education programs including the Texas DWI Education Program, the Texas Alcohol Education Program for Minors, and the Texas Drug and Alcohol Driving Awareness Program. CADES programs have been instrumental in teaching students, prosecutors, probation officers, expert trial witnesses and alcohol servers various aspects of alcohol-related issues.

"While the administrative responsibility for CADES has been transferred to TTI, the College of Education and Human Development will continue to be involved with center activities and research," says Dennis. ■



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Looking Out for Pedestrians

Beacons, Pavement Markings Improve Crosswalk Safety

“Many agencies are afraid to try new devices because of the possibility of increased crashes. TTI’s crash study showed that the pedestrian hybrid beacon reduced not only pedestrian crashes but also total crashes, making agencies more willing to try the device and invest money in it. You can depend on the quality of the work done at TTI.”

Mike Cynecki,
retired traffic engineering supervisor
with the City of Phoenix



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It can feel like you’re taking your life into your own hands when you cross some of Texas’ wide, high-speed roads. Sometimes the only thing that alerts drivers to a crosswalk is the thin white lines on the pavement. That’s not much to stand between you and a vehicle hurtling toward you.

Researchers at the Texas Transportation Institute (TTI) are trying to make things easier for both you and the driver coming toward you. Two recent research studies on pedestrian crossings have aimed at making crosswalks safer and more efficient. The first study, involving pedestrian hybrid beacons, evaluated crash data before and after installation of the treatment, while the second study examined the visibility of different types of crosswalk pavement markings.

“Both studies are influencing national standards and making conditions better for pedestrians,” says Kay Fitzpatrick, manager of TTI’s Roadway Design Program, who led the studies.

Pedestrian Hybrid Beacon

In 2009, the pedestrian hybrid beacon was added to the national *Manual on Uniform Traffic Control Devices* (MUTCD), the Federal Highway Administration (FHWA) document that defines standards for installing and maintaining traffic control devices on public roadways. TTI had an integral role in getting the device recognized for the safety it brings to pedestrian crossings.

The path to getting the safety device included in the manual began in the late 1990s when Dr. Richard Nassi, transportation administrator with the City of Tucson (now retired), developed the predecessor of the pedestrian hybrid beacon, the High-Intensity Activated Crosswalk (HAWK) pedestrian beacon. Today’s pedestrian hybrid beacon, like the HAWK treatment, has more than one cue to alert drivers to the presence of the crosswalk. At the crosswalk, the pedestrian pushes a button and activates the beacon. A flashing yellow light and then a steady yellow light warn drivers that they will need to stop. When the light turns red, the pedestrian can safely cross the street.

The effort to gain widespread use of the pedestrian hybrid beacon culminated in an FHWA study to evaluate the safety effectiveness of the device. TTI performed a before-and-after study to determine how the device actually worked in the field.

“We performed a statistical evaluation of crash data from Tucson, typically three years before installation of the treatment and then three years after installation,” says Fitzpatrick. “We found a 29 percent reduction in total crashes and a 69 percent reduction in pedestrian crashes.”



The HAWK treatment was the forerunner of the pedestrian hybrid beacon, which is helping make crosswalks safer for communities across the country.



TTI studied three crosswalk marking treatments: bar pairs (left), continental markings (center) and transverse markings (right). Researchers found that bar pairs and continental markings performed better than transverse markings.

This dramatic reduction in crashes proved to FHWA how important the pedestrian hybrid beacon can be to pedestrian safety. “Many agencies are afraid to try new devices because of the possibility of increased crashes. TTI’s crash study showed that the pedestrian hybrid beacon reduced not only pedestrian crashes but also total crashes, making agencies more willing to try the device and invest money in it. You can depend on the quality of the work done at TTI,” says Mike Cynecki, retired traffic engineering supervisor with the City of Phoenix.

“We’re helping change national policies to make it safer for pedestrians, and also to make it easier for them to cross at clearly marked crosswalks,” says Fitzpatrick.

Crosswalk Markings

A second TTI study evaluated pavement markings at crosswalks for possible inclusion in the next edition of the MUTCD. Research focused on determining the relative daytime and nighttime visibility of crosswalk marking patterns.

“We looked at the types of markings currently in use at crosswalks and narrowed our focus down to the three most common patterns for investigation,” says Fitzpatrick. “We were very fortunate that Texas A&M University allowed us to place temporary pavement markings around campus as part of this study.”

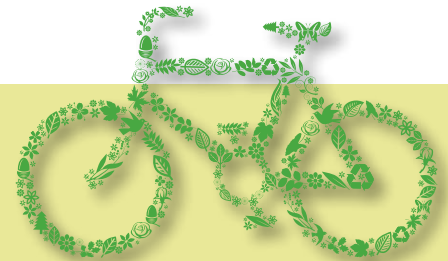
Volunteer drivers set out in TTI’s instrumented vehicle, drove through campus on a predetermined route, and told the accompanying researcher the moment they first saw the crosswalk pavement markings. The route was driven during daytime and nighttime, and clockwise and counterclockwise, to reduce possible bias.

The resulting data allowed the research team to calculate the detection distance for each crosswalk and then determine how each type of treatment performed.

“Bar pairs and continental markings were visible from a longer distance than transverse markings,” says Fitzpatrick. “This is intuitive because they’re wider than transverse markings. What we were interested to see is that bar pairs performed as well as continental markings. Bar pairs use less marking material, and

that can save agencies significantly over several crosswalks.”

The research effort was so successful that a paper about it won the D. Grant Mickle Award for the outstanding paper in operations and maintenance at the Transportation Research Board’s 90th Annual Meeting in January. (See the “TTI at TRB” article on page 4 for more information about this award.) ■



TTI Bikes!

TTI is kicking off a bike-sharing program on the Texas A&M University campus. The effort is designed to demonstrate and promote the benefits of alternative transportation modes — and hopefully inspire others to get on board.

Participants in the program are required to complete a bicycle safety training course, wear helmets, and obey all traffic control devices and regulations. The TTI program includes four bicycles: two each at the CE/TTI Tower and the State Headquarters and Research Building. Participants can check out a bicycle and then return it within 24 hours.

Employees can use the bicycles for interoffice transport and courier service on campus, rather than using an agency or personal vehicle. Bikers benefit

from exercise, an environmentally friendly alternative to driving, and the ability to park closer to buildings (something always welcome on a college campus).

Bike-sharing programs are catching on in many U.S. cities, including Washington, D.C., San Antonio, Austin — and now College Station.



Shawn Turner (left) is leading the TTI Bikes! effort to encourage employees to use bicycles on campus, rather than motor vehicles.

Energy Developments and Our Roadways: Impacts and Strategies



“As a communications tool, the geodatabase is a visual way to predict well permits and well development in any area. When you run the program year to year, you can see ‘waves’ of wells progressing across the screen. If you then show your audience the pavement distress and how that has progressed through the years, it paints a vivid picture of what energy developments in our state are doing to our transportation infrastructure. As a communications tool and predictor of future needs, the geodatabase is the centerpiece of this project.”

Dale Booth, TxDOT project director

In recent years, there has been a boom of energy-related activities in Texas. While these efforts enhance the state’s ability to produce energy reliably, many short- and long-term impacts on the state’s right-of-way and infrastructure are not properly documented.

The Texas Transportation Institute (TTI) recently completed a project to examine some of these impacts.

“The purpose of the project was to measure the impact of the increased level of energy-related activities on the Texas Departments of Transportation’s [TxDOT’s] right-of-way and infrastructure, develop recommendations to reduce and manage TxDOT’s exposure and risk resulting from these activities, and develop recommendations for potential changes to business practices,” says Cesar Quiroga, manager of TTI’s Research and Implementation Office in San Antonio, Texas.

“Pavement was a big part of the project for the researchers,” says TxDOT project director Dale Booth. “The researchers focused their efforts in Abilene, Lubbock and the Dallas-Fort Worth area. And they found quite a bit of distress in those areas related to those industries.”

The researchers focused on the infrastructure impact by heavy trucks and machinery moving in and out of oil and gas well sites, as well as wind farms. Some of the problems observed included the following:

- failures,
- surface ripples,
- tire tracks on unpaved shoulders,
- drainage problems at driveways,
- mud tracking,
- alligator cracking,
- shoulder patches,
- cracked seals and
- loss of surface.

The researchers also collected ground-penetrating radar and falling weight deflectometer data. Considering the increasing level of activity in connection with the Eagle Ford Formation in South Texas, the researchers also met with officials from the Laredo, San Antonio and Yoakum TxDOT districts.



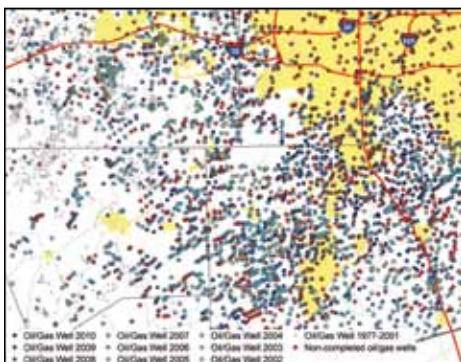
A well fluid station on FM 1585 near Lubbock.

“After we gathered the data, we conducted an evaluation of impacts of energy developments on the transportation infrastructure, including pavement impacts and remaining pavement life, roadside impacts, operational and safety impacts, and economic impacts. We also developed file geodatabases of relevant energy- and transportation-related datasets and provided TxDOT with recommendations on how to alleviate potential problems that may arise with energy-related activities,” says Quiroga.

The researchers used these geodatabases to generate a range of reports mapping the following:

- wind farms in relation to other energy developments as well as transportation datasets;
- wind farms, competitive renewable energy zones and transmission lines;
- pipelines in relation to oil and gas wells;
- permitted (and completed) oil and gas wells over time;
- permitted (but not completed) oil and gas wells;
- oversized/overweight routes in relation to energy developments;
- pavement statistics in relation to energy developments over time; and
- crash locations in relation to energy developments.

Key recommendations at the end of the research included the need to maintain the geodatabase of energy developments to help TxDOT forecast and manage future developments, the need to engage and coordinate with energy developers earlier in the process, and the



This screenshot of the geodatabase of energy developments shows completed versus non-completed wells as of 2010 in the Fort Worth area.



Drainage problems caused by truck traffic are evident on this access road near Abilene.

need to strengthen certain protocols and requirements (e.g., those dealing with triaxial design checks, cross-sectional elements on rural two-lane highways, and driveway permits).

“As energy development continues in our state, especially in the gas-bearing shale formations that have become so busy in the last 10 years, having a statistical basis to show their impacts serves as a springboard for additional funding,” says Booth.

Booth also notes the importance of the geodatabase as a communications and predictor tool for TxDOT.

“As a communications tool, it is a visual way to predict well permits and well development in any area. When you run the program year to year, you can see ‘waves’ of wells progressing across the screen,” says Booth. “If you then show your audience the pavement distress and how that has progressed through the years, it paints a vivid picture of what energy developments in our state are doing to our transportation infrastructure. As a communications tool and predictor of future needs, the geodatabase is the centerpiece of this project.” ■



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The above series of photos shows various types of pavement failures observed during field visits.

A Blueprint for Sustainability

The Big Picture of Transportation Development



Part of the concept of sustainability involves choices: walking, biking, commuting. Making multiple modes work in harmony with environmental needs and economic realities — without losing the human factor from the equation — is the real challenge.

“At this time of fiscal constraint, the New York State Department of Transportation [NYSDOT] must make some tough choices. To guide our decisions, we have incorporated the ‘triple bottom line’ of economic competitiveness, social equity and environmental stewardship into our programming and investment guidance. NCHRP’s *A Guidebook for Sustainability Performance Measurement for Transportation Agencies* provided NYSDOT with a much-needed methodology and comprehensive list to develop our sustainability performance measures.”

Debra Nelson, NYSDOT assistant to the director of operations

Sustainability — a popular, emerging concept — has become a key consideration in the delivery and operation of transportation infrastructure, and at all levels of government. Sustainability deals with meeting human needs in the present and future, while preserving and restoring the environment, fostering community health and vitality, promoting economic development and prosperity, and ensuring equity among population groups and over generations.

“Sustainability is a way of looking at other costs that don’t always get considered in the decision-making process. Thinking about these costs should be broader than just the tangible dollars,” says Tara Ramani, assistant research scientist with the Texas Transportation Institute (TTI). “The question is less ‘how can we implement sustainable transportation?’ but really more ‘how can transportation support the principles of sustainability?’”

Ramani, along with the international team led by Joe Zietsman, head of TTI’s Environment and Air Quality Division, produced a sustainability guidebook that teaches transportation practitioners the principles of sustainability, how to develop goals and objectives based on sustainability, and how to apply performance measures for these goals.

A Guidebook for Sustainability Performance Measurement for Transportation Agencies provides a



"The [guidebook] provided NYSDOT a great starting point for evaluating and selecting measures for the department's Regional Infrastructure Sustainability Elements (RISE) table. The report goes beyond presenting background research; it also provides a methodology (step-by-step process) for transportation agencies to define what sustainability means to them and link this to practical goals, objectives and measures. Overall the report is well written, easy to understand and has great appendices, which offer detailed workshop materials, PowerPoint presentations and a tremendous list of possible measures."

Paul Krekeler, NYSDOT GreenLITES program manager

generally applicable framework that transportation agencies can adapt and use, either in their existing performance measurement programs or as a part of a new sustainability initiative. The guidebook provides a practical approach to understanding sustainability, and identifying and applying sustainability-related performance measures. It discusses linkages to an agency's mission and strategic plan, and the integration of these sustainability measures into other programs and agency business practices. The guidebook also contains a compendium of sustainability performance measures, with a menu of goals, objectives and performance measures that agencies can use as the

basis for their performance measurement applications.

"Working with performance measures can be a daunting task due to the large number of possible measures, extensive data required and complexity involved in applying the measures," Zietsman said. "Moreover, a first step in developing performance measures for sustainability is to understand what sustainability means, and how it applies to transportation networks, systems, facilities, projects and activities at different stages, scales and time frames."

The guidebook incorporates real-world examples from departments of transportation and private industry in both the United States and Europe. It's designed to be flexible so that any division in any agency can apply, refine and modify it based on the specific context for planning, programming, project development, construction, maintenance or

operations. The framework can be used in many different ways, such as to evaluate progress, assess current conditions, forecast the future, make decisions or communicate with stakeholders.

"The guidebook provides a wealth of information and resources for departments of transportation to use to understand the concept of sustainability and apply performance measures for their sustainable transportation goals," Zietsman said.

Published by the National Cooperative Highway Research Program (NCHRP) in November 2011, the guidebook has been well received across the country. Zietsman plans on leading TRB webinars to help transportation officials learn how to use the guidebook.

"This guidebook should be of immediate use to those who are familiar with their own agency's performance measurement program but need to provide useful information to agency leadership on how effectively their organization is meeting sustainability goals," said Lori L. Sundstrom, a senior program officer with TRB. "The examples included illustrate how sustainability can be successfully added to an agency's existing performance measurement system." ■



Encouraging alternate modes, like transit, helps reduce congestion, improve air quality and control infrastructure maintenance costs over the long term.



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Freight Shuttle System Promises the Next Historic Milestone in Freight Movement



The Freight Shuttle System will make freight transportation safer, cleaner and more economical through innovations like raising the system itself up on guideways to take advantage of vertical space in existing rights-of-way.

The current manner of highway freight movement in Texas — for a variety of reasons — is not sustainable:

- Growing volumes of harmful truck emissions foul the air and threaten our health.
- Increasing amounts of cargo on an already-congested network mean costly delays for shippers and higher costs for consumers.
- Declining levels of transportation funding make it increasingly difficult to repair the roadway wear and tear caused by heavy trucks.

“The Freight Shuttle System is going to address three urgent needs we now have in freight movement. It’s going to make it safer, cleaner and more economical.”

Steve Roop, TTI assistant agency director

Most experts agree: the problem has become so severe that nothing short of a game-changing development can make a meaningful difference. Fortunately, that development may be on the horizon.

Picture a system in which transporters powered by electric motors carry trailers from trucks and containers from ships on an elevated track above existing highway right-of-way, safely separated from passenger traffic. Picture a system that produces less air pollution, less traffic congestion, less wear and tear on the roads, and less noise. Clearly, it’s a more sustainable scenario, one that would add an essential new link in the transport chain of a trucking industry suffering from a severe nationwide shortage of drivers.

Sound too good to be true? It’s not. It’s a system currently in development by Freight Shuttle International (FSI), applying technology developed at the Texas Transportation Institute (TTI) by Assistant Agency Director Steve Roop. Financed entirely from private sources and requiring no public funding, the system would provide low-cost, time-certain delivery of freight, and at the same time answer the state’s need for safe and efficient transportation.

The guideways carrying the freight could be built on existing right-of-way that would be leased by the state to FSI. The lease would produce new revenue for the state at a time when available public funding for highways is diminishing.

“The Freight Shuttle System is going to address three urgent needs we now have in freight movement,” Roop says. “It’s going to make it safer, cleaner and more economical.”

The system promises safety benefits by removing thousands of trucks from the highways, thereby reducing the chance of fatal crashes involving those trucks (one in nine traffic fatalities results from a collision involving a large truck). The system will also eliminate the pollution created by the exhaust from those trucks, and be more economical by sharply reducing the cost of moving goods.

“And the benefits don’t stop there,” Roop continues. “The system will create thousands of jobs, it will reduce highway congestion, and it will make millions in new revenue for the state — all without costing taxpayers a single dime.”

To become more sustainable, the freight transportation industry needs a game-changing development. And if plans in Texas come to pass, it’s a whole new game. ■



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Fighting Congestion with Technology: The New Frontier

A technological revolution is underway that has transportation leaders, government officials and even attorneys abuzz with questions and hope about what it could mean in solving a growing and costly concern — congestion.

Since the early 1980s, the Texas Transportation Institute (TTI) has estimated congestion in hundreds of urban regions across the country. Published annually, the resulting *Urban Mobility Report* has been the most reliable source of congestion information available.

Although Institute researchers will continue publishing this report, the way they received their congestion data dramatically changed two years ago.

“It’s clear that the technology is changing dramatically, and there are numerous questions about its use and application. The report is a starting point for FHWA. It’s an exciting time because it’s entirely possible that a newer technology will emerge that will make this data collection method obsolete within a few years.”

Shawn Turner, head of TTI’s Mobility Division

“Up until recently, congestion data were gathered from public sources,” Shawn Turner, head of TTI’s Mobility Division, explains. “Cities and state departments of transportation gathered that information themselves using sporadic

traffic counters, a limited number of roadway sensors and a lot of estimations.”

Those methods seem primitive today compared to what is available from the private sector — real-time data thanks to global positioning system and Bluetooth® devices that are contained within many vehicles, cell phones and mobile devices. Traffic-monitoring companies receive data from the devices and can monitor actual speeds and travel times with ever-increasing accuracy on any major highway across the country — not just in urban areas. The data they collect are sold to auto manufacturers, fleet management companies, vehicle navigation firms and, now on a limited basis, government agencies.

TTI has just completed a report for the Federal Highway Administration (FHWA) that examines this new technology — the growing number of companies that collect the data, how the data are collected, the products used in collecting the data, who’s buying the data and how much the data cost, how the data are being used, and the legal issues sur-

rounding use of private-sector data by the public sector. *Private Sector Data for Performance Management* will act as FHWA’s guide in assisting states and the federal government in using this information to manage/reduce congestion.

“FHWA really wanted to know everything it could about these new, private data sources,” Turner says. “It has been charged with knowing what the congestion problems are and where they are, and recommending where the money should go to help fix it.” Turner adds that the next transportation authorization bill will likely require a much more detailed level of congestion data for performance monitoring.

In addition to TTI, the University of Maryland and attorneys from the law firm of Nossaman, LLP, helped with the report.

“It’s clear that the technology is changing dramatically, and there are numerous questions about its use and application. The report is a starting point for FHWA,” Turner says. “It’s an exciting time because it’s entirely possible that a newer technology will emerge that will make this data collection method obsolete within a few years.” ■



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Looking into the Retroreflective Glass

Could glass beads used in pavement paint be harmful to human health?



Mixed with paint, microscopic glass beads like those seen here help enhance the retroreflective property of pavement markings.

“Glass beads are a very integral part of highway safety. So when considering the risk associated with heavy-metal contents in the beads, decision makers have to balance that with the risk of not having the beads in the paint.”

Bryan Boulanger, assistant professor in Texas A&M University’s Department of Civil Engineering



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Lines, signs and symbols painted on the pavement play a major role in providing drivers with needed information about how to navigate the roadway safely and legally. In order to ensure that drivers can see the markings at night, the paint is mixed with micro-sized glass spheres, making it retroreflect the light from vehicle headlamps to drivers’ eyes. But as this paint–glass bead mixture is applied to the road, degrades over time, and is reapplied, what effect does it have on the people handling it and on our environment? Researchers with the Texas Transportation Institute (TTI) and the Texas A&M University Zachry Department of Civil Engineering (CE) recently began an effort to find an answer to this question.

The microscopic glass beads added to pavement paint most often start out as recycled glass feedstock, which can have high levels of arsenic and other heavy metals.

“In the past, arsenic had been used to purify glass. While we no longer purify glass this way, arsenic is still present in recycled glass that becomes the beads,” says Bryan Boulanger, assistant professor in CE. “Volume-wise, a lot of glass beads go down on the roads, and they are constantly being replaced.”

“I estimate that there are about 80 million pounds of glass beads used each year on U.S. highways,” says Paul Carlson, head of TTI’s Operations and Design Division. With such a large quantity in use, private producers and public officials began to wonder if the beads could leach heavy metals into the ground or affect human health.

So the Federal Highway Administration (FHWA) tasked Boulanger and Carlson to find out the concentrations of heavy metals in the beads. After collecting samples from around the country and participating vendors, the beads were ground down to measure the metal

contents and determine what chemical forms could leach out. Researchers also observed how the glass beads are handled in the workplace to see what risks there might be to the workers. Since the glass beads are approximately the size of small ball bearings, workers could inadvertently consume them through unwashed hands.

The statistics gathered were incorporated into a risk assessment model that will be used by decision makers at all levels of transportation. The model is currently being reviewed for impartiality and refined for accuracy. An analysis of small samples of glass beads shows only a weak relationship between the metal contents and the retroreflectivity level.

“Glass beads are a very integral part of highway safety. So when considering the risk associated with heavy-metal contents in the beads, decision makers have to balance that with the risk of not having the beads in the paint,” says Boulanger. More research is needed to determine the full impact on pavement marking retroreflectivity, if any, as well as to assess how removing metals from the glass beads will affect their efficacy. ■

High Crash Rates Among Hispanics and Military Prompt Study

The Texas Transportation Institute's (TTI's) Center for Transportation Safety (CTS) is beginning to examine the reasons why two distinct population groups — Hispanics and U.S. military personnel — are experiencing above-average crash rates at a time when overall crashes and traffic deaths have been reduced.

Because data show that Hispanics have a disproportionate risk of dying or being injured in traffic crashes, CTS has begun a Latino Traffic Safety Initiative (LTSI) to study this complex problem in Texas and offer countermeasure approaches.

Nationally, the figures are alarming:

- Motor-vehicle crashes are the leading cause of death for Hispanics ages 1–34.
- Hispanic children ages 5–12 are 72 percent more likely to die in a motor-vehicle crash than non-Hispanic children, and they are less likely to wear a restraint device.
- Hispanics are more likely to drive under the influence of alcohol or other drugs, and are more likely to be driving without a valid license.

The LTSI will first examine the Texas crash and fatality data. Do our state's Hispanic figures reflect national statistics? Eventually, the goal of the LTSI is to determine if language barriers, education levels, socio-economic status and other cultural differences play a role in the crashes.

"In just nine years, the Hispanic population is expected to outnumber the non-Hispanic population in Texas," says CTS Senior Research Scientist Katie Womack. "The more we learn about the reasons for the lopsided crash statistics, the better head start we'll have on making travel safer for what will soon be the majority population. Everyone will benefit as a result."

Meanwhile, a March 2011 article in the military publication *Medical Surveillance Monthly Report* caught the attention of CTS researchers. In it, crash data over an 11-year period were examined.

Citing the study, the article, entitled "Motorcycle and Other Motor Vehicle Accident-Related Deaths, U.S. Armed Forces, 1999–2010," states: "Motor vehicle accidents (MVA) are the leading cause of deaths of U.S. military members during peacetime. During the four years prior to operations in Iraq and Afghanistan, one-third of all deaths of service members were caused by MVAs. Since the beginning of those operations, there have been nearly as many deaths of service members due to 'transportation accidents' as war related injuries."

The article reported that more than 4,000 active-duty service members died in crashes during that period, with motorcycle deaths accounting for 24 percent of the fatalities.

"As the article points out, many of the crash victims are young, high-school-educated, single males — characteristics that could be associated with a higher risk of dying in crashes," says Russell Henk, head of TTI's Research and Implementation Division offices in El Paso and San Antonio. "We know motorcycle fatalities are overrepresented among our military service members — one of the key problem areas for which we hope to develop solutions."

More than 4,000 active-duty service members died in crashes between 1999 and 2010, with motorcycle deaths accounting for 24 percent of the fatalities.



Henk, who is also the director of TTI's Teens in the Driver Seat program, says elements of the successful high-school-targeted driver safety program — especially its peer-to-peer approach — could be used with the younger members of the military to address the crash-rate problem.

In exploring the CTS military initiative, contacts have been made with the Corps of Cadets at Texas A&M University, Ft. Hood in Killeen, Ft. Bliss in El Paso and military officials in San Antonio. ■



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Center for Railway Research Established at TTI



Fry

With a focus on improving railway safety and enhancing the performance of the nation's rail system, the Texas A&M Board of Regents has approved establishing the Center for Railway Research

(CRR) as a part of TTI.

"Having this center is a very positive step in our plans to increase the breadth and volume of initiatives that we pursue with our partners and sponsors in railway research. It will certainly position the university and TTI to become a more impactful leader in railway research," says TTI Associate Research Engineer Gary Fry, who will direct the center. Fry is also an associate professor in Texas A&M's Zachry Department of Civil Engineering.

"The Center for Railway Research will also be dedicated to education and information sharing through formal initiatives," Fry said. As part of this, CRR will actively recruit students to enter railway transportation fields.

CRR will focus its research on the physical infrastructure associated with the rail industry, including the mechanical systems of trains, tracks and bridges. Safety and performance through innovation will be priorities for the center, which has a goal of creating longer-lasting and more efficient components and systems. ■

GM Executive Briefs TTI on Emissions-Free, Safe Cars

Envisioning a world with all-electric cars that don't crash, Nady Boules, the director of General Motors' (GM's) Electrical and Controls Integration Lab, met with TTI employees and two Texas A&M University engineering departments Jan. 31 prior to a presentation he gave that evening at the Annenberg Presidential Conference Center at the George Bush Presidential Library.

Boules told those attending his presentation — entitled General Motors Advanced Vehicle and Transportation Research — the cars of the future will be "energized by electricity and hydrogen, powered by internal motors, controlled electronically and should be connected." Boules' 90-minute presentation envisioned a new fleet of cars that are completely safe and have zero emissions.

Boules told his audience that the growing population, especially around major cities, is a threat to life and safety because of automobile air pollution and crashes. Boules anticipates a time when all vehicles will be equipped with a series of

onboard computers that create a 360-degree sensing capability around the vehicle's perimeter. Onboard radar systems, steering cameras and ultrasonic devices will be connected with other vehicles' systems to improve safety and facilitate mobility.

"If we can get to cars that do not crash, we can create radically different, lower-mass, higher-efficiency vehicles. If you have a lightweight shell, energy consumption will be less," he said.

Boules was invited to speak by TTI Agency Director Dennis Christiansen. Both are members of the Intelligent Transportation

Society of America Board of Directors. "Because of the commitment of General Motors in turning science fiction into reality, we have a sense of what our world will look like," Christiansen said of the presentation. "This is a look forward and makes us realize the scope of the dramatic changes we are likely to see in our lifetime." ■



GM's Nady Boules looks into the future as he presents General Motors' advanced vehicle and transportation research at the George Bush Presidential Library.

TTI to Continue Leading Regional Center



Burke

TTI is the recipient of a \$3.5 million federal grant that extends operations of the Southwest Region University Transportation Center (SWUTC) another year. The funding announcement was made in January by U.S. Transportation Secretary Ray LaHood.

As a result of the funding, transportation programs at Texas A&M University, The University of Texas at Austin, Texas Southern University, Louisiana State University and the University of New Orleans will address a wide range of vital transportation research and curriculum issues. SWUTC is one of 10 regional consortia that are part of a nationwide UTC program that includes a total of 121 universities. In all,

\$77 million will be awarded for this year's program, which includes 10 regional UTCs plus 12 Tier 1 centers.

"Winning this grant award is great news for our researchers, faculty members and students," says SWUTC Director Dock Burke, who is also a Texas A&M University System regents fellow and senior research scientist at TTI. "The one-year funding will allow us to enhance SWUTC's education, research and technology-transfer efforts that have been so vital in solving transportation-related problems in our region and educating the professional cadre that will lead the transportation sector of the future." Burke has been involved in SWUTC since its inception in 1988 and has been director since 1992. ■

Voigt, Brydia Recognized at ITS Texas Meeting



Voigt



Brydia

Tony Voigt, program manager for TTI's Research and Implementation Office in Houston, Texas, was elected to a two-year term to the ITS Texas Board of Directors, and TTI Research Scientist Bob Brydia was thanked for his six years of service to the organization during its Annual Meeting in San Marcos Nov. 9–11, 2011.

Houston TranStar and the City of Houston were honored for their technology application of TTI's travel-time monitoring system, Anonymous Wireless Address Matching. The patent-pending technology is a traffic-monitoring system consisting of Bluetooth®-enabled sensors placed

along I-45 from Houston to Dallas and at 50 locations within a 62-square-mile area of West Houston. It allows TranStar to monitor the 200-mile stretch of highway, which is a major evacuation route, and a densely populated arterial network in Houston.

Brydia, who has held numerous positions on the ITS Texas board including president, says the organization's mission is sharing knowledge on industry innovation, technologies and deployments, as well as providing education opportunities for professionals and students that will be the next generation. ■

TxDOT Executive Director Visits TTI

Texas Department of Transportation (TxDOT) Executive Director Phil Wilson, who was appointed to his position last October, made his first official visit to TTI on Feb. 7. He shared information about TxDOT's priorities and heard an update on TTI and some of the research projects underway between the two agencies.



TxDOT's new executive director, Phil Wilson, visited TTI on Feb. 7 to learn more about the Institute's research and partnership with TxDOT.

Wilson discussed three of his immediate focus areas for TxDOT: 1) improvements in project planning and forecasting, including ensuring the agency incorporates up-to-date technology in this area; 2) taking best practices and technologies to the marketplace, especially those that TTI and TxDOT work on together; and 3) effectively telling the Texas transportation story, including explaining the most misunderstood

aspects of transportation and educating the public about how transportation is funded.

In addition to receiving an overview of the Institute, Wilson learned more about recent TxDOT/TTI collaborative initiatives, including the I-35 Mobility and Traveler Information System project, the Freight Shuttle

System, and the Mobility Investment Priorities Study (specified in Rider 42 of the state budget).

"Rider 42 is a key priority project that is going very well," Wilson said. "In every speech I give, I talk about it." He also praised TTI for the agency's leadership role in developing and implementing "innovative ideas to help TxDOT get better."

Other TxDOT staff traveling to TTI with

Wilson were John Barton, deputy executive director and chief engineer; Jerry Haddican, senior state legislative representative; Scott Haywood, chief of staff; Catherine Heil, Bryan District engineer; and Russell Zapalac, chief planning and project officer. Colin Parrish, transportation advisor in the Office of the Governor, also came to TTI with the group. ■

Turnbull Named National Associate



Turnbull

TTI Executive Associate Agency Director Katie Turnbull has been named a national associate of the National Research Council (NRC). The selection is based on her volunteer service

with the Transportation Research Board (TRB).

Turnbull joins 28 others in the 2011 Class of National Associates. The program began in 2001 "to recognize extraordinary contributions made by individuals to the [NRC] through their service on committees and panels of the NRC and the Institute of Medicine without compensation." Turnbull and others were singled out for their past service. The designation means a lifetime membership in the program.

Over her career Turnbull has served in numerous capacities in TRB activities. She served as chair of the following: HOV Systems Committee, the Policy and Organization Group, the Planning and Environment Group and the Planning, Policy, and Process Section. Turnbull is currently the chair of the Technical Activities Council. She has also assisted in planning numerous conferences and has served on project panels.

As part of the honor, Turnbull has access to the Members Center at the National Academy of Sciences Building on Constitution Avenue.

"It is an honor to be recognized for your volunteer activities, and it's really special to be included with the very qualified individuals who make up the 2011 Class of National Associates," she said. ■

Norboge to Author Eno Paper



Norboge

TTI Assistant Transportation Researcher Nick Norboge was selected by the Eno board of directors to author the annual *William P. Eno* paper, to

be presented June 8 at the 2012 Leadership Development Conference in Washington, D.C.

His economic analysis paper will focus on establishing a methodology that develops a process for determining the economic impacts associated with transportation improvements. Norboge will be awarded a \$1,000 stipend. ■

Walden Picked for Leadership Texas



Walden

Melissa Walden, program manager for TTI's Planning and Evaluation Group, has been selected for the 2012 class of Leadership Texas — the longest-running women's leadership enhancement program in the nation.

Walden was chosen following a competitive application process that identifies women from all backgrounds and professions who have demonstrated leadership qualities.

"This is an exciting opportunity for me and TTI," Walden says. "I've known many people who have been fortunate

enough to have graduated from the program. They all come away from the year-long class inspired about ways to help tackle the numerous issues facing our state."

As part of the program, class members interact with state and national experts and travel across Texas for five on-site visits — learning about various topics in those regions by touring major businesses, educational institutions and cultural centers. According to its website, "participants increase their understanding of the challenges and opportunities that leaders face in both the private and public sectors." ■

Rail Conference Examines Safety Issues

Thanks to 180 participants from across the country, organizers with TTI say the 2011 National Highway–Rail Grade-Crossing Safety Training Conference, held in Galveston Nov. 6–9, was a success.

Held every other year, the grade-crossing safety conference examines the current issues in the highway and railroad industries, and serves as an information-sharing and education program. Among the issues discussed during breakout sessions were:

- safety and treatment enhancements at pedestrian crossings;
- shared-use corridors;
- safety plans from various states; and
- human factors safety training program development, or crew resource management training, in the railroad industry.

This year's winner of the Hoy Richards Career Achievement Award was presented posthumously to Anya Carroll, a former civil engineer and research scientist at the U.S. Department of Transportation's Volpe National Transportation Systems Center. Carroll was a tireless leader in the effort to reduce the number of fatalities and injuries as a result of collisions between trains and roadway users. Carroll died in August. ■

New Members Join TTI Advisory Council

TTI recently welcomed four new members to its Advisory Council, a 40-member group of high-level transportation professionals from across Texas and from every sector of the transportation world. The council provides a tremendous service to the Institute by providing advice on transportation issues and trends, and supporting TTI research programs and initiatives. The new members are:

- Bill Allaway, senior advisor to the Texas Taxpayers and Research Association (TTARA) and president of the TTARA Research Foundation in Austin, Texas;
- Gregg Mitchell, president of Trinity Highway Products, LLC, in Dallas, Texas;
- Rene Ramirez, founder and owner of Pathfinder consulting firm, which specializes in government relations, economic development and community outreach, in McAllen, Texas; and
- Phil Wilson, executive director of the Texas Department of Transportation (TxDOT) in Austin, Texas.

"TTI is extremely fortunate to have these distinguished individuals join the Institute's advisory board," says TTI Agency Director Dennis Christiansen. "They each will provide unique knowledge and insight as we move forward to solve critical transportation problems to help promote continued economic development in Texas and the nation." ■



Allaway



Mitchell



Ramirez



Wilson

For more information about these news items or other media inquiries regarding TTI research, please contact Rick Davenport at (979) 862-3763 or r-davenport@tamu.edu.

A&M System Chancellor Visits TTI

Texas A&M University System Chancellor John Sharp visited TTI Jan. 12, telling Institute officials, “TTI is the shining star of the A&M System, so you don’t have to win me over; you just have to educate me.”

Sharp, who became the 14th chancellor of the A&M System on Aug. 15, spent the afternoon learning firsthand about numerous aspects of TTI including its history, accomplishments and ongoing projects. He toured the Visibility Research Laboratory and viewed presentations about TTI’s legislative studies, the I-35 Expansion Project, the Roadside Safety and Physical Security Program, and — in what evoked a lot of enthusiasm from the chancellor — the Institute’s development of the Freight Shuttle System.

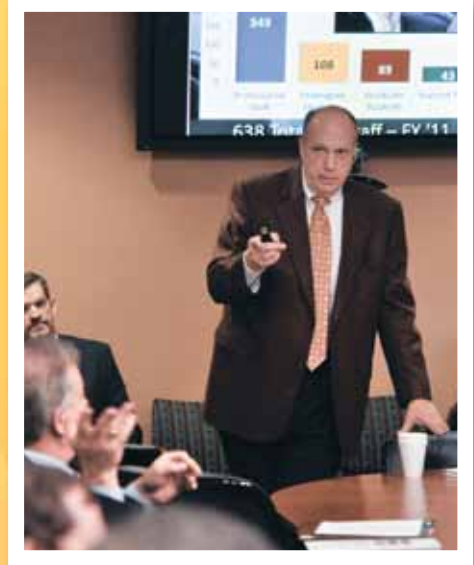
After the afternoon gathering, Sharp admitted to TTI staff that he had a high opinion of the Institute even before the meeting. “This is an amazing place. It’s more impressive than I ever thought it was before.” ■



TTI Assistant Agency Director Steve Roop discusses the Freight Shuttle System, a TTI technical innovation that promises to revolutionize freight movement in Texas.



Chancellor John Sharp (center) tours TTI’s Visibility Research Laboratory as part of his inaugural visit to the Institute.



TTI Agency Director Dennis Christiansen briefs A&M System Chancellor Sharp on TTI.



TxDOT Deputy Director and Chief Engineer John Barton talks with Tom Duffy from Chancellor Sharp’s transition team.



Attending the meeting with Chancellor John Sharp are (from left to right) Tom Duffy, a member of the chancellor’s transition team; TxDOT’s John Barton; Sharp; Dennis Christiansen; Trinity Highway Products President Gregg Mitchell; and Chairman of the TTI Advisory Council David Cain.

TEXAS TRANSPORTATION INSTITUTE

Publications

VIDEO SUMMARY REPORTS

Video summary reports are available on the Texas Department of Transportation's Research and Technology Implementation Office's YouTube channel at YouTube.com/bestpracticesvrsr/.

Automated Flagger Assistance Devices (AFADs), **0-6407**.

Bioretention Techniques for Storm Water Quality, **0-5949**.

Development of Very Thin Overlay Systems, **0-5598**.

Evaluation of Modern Traffic Control Devices to Improve Safety at Rural Intersections, **0-6462**.

Evaluation of Warm Mix Asphalt New Technology, **0-5597**.

FDR (Full-Depth-Reclamation) Performance Based Design, Construction, and Quality Control, **0-6271**.

Improving Driver Awareness of Signals Beyond Vertical Curves, **5-4084**.

Preparing for EPA Effluent Limitation Guidelines, **0-6638**.

Synthesis Study on Transverse Variable Asphalt Shot Rates (TVAR) for Seal Coats, **0-5833**.

Texas Energy Developments and TxDOT Right of Way, **0-6498**.

TECHNICAL REPORTS

Analysis of Roadway Departure Crashes on Two-Lane Rural Roads in Texas, by Dominique Lord, **0-6031-1**, February 7, 2012.

Applying the Systems Engineering Approach to Video Over IP Projects: Workshop, by Gary Thomas, **5-5942-01-1**, January 4, 2012.

Characterization of Exhaust Emissions from Heavy-Duty Diesel Vehicles in the HGB Area — Final Report, by Jeremy Johnson, **0-6237-1**, February 1, 2012.

Determination of Minimum Height and Lateral Design Load for MASH Test Level 4 Bridge Rails, Nauman Sheikh, **9-1002-5**, January 4, 2012.

Development of the Transportation Revenue Estimator and Needs Determination System (TRENDS) Forecasting Model: MPO Sub-models and Maintenance, by David Ellis, **5-6395-01-1**, January 11, 2012.

Evaluating the Impact of Overweight Load Routing on Buried Utility Facilities, by Edgar Kraus, **0-6394-2**, January 20, 2012.

High RAP Mixes Design Methodology with Balanced Performance, by Fujie Zhou, **0-6092-2**, December 6, 2011.

Mobility and Economic Effects of System Investments in Texas: 2010 to 2020, by Tim Lomax, **0-6655-TI-2**, December 8, 2011.

Modern Traffic Control Devices to Improve Safety at Rural Intersections, by Kay Fitzpatrick, **0-6462-1**, December 19, 2011.

Research on Asset Management for Safety and Operations, by Beverly Kuhn, **0-6390-1**, December 5, 2011.

School Traffic Workshop: Dealing with Texas-Sized Problems Around Schools, by Scott Cooner, **5-5470-01-1**, January 20, 2012.

Statewide Implementation of PAVE-IR in the Texas Department of Transportation, by Stephen Sebesta, **5-4577-05-1**, February 27, 2012.

Studies to Determine the Effectiveness of Automated Flagger Assistance Devices and School Crossing Devices, by Melisa Finley, **0-6407-1**, January 13, 2012.

Synthesis of TxDOT Uses of Real-Time Commercial Traffic Data, Dan Middleton, **0-6659-1**, January 6, 2012.

Use of Intelligent Transportation Systems in Rural Work Zones, by Dan Middleton, **0-6427-1**, December 21, 2011.

PROJECT SUMMARY REPORTS AND PRODUCTS

Development of a Statewide Sign Maintenance Program, by Paul Carlson, **0-6408-S**, January 30, 2012.

Improvements to Large and Small Roadside Sign Hardware and Design, by Roger Bligh, **0-6363-S**, December 6, 2011.

Materials and Performance Data for Texas Flexible Pavements and Overlays: Data Collection Plans, by Lubinda Walubita, **0-6658-P1**, December 9, 2011.

Texas Energy Developments and TxDOT Right of Way, by Cesar Quiroga, **0-6498-S**, January 9, 2012.

TxDOT Uses of Real-Time Commercial Traffic Data: Opportunity Matrix, by Dan Middleton, **0-6659-P1**, January 6, 2012.

User's Guide: Pavement Marking Management System Database, by Yunlong Zhang, **0-5548-P1**, January 9, 2012.

TTI PUBLICATIONS

A full catalog of TTI publications and other products is online at <http://tti.tamu.edu/> publications. You can find the publications by searching for either the title or publication number listed here. Most of these publications are available as free downloads in portable document format (PDF).

Printed, bound versions of these reports are also available through the URL above.