Florida Department of Transportation
Intelligent Transportation Systems Program

Annual Report
Fiscal Year 2005-2006

General Content

ITS Program Highlights

Vision Statement

Provide support and expertise in the application of Traffic Engineering principles and practices to improve safety and mobility.

Mission Statement

Provide leadership and serve as a catalyst in becoming the national leader in mobility.

Florida Department of Transportation

605 Suwannee Street, MS90 Tallahassee, FL 32399-0450

JEB BUSH
GOVERNOR

DENVER STUTLER, JR.
SECRETARY

Dear Reader:

The Fiscal Year 2005-2006 has drawn to a close and again, it has been an exciting year for Florida's ITS Program.

Our efforts continued on performance measures. We continued to define and fine tune those measures that would help us quantify the benefits of ITS. This year, the first statewide ITS Customer Satisfaction Survey was performed allowing us valuable insight into what our customers, the traveling public know and think about our ITS deployments.

This year we also got involved in the Federal Highway Administration's Integrated Corridor Monitoring Initiative. Submitting our proposal in May 2006, we hope to be one of the selected pioneer sites, enabling us to manage congestion on a regional basis instead of the traditional individual network emphasis.

We took exciting steps in the development and deployment of our SunGuide Software. With deployments in Jacksonville and Miami, we move closer to deploying the software at all regional transportation management centers in the state of Florida. This year also brought many enhancements to the software and its functionality ensuring a software package capable of meeting our needs.

Progress continues on the ITS wide area network and our efforts in center-to-center communications. Being able to share data between transportation management center, in addition to remote command and control, will be a tremendous asset, particularly during emergency events such as hurricane evacuations.

As we continue to work on these initiatives, and look forward to new initiatives on the horizon, we strive to make sure Florida's ITS Program will continue to be as exciting and progressive as ever.

Elizabeth Birriel

Elizabeth Birriel, PE
Deputy State Traffic Operations Engineer
ITS Program Manager

Florida's Transportation Future

Florida's Growth Fast Facts

Over the past years, transportation demand in Florida has grown at a rapid pace. It is anticipated that this growth will continue to accelerate.

Population

- Florida has the fourth highest population in the nation (based on 2005 estimates).
- By 2011, Florida should pass New York as the third most populous state.
- Florida's population is projected to increase to more than 28 million by 2030, a 39 percent increase from 2005 levels.

Commerce

- Florida ranked first in the nation in job creation, adding about 225,000 new jobs from mid-2004 to mid-2005.
- Florida is the fourth ranked state in the nation for high-tech workers.
- With $81.4 billion in 2004 trade, an 11.7 percent increase over 2003, and its multi-cultural population, Florida is the national leader in international commerce.
- Florida hosts some 2,000 firms from other countries, including 300 regional corporate headquarters.
- Exports originating from Florida totaled $29 billion in 2004, a 16.1 percent increase over 2003.
- Defense-related spending accounts for $44 billion of Florida's gross state product.
- With deposits of $90 billion-plus, over 600 financial institutions—banks, savings and loans, and credit unions—operate in Florida.
- More than 85 million out-of-state tourists came to Florida in 2005, a 7.6 percent increase over 2004, and a 92 percent increase over the past ten years.

Transportation Infrastructure

- Florida land transportation includes four interstate highways, 40,000 lane-miles of state highway, nearly 3,000 miles of rail, and 18 local and regional transit systems.
- The 2005 federal highway bill will bring $10.4 billion to Florida through 2011.
- No place in Florida is more than 90 miles from one or more of 14 deep-water seaports.

Sources: University of Florida, Bureau of Economic and Business Research; American Electronics Association; U.S. Department of Labor; U.S. Census Bureau; Enterprise Florida Inc.; U.S. Department of Commerce, Bureau of Economic Analysis; Florida Office of Economic and Demographic Research; Visit Florida; Travel Industry Association of America

Overall Vision

To ensure that Florida's transportation system meets future demands, the Florida Department of Transportation (FDOT) is working to achieve the following mission:

FDOT's Mission

> *Provide a safe transportation system that ensures the mobility of people and goods, enhances economic prosperity, and preserves the quality of our environment and communities.*

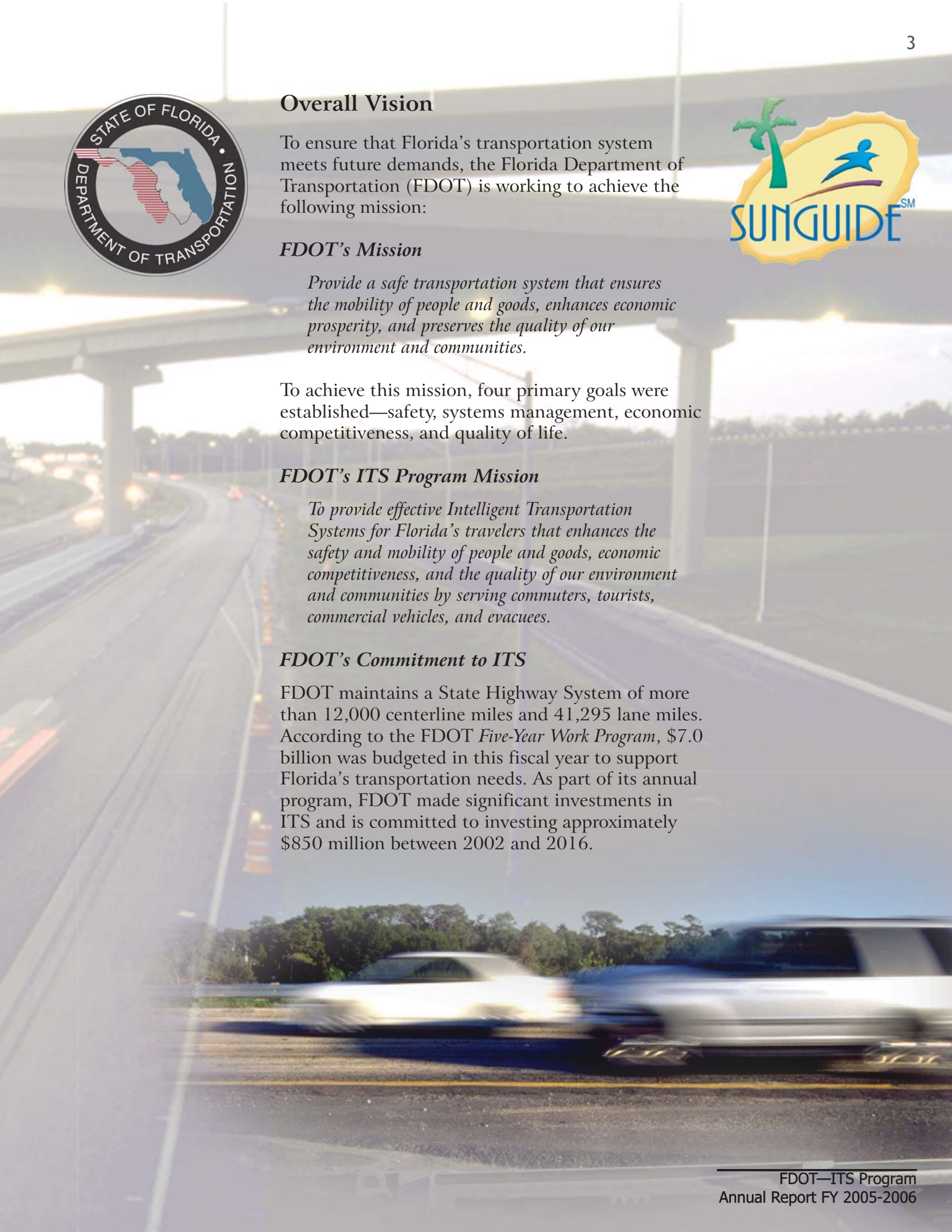
To achieve this mission, four primary goals were established—safety, systems management, economic competitiveness, and quality of life.

FDOT's ITS Program Mission

> *To provide effective Intelligent Transportation Systems for Florida's travelers that enhances the safety and mobility of people and goods, economic competitiveness, and the quality of our environment and communities by serving commuters, tourists, commercial vehicles, and evacuees.*

FDOT's Commitment to ITS

FDOT maintains a State Highway System of more than 12,000 centerline miles and 41,295 lane miles. According to the FDOT *Five-Year Work Program*, $7.0 billion was budgeted in this fiscal year to support Florida's transportation needs. As part of its annual program, FDOT made significant investments in ITS and is committed to investing approximately $850 million between 2002 and 2016.



FDOT's ITS Program Areas

FDOT's Traffic Engineering and Operations Office coordinates and promotes the deployment of ITS throughout Florida. The ITS staff is led by Elizabeth Birriel, P.E., Deputy State Traffic Engineer—ITS Program Manager.

Florida's ITS is organized into the following program areas:

- ITS Management/Deployments—*Gene Glotzbach, P.E.*
- ITS Architecture, Software, and Standards—*Trey Tillander, P.E.*
- Telecommunications Program Management—*Randy Pierce*
- Commercial Vehicle Operations—*Michael Akridge*
- Traffic Systems—*Liang Hsia, P.E.*

ITS Management/Deployments

- Promote ITS deployments on Florida's roadways, develop standards, maintain the *ITS Strategic Plan*, and implement a systems engineering process to support procurement and deployment of ITS
- Deploy advanced traveler information systems and 511
- Provide technical support and assistance to FDOT's District Offices and other partners
- Manage the *Ten-Year ITS Cost Feasible Plan*
- Continue research in the use and deployment of transponders and other communications devices as probes for real-time traffic data and statistics for planning

ITS Architecture, Software, and Standards

- Manage the SunGuide℠ Software System for freeway and incident management, transportation management center interoperability, and data archiving
- Manage the *Statewide ITS Architecture* to promote integrated ITS regions, corridors, and projects
- Promote and coordinate the statewide use of robust, non-proprietary ITS standards
- Coordinate ITS training to enhance the quality and quantity of the state's ITS workforce
- Develop and update the ITS standards and specifications

Telecommunications Program Management

- Guide deployment of a communications backbone to serve ITS deployments on major corridors
- Implement and manage the Statewide ITS Wide Area Network (WAN) to support ITS deployments
- Manage the operations and maintenance program for the statewide ITS telecommunications network to support ITS deployments, motorist aid call boxes, and various ITS research and development initiatives
- Manage all FDOT Federal Communications Commission radio licenses
- Manage the Wireless General Manager Agreement, a resource sharing public/private partnership which places commercial wireless carriers on FDOT rights-of-way, with Lodestar/American Tower
- Develop operations standards and equipment specifications to support District telecommunications initiatives in their ITS, Maintenance, and Traffic Incident Management programs

Commercial Vehicle Operations

- Support deployment of information and communications technologies to serve commercial vehicles
- Guide deployment of the Commercial Vehicle Information Systems and Networks infrastructure and infostructure to assist both state and motor carrier communities
- Continue support of the Cooperative Vehicle Highway Automation System program

Traffic Systems

- Support quality assurance and certification programs
- Support the Traffic Engineering Research Laboratory (TERL) testing and research programs
- Maintain traffic operations and ITS device asset inventory
- Operate TERL for ITS and Communications testing

FDOT's ITS Program Accomplishments

Florida's ITS Program accomplishments are numerous. The following is a list of the Fiscal Year 2005-2006 major accomplishments.

ITS Management/Deployments

- Updated the *Ten-Year ITS Cost Feasible Plan.*
- Promoted 511 traveler information in Florida with continued support to Districts 1 and 2 for the provision of data to the statewide 511 traveler information system.
- Provided support to District Traffic Operations and Work Program staff.
- Developed plans and contractual documents for District 1's Traffic Operations Interstate 75 ITS deployment project and provided post-award support.
- Provided post-award support to District 2's Traffic Operations Office with the Phase IV Interstate 95 North ITS Expansion.
- Developed plans and contractual documents for the Phase V Interstate 295 Projects in Jacksonville.
- Developed an Invitation To Bid for the procurement of ITS field devices and transportation management center equipment to support Districts 2's Phase V Interstate 295 project.
- Provided support to District 3's Traffic Operations with the development of design plans for fiber deployment (Phase I) of the Bay County advanced traffic management system (ATMS).
- Developed 60 percent plans for the Bay County ATMS deployment (Phase II) and will continue to provide support through to 100 percent plans.
- Provided support to District 4 to prepare a formal application to the FHWA to designate Palm Beach and Broward counties as a "Pioneer Site" for Integrated Corridor Management development.
- Developed design plans and contract documents for the Tallahassee dynamic message sign (DMS) deployment as part of the Amber Grant received from the FHWA.
- Completed a review of the state's contraflow routes in preparation for the 2006 hurricane season.
- Completed a draft technical memorandum to provide a tutorial and template for the development of a project *Systems Engineering Management Plan (SEMP)* and conducted training.
- Provided quality assurance support to the Traffic Engineering Research Lab.

- Deployed a license plate reader test and studied other innovative data collection techniques to gain information for future ITS data collection deployments.
- Provided support to the Traffic Engineering and Research Lab for development of an ITS lab to test the operability of ITS equipment, utilizing the new SunGuide software.
- Continue to operate the Change Management Board and processed *Engineering Change Proposal 2.11*.
- Continue to produce the *SunGuide℠ Disseminator* (FDOT's Traffic Engineering and Operation's monthly newsletter).
- Exhibited at ITS America's 16th Annual Meeting and Exposition to showcase FDOT's ITS accomplishments.
- Held the Annual FDOT ITS Working Group Meeting to showcase ITS in the state of Florida.
- Provided support to FDOT's Public Transportation Office for their Resource for Advanced Public Transportation System Program.
- Continued work on developing ITS performance measures and conducted a customer satisfaction survey.

ITS Architecture, Software, and Standards

- Conducted SunGuide Software Release 1.1 Independent Validation and Verification at the District 4 Broward County regional transportation management center (RTMC).
- Deployed the SunGuide Software in the Districts 2 and 6 RTMCs.
- Enhanced the SunGuide Software by developing additional DMS, closed-circuit television, incident management, travel time, center-to-center, and data archive functionality; and deployed these enhancements in the Districts 2, 4, and 6 RTMCs.
- Selected as a Best of ITS finalist at the ITS America 2006 Annual Awards in the Return of Investment category for the SunGuide Software.
- Began development of the SunGuide Software performance measures and Road Rangers modules.
- Began deployment of the SunGuide Software in the Traffic Engineering Research Lab to enhance Independent Verification and Validation of the software and its interfaces.
- Conducted stakeholder workshops in every FDOT District to ensure that the regional and statewide ITS architecture services accurately reflect necessary ITS requirements.

- Updated the Statewide ITS Architecture to enhance the areas of ITS operations, ITS maintenance, security, 511, road closure management, emissions management, parking management, and disaster response and evacuation.
- Received final approval from FHWA on the draft statewide ITS device specifications—making Florida the first state in the nation to adopt comprehensive, standard requirements for the specified ITS devices.
- Completed specification development for General Requirements for ITS Devices (Section 780), Motorist Information Systems (Section 781) Video Equipment (Section 782), Fiber Optic Cable and Interconnect (Section 783), Network Devices (Section 784), and Infrastructure (Section 785).
- Began processing ITS device specifications for Vehicle Detection and Data Collection (Section 786) equipment.
- Incorporated the new ITS device specifications into the *FDOT Workbook of Implemented Modifications to the Standard Specifications for Road and Bridge Construction*.
- Published the first design criteria for ITS devices and systems in the *FDOT Plans Preparation Manual*.
- Coordinated training and outreach for ITS standards.

Telecommunications Program Management

- Completed the Scope of Services for equipment installation of the ITS Wide Area Network (WAN) project connecting the regional transportation management centers (RTMCs) in Districts 4 and 6, Florida's Turnpike Enterprise (south), and the Traffic Engineering Research Lab (TERL).
- Provided streaming video from the *i*Florida project in District 5 to the State Emergency Operations Center (EOC), District 2 RTMC, District 3 EOC, and the TERL, over the Statewide Microwave System.
- Initiated a project to develop a statewide facility management system to enable the Districts to manage their overall telecommunications networks, their field system configuration, and its components.
- Added 11 wireless collocations under the Lodestar/American Tower Wireless General Manager Agreement.
- Funded the design and deployment of permanent emergency backup power generators, for continuity during power outages, at 12 microwave system locations with revenues from the Lodestar/American Tower Agreement.
- Completed the design and kicked off the construction of the Repeater Deployment for the 47 MHz radio system in Districts 2 and 3.

- Developed specifications for District 4 to install 47 MHz radio equipment in the District EOC enabling communications with maintenance crews during times of EOC activation.
- Developed specifications for District 4 to acquire a maintenance contractor for their 47 MHz radio equipment.
- Completed the design and kicked off the construction of a new tower for 47 MHz radio communications at the North Dade Maintenance facility in District 6.
- Maintained operational radio facilities during multiple hurricanes to assist in recovery efforts.
- Managed a research project by Florida International University on the use of cellular telephones as traffic probes to report travel times for ITS use.

Commercial Vehicle Operations

- Continued increase in the number of participants in the Florida Department of Agriculture and Consumer Services' AgPass® pre-clearance program; benefits to Florida's Department of Revenue from AgPass in the collection of almost $4 million in unpaid sales and use taxes since the programs inception in 2002. In 2006, the Department collected $1 million from just one electronic bill of lading.
- Continued increases in utilization of Florida's Commercial Vehicle Help Desk (telephone and Web site)—automated Helpdesk (850-414-4700) use increased 280 percent and Web site (www. FloridaTruckingInfo.com) visits increased 326 percent.
- FDOT's Motor Carrier Compliance Office (MCCO) awarded a contract to Mettler Toledo for a bypass detection system near the weigh stations at Punta Gorda to detect and advise law enforcement officers of trucks bypassing the weigh stations. The project is scheduled for completion September 2006.
- FDOT's MCCO launched a license plate reader (LPR) system at 8 locations throughout the state. The LPR systems are located at weigh-in-motion facilities and static scales, and can be remotely monitored from any authorized Internet access site. The LPR system has been integrated with the Florida Department of Law Enforcement database and is used to search the Florida Crime Information Center (FCIC) and the National Crime Information Center (NCIC) databases to identify stolen equipment (and other such law enforcement warnings) on a real-time basis.
- The Florida Department of Highway Safety and Motor Vehicles (DHSMV) completed Phase 1 of the Electronic Credentialing Project which allows motor carriers to electronically file their International Fuel Tax Agreement (IFTA) tax returns via the Internet.

- The DHSMV signed a letter of intent with the Federal Motor Carrier Safety Administration (FMCSA) for participation in the Federal Performance and Registration Information Systems Management (PRISM) Program. They plan to implement the program in 2007. FMCSA committed $750,000 in funding for the project. The goal of this program is to use state commercial vehicle registration sanctions as an incentive to improve motor carrier safety.

Traffic Systems

- Developed a statewide ITS quality assurance and certification program.
- Managed the Traffic Engineering Research Lab (TERL), including: National Transportation Communications for ITS Protocol (NTCIP) standards development, testing, and training; quality research engineering; approved product list vendor qualification program management; dynamic message sign (DMS) qualification program management; display properties testing for LED traffic signals and DMSs; travel time and delay software development; and ITS product approval process development.
- Setup an expanded lab within TERL for ITS and communications.
- Provided ITS products and systems evaluation for the statewide invitation to bid (ITB).
- Managed traffic engineering and ITS research projects.

Specifications for ITS Devices—

Setting the Standard in Florida

By Gene Glotzbach, FDOT and
Dave Hodges, PBS&J

New statewide specifications for ITS equipment made their debut in 2006 when the State Specifications Office published the *Workbook of Implemented Modifications to the Standard Specifications for Road and Bridge Construction* (the *Workbook*) effective for contract lettings July 1 and thereafter.

This publication of the *Workbook* marked the conclusion of a three-year ITS Program development effort to write standard specifications for the various devices used in deployments throughout the state. "We are the first state in the union to set out requirements for these types of roadway devices," said Chung Tran, ITS Engineer for the Florida Division of the Federal Highway Administration (FHWA). He added that this enables more systems to be interoperable because the devices will conform to a common set of standards.

The benefit to manufacturers is knowing what the FDOT expects in the performance of devices. "We reduced the risk for the manufacturers, and this will lead to better products and cheaper products," Tran said. Price reductions are already evident in a procurement taking place in District 2 for the I-295 project there.

Besides the new ITS section in the *Workbook*, the project generated standard drawings of the devices for publication in the FDOT *Design Standards*. Design criteria for the devices form a new chapter in the FDOT *Plans Preparation Manual*. As technologies advance and District needs change, the specifications will be revised and expanded to keep them current.

The specifications appear in the *Workbook* under Sections 780 to 785, each one grouped according to the general categories of devices it contains.

Specifications

The approval process included the development of FDOT pay item numbers for the devices, and a 30-day industry review period during which the FDOT solicited comments on the specifications. Afterward, the specifications were submitted to the FHWA for approval.

The goal of the specifications project was to prepare basic equipment requirements for the 15 most common ITS devices utilized in today's deployments. Also added were the field cabinet requirements unique to ITS projects and the lowering device apparatus often necessary for pole-mounted cameras and similar installations.

The network devices section covers the communications components that enable a transportation management center (TMC) to collect video and traffic data from the field, assimilate it, and report that information to motorists and incident response personnel. The intent was that the specifications reflect the latest technology while emphasizing product reliability, ease of maintenance, and overall performance. An additional goal was interoperability among ITS deployments. By having Florida's ITS projects developed from a common set of hardware requirements, the TMCs would be better able to share traffic information and seamlessly operate freeway management systems across jurisdictional lines because their equipment would more likely be compatible.

Achieving Consensus

The statewide ITS specifications development process was conducted in accordance with the systems engineering management process. The project relied upon the skills and experience of numerous stakeholders, who played an important role in making certain that the requirements adopted were relevant to District needs. A specifications review and acceptance steering committee was formed, composed of FDOT Central Office ITS staff, FDOT District ITS engineers, and traffic operations personnel. The committee members worked to identify the desired functional requirements for each ITS device. Additional input came from the State Specifications Office, the FDOT Traffic Engineering Research Laboratory (TERL), and various equipment manufacturers.

This steering committee reviewed the existing standards and specifications that FDOT Districts had been using, plus others developed by TERL and transportation agencies in other states. From this information, draft ITS specifications were prepared, then thoroughly reviewed for content, technical accuracy, adherence to industry standards, and applicability to the environmental conditions typical of Florida. The first round of draft specifications were then released to the Districts, Florida's Turnpike Enterprise, device contractors, manufacturers, and others for their comments and additional input. The comments received from these stakeholders were logged in a database, along with notes on the FDOT action taken in response.

The equipment specifications are arranged into the following groups according to device type. They are found in *Workbook* Sections 780 through 785. The proposed Section 786 is currently under review and expected to be published in the January 2007 *Workbook*.

Section 780 General Requirements for Intelligent Transportation System (ITS) Devices

Section 781 Motorist Information Systems
- 781-1 Dynamic Message Sign
- 781-2 Highway Advisory Radio
- 781-3 Road Weather Information System

Section 782 Video Equipment
- 782-1 CCTV Camera
- 782-2 Video Display Equipment

Section 783 Fiber Optic Cable and Interconnect
- 783-1 Fiber Optic Cable
- 783-2 Conduit and Locate System
- 783-3 Pull Box and Splice Box

Section 784 Network Devices
- 784-1 Managed Field Ethernet Switch
- 784-2 Device Server
- 784-3 Digital Video Encoder and Decoder

Section 785 Infrastructure
- 785-1 Grounding & Transient Voltage Surge Suppression
- 785-2 Pole and Lowering Device
- 785-3 Field Cabinet
- 785-4 Equipment Shelter

Section 786 Vehicle Detection & Data Collection
- 786-1 Microwave Vehicle Detection System
- 786-2 Video Vehicle Detection System
- 786-3 Magnetic Traffic Detection System
- 786-4 Acoustic Detection System

As the above sections are finalized and published by the Specifications Office, interested stakeholders can track the documents' progress and print or download draft copies by visiting the Specifications Office Web site at http://www.dot.state.fl.us/specificationsoffice/#FDOT%20Standard%20Specifications.

Specifications

Integrated Corridor Management—

Think Regionally, Act Locally

By Elizabeth Birriel, FDOT and
Tahira Faquir, PBS&J

Palm Beach County and neighboring Broward County are thinking "integrated corridor" when it comes to moving people and goods in a coordinated fashion along one of the most heavily traveled regions in the southern United States.

It was during the decade of the 1990s, when Broward and Palm Beach counties saw their populations rise by 29.3 and 31 percent, respectively, that transportation decision-makers recognized the need to work together. With two communities so interconnected, such resources as transit, passenger rail, traffic systems, and incident management would be better developed cooperatively and shared where possible. Common transportation challenges could be solved more effectively if all the available minds were gathered around the same table.

Today, this philosophy has come to permeate the transportation community, as is evidenced in the sophisticated infrastructure installed for advanced traffic management, traveler information, and freeway systems. It is also a primary reason why this region of FDOT District 4 was selected as Florida's preferred candidate for the Federal Highway Administration's (FHWA's) Request for Applications (RFAs) regarding its "Discretionary Cooperative Agreement for Integrated Corridor Management." The purpose of the RFA is to identify and fund up to eight sites around the U.S. where integrated corridor management (ICM) can be demonstrated, thereby enhancing the mobility and productivity of each region's transportation system.

The concept behind ICM is to break down the barriers between different transportation modes in a geographical area and create a system that manages transportation at the corridor level. To this end, the FHWA, in conjunction with the Federal Transit Administration (FTA) and the U.S. Department of Transportation's ITS Joint Program Office, developed the ICM initiative, which consists of three stages:

- Stage 1 – Selection of Eight Pioneer Sites
- Stage 2 – Selection of Four Pioneer Analysis, Simulation, and Modeling Sites
- Stage 3 – Selection of Up to Four Pioneer Demonstration Sites

Stage 1 of the ICM initiative includes development of a concept of operations for each of the eight Pioneer Sites. Each site will also identify the available data at each of its participating agencies that could be used in Stage 2 of the ICM initiative, if that Pioneer Site were selected for Stage 2.

The initiative's Stage 2 calls for the four Pioneer Analysis, Simulation, and Modeling Sites to supply data to the FHWA for analysis. The data would be used to evaluate the proposed ICM project and identify the potential benefits that the project could achieve. The sites for Stage 2 will be chosen from among the Stage 1 sites.

Stage 3 of the ICM initiative includes the actual implementation of an ICM project based upon the concepts of operation developed and lessons learned from Stages 1 and 2. Up to four Stage 3 sites will be selected from the original eight sites that participated in Stage 1.

FDOT and its partner agencies prepared a response to the RFA and submitted it in May 2006. The FHWA was expected to announce the Stage 1 Pioneer Sites the following August.

In nominating a candidate ICM site for Florida, FDOT performed a statewide analysis of locations to identify the best possible location for an ICM project. After a thorough investigation, the Broward-Palm Beach region was selected for three primary reasons:

- ITS and other facilities had already been established that would support an ICM concept.
- Strong, proven relationships had been established among the partners, who had adopted cooperative, mutually beneficial operating agreements.
- The area will see additional, long-term benefit from further integrated traffic management strategies.

The selected corridor's boundaries are the Atlantic Coast to the east, Everglades National Park to the west, I-95 north of the SR-826/Turnpike interchanges at the Miami-Dade/Broward County line to the south, and I-95 at PGA Boulevard to the north. The corridor encompasses numerous principal highway and intermodal facilities. There are Interstates 95 and 595. Florida's Turnpike and the Sawgrass Expressway are major toll roads serving the region and feature the latest in electronic toll collection systems. Both counties have numerous major arterial routes, a major seaport, and an international airport. The corridor is served by three advanced traffic signal systems and widespread use of ITS deployments that aid in traffic surveillance and management, plus notification of motorists using the highway network. Tri-Rail passenger trains operate in the corridor and that service is coordinated with the PalmTran bus system in Palm Beach County.

All of these partners are committed to pursing this project for the benefit of the corridor's traveling public as well as their individual systems, regardless of whether the corridor is chosen as an FHWA Stage 1 Pioneer Site. In fact, the Broward-Palm Beach corridor already benefits from a seasoned, stable approach to transportation management on a regional basis. Partnerships are in place and proving that teamwork gets results. FDOT is highly involved locally, statewide, and nationally in ITS implementation and operations strategies. The agency takes a great interest in seeking ways to maximize available transportation network capacity. As lead partner, the FDOT works closely with both federal agencies, the county and municipal traffic engineering departments, transportation boards, and private industry in the creation of effective coalitions that actively pursue ICM and seek ways to broaden its impact now and in the years to come.

Capital Improvements Prepare FDOT for Better Hurricane Response, Recovery

By Paul Clark, FDOT and
Dave Hodges, PBS&J

The 2004 and 2005 hurricane seasons underscored the importance of transportation systems in managing weather emergencies. Florida took this opportunity to examine its own emergency plans, particularly the state's contraflow routes and how best to prepare for these reverse-lane evacuation procedures. To learn more about the experiences of other states during the past two years, the FDOT hosted the first Contraflow Workshop on February 14-15, 2006, in Orlando. Nine states made presentations on their contraflow efforts, providing valuable insight on how Florida could plan for this evacuation and avoid some of its pitfalls.

The FDOT Incident Management Section entered the 2006 hurricane season June 1 with a detailed plan to enhance hurricane response operations in the state, focusing on physical improvements to better manage evacuations of threatened areas.

From the best practices of these coastal states, recommendations were drafted and a final report was presented to FDOT management, which approved the expenditure of $6,392,992 for various highway information systems and safety improvements. These installations support the state's emergency management and hurricane evacuation efforts, including the execution of contraflow plans should reverse-lane procedures need to be implemented. Other improvements will aid in the transportation network's recovery following a hurricane or similar natural disaster.

The various improvements include placing thermoplastic exit numbers on the pavement at approximately 600 interchanges. The numbers, applied to the paved shoulder, allow pilots flying aerial contraflow route checks to verify their aircraft's location, thereby providing more precise reports of highway conditions. The exit numbers also help hurricane response teams, maintenance crews, and other relief personnel avoid the problem of damaged or missing exit signs after a hurricane.

A total of 198 potential locations on the state's contraflow routes are proposed to have flip-down signs installed. These signs are intended for use by motorists traveling on the contraflow side of a highway, where the installed signs are facing the wrong direction. Placed on existing poles, flip-down signs provide a temporary means of marking exit numbers and detour locations.

A critical need during hurricane evacuations and contraflow operations is the ability to communicate information directly to motorists. Highway advisory radio (HAR) installations at 13 new locations allow emergency managers to broadcast messages at the beginning, middle, and end of an evacuation route. A companion to HAR is the Citizen Band (CB) Wizard Alert System, which broadcasts emergency messages to truck drivers and other commercial highway users who rely on CB communications. Installation of CB Wizard on given routes improves coverage and ensures that emergency broadcasts reach commercial vehicle operators prior to their arrival at the contraflow route or emergency situation.

A total of 236 drop gate locations have been proposed at interchanges. These gates will prevent the wrong-way entry of vehicles on ramps that serve contraflow lanes during an evacuation. These gates will extend across the ramp lane and the paved shoulder. They lock in the down position and are better devices to use than typical barricades, cones, or barrels. The gates reduce the number of maintenance of traffic devices needed and the amount of setup time required to activate a contraflow route. Another improvement was the addition of closed-circuit television cameras at key interstate locations in Districts 1 and 2 to view traffic conditions in real time.

The public awareness aspects of contraflow operations are critical to the plan's success. For this reason, the FDOT joined with the Florida Highway Patrol and the Florida Division of Emergency Management to produce contraflow materials that describe the different routes and how they function. Additional information is being provided on a new Web site, www.OneWayFlorida.org. Other materials were produced for local leaders and agency decision-makers so they can communicate the reasons for the contraflow evacuation procedure and how it affects their communities.

Hurricane recovery efforts focus on restoring the operation of arterial intersections. The four major hurricanes that struck Florida in 2004 damaged more than 3,500 signalized intersections statewide. In 2005, over 2,000 signalized intersections sustained damage. To avoid the potential for signal equipment shortages after hurricanes, the FDOT is stockpiling replacement traffic signal heads, cable, and span wire equal to 7.5 percent of the total installed traffic signals on the state's roads. This inventory will be available for prompt traffic signal replacement in hurricane-damaged areas so that intersections can be returned to normal service without delays. These items are being stored at 16 locations around the state as a remedy for the huge losses of traffic signals due to hurricane winds.

It is the FDOT's hope that this combination of roadside equipment installations, greater public awareness, and quick replacement of damaged traffic signals will enable the state to better manage the highway system during hurricane events.

ITS Facility Management System—

Supporting System Deployments

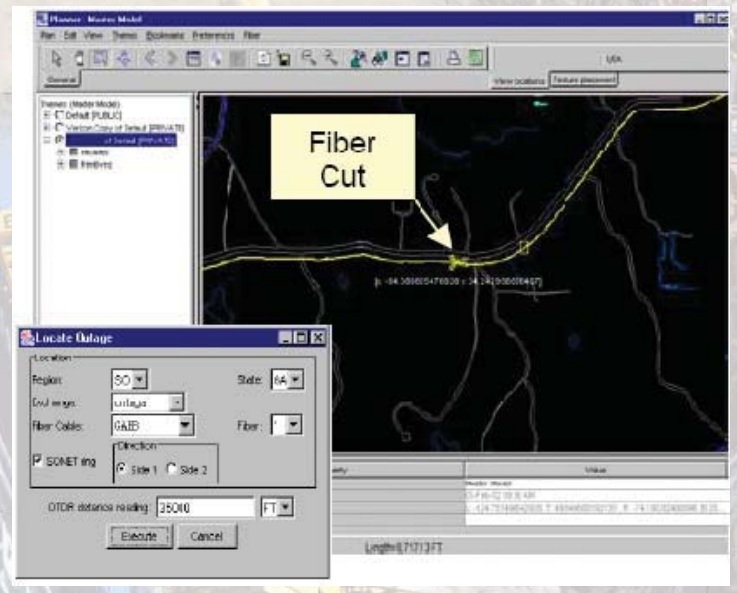
By Randy Pierce, FDOT and
Tim Sapp, Telvent Farradyne

The FDOT Districts have deployed ITS field devices and support telecommunications systems in various areas of Florida. These ITS are comprised of a complex network of cables, wireless links, electronics, and field devices that are constantly changing through system expansions, routine maintenance or equipment updates.

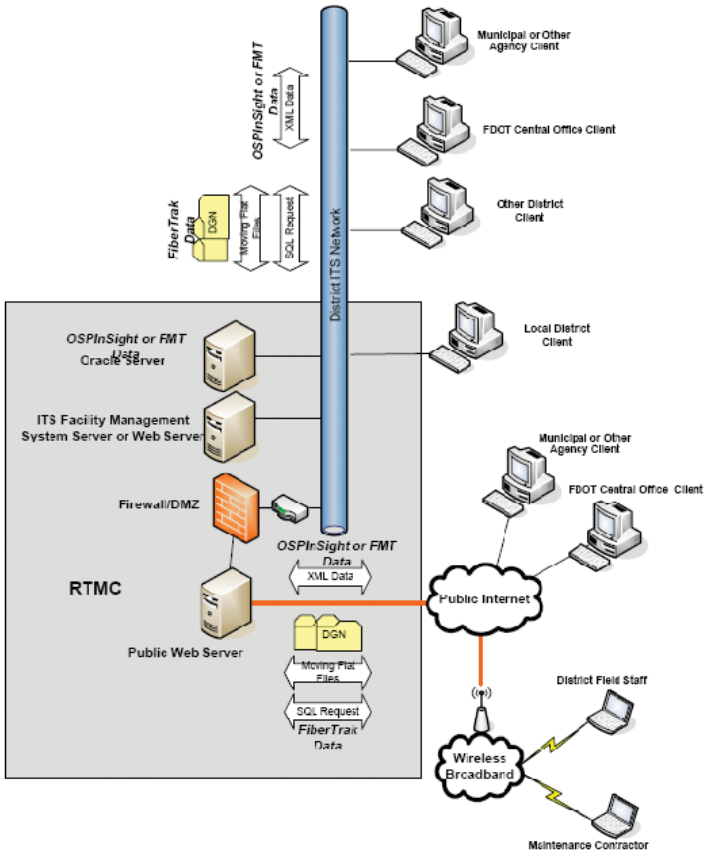
The lack of statewide standards for ITS plans preparation, as-built documentation, and operational ITS facility management systems makes it difficult for the Districts to manage the overall network, the system configuration, and its components (assets). This greatly impacts the District's ability and the effort required to troubleshoot maintenance issues, and plan and design timely network expansions or rearrangements. This also results in a higher cost and effort expended to maintain the network and can aggravate service interruptions impacting the ITS and its designed purpose.

The FDOT needs a way to compile network asset information into a single, accessible database allowing the Districts and the Central Office to manage the entire system. This database will facilitate identifying requirements to ensure proper planning for future growth and funding availability.

The Telecommunications General Consultant (TGC) has undertaken this task, in coordination with the Districts, to develop a working ITS Facility Management (ITSFM) software application and develop companion Construction Inspection and As-built Guidelines to support system deployment and the requirements of the application.



Three commercial-off-the-shelf products were identified and selected for evaluation, including: OSPInSight, FiberTrak, and Fiber Management Tool (FMT). All three products are not specifically designed to support ITS, but provide the telecommunications facility management engine needed to manage complex communications networks.



Each product was evaluated on the following functionality:

- System Architecture,
- System Administration,
- Remote Access,
- User Requirement, and
- Reporting and Import/Export Capabilities.

The TGC completed an extensive evaluation to compare each product's capabilities against FDOT's functional needs for a statewide ITS facility. It was found that each product requires varying levels of user modifications to the graphical interface and database to support the needs of ITS professionals. Several deployment options were also evaluated to identify an application that would provide FDOT with the flexibility to meet each District's deployment needs.

The conclusion — FMT was identified as the preferred product for a statewide deployment.

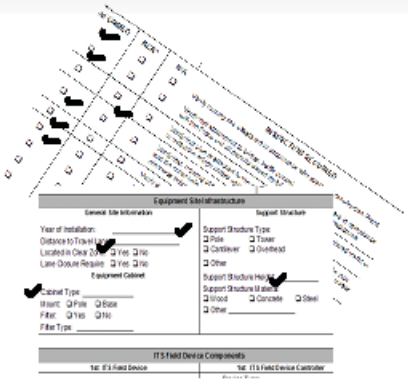
The product configuration and standards are currently under development for the ITSFM application. The product is being designed to provide fiber optic cable, electrical systems, wireless communications, and ITS field device management functionality.

This summer, the TGC will conduct a field inventory of installed assets in Districts 4 and 6 and Florida's Turnpike Enterprise that comprise the ITS South Florida Wide Area Network (WAN) and to develop a working prototype of the application. The prototype will include all fiber optic assets along the WAN route and a portion of the power and wireless systems in the area to demonstrate the full functionality of the application. The prototype application is expected to be complete late in the fourth quarter of 2006.

The ITS Construction Inspection and As-Built Guidelines were issued to the District for review in late June 2006. The guidelines provide ITS-specific construction inspection, quality assurance and quality control, as-built documentation guidance, and the ITSFM system requirement for collecting data on ITS construction projects.

This guideline discusses the roles and responsibilities of the construction contractor and the Construction Engineering and Inspection (CE&I) firm as it relates to the project deliverable, quality inspection, and as-built documentation. Most FDOT projects are focused around heavy construction with the exception of ITS, which is more technical in nature. These guidelines are not intended to supersede any existing FDOT practices for CE&I, but are designed to supplement the special needs for ITS construction.

While FDOT maintains proven construction inspection processes for roadway projects, the installation of ITS are relatively new and, historically, represent only a small percentage of the overall construction preformed by FDOT. As a result, ITS-specific inspection processes have not yet been developed for statewide use. The report recommends and outlines a standardized process for as-built data collection



for new installations to ensure consistent and accurate data collection for all pertinent installed components.

This document references the appropriate FDOT specifications based on the type of work being preformed and provides 25 ITS-specific quality checklists to assist the inspectors with monitoring the quality of installations. As a result, nonconforming installations can be more readily identified. The guideline establishes a noncompliance reporting procedure for documenting these acts, and provides the means for follow up and final closure. The guideline also provides the inspector with an understanding of the contractor's as-built deliverable and defines what constitutes a field change as well as establishing a process to document changes.

Timely and accurate data collection during the installation phase of ITS projects is a key element in documenting system assets and cost-effectively populating the ITSFM application. The quality checklists help the CE&I ensure that all of the various quality stages of facility deployment are addressed at the time of installation.

The Facility Management System's Requirement section provides a detailed explanation of how the ITSFM application imports data from the as-built plans, outlines standardized naming conventions for equipment sites, field devices, infrastructure hardware, equipment bays and racks and electrical circuits, and provides a list of abbreviations to ensure consistency. The guideline includes data collection forms to document the installed components at the regional transportation management center, communications HUB buildings, ITS field device locations, electrical load centers, utility demarcations, and fiber optic access points.

This standardized data collection process not only helps ensure that all of the required data is collected, but also streamlines the data importation process by allowing the data to be confidently and quickly keyed into the ITSFM application.

Performance Measure

Customer Satisfaction Outcome-

By Elizabeth Birriel, FDOT and
Kenny Voorhies, Cambridge Systematics, Inc

In late 2005, the FDOT Central Office ITS Program initiated a project to conduct a customer satisfaction survey in order to determine public attitudes toward ITS services provided by the FDOT Districts.

A draft questionnaire was developed and submitted for review by the Districts at the December 8, 2005, ITS Working Group Meeting. Further review was conducted by the Central Office Traffic Engineering and Operations staff. Approval of the Customer Satisfaction Outcome Performance Measure questionnaire was obtained in February 2006. A telephone survey for all seven geographical Districts was conducted in March 2006, and a draft analysis of the survey was delivered in May 2006.

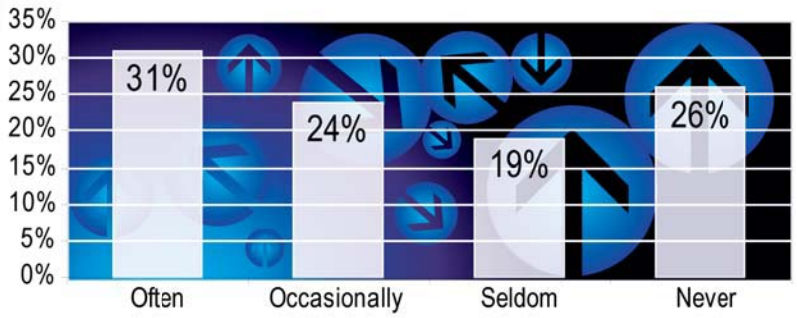
Customer satisfaction was measured by collecting a statistically valid sample survey data from ITS users throughout the state. This task surveyed, via telephone, a random sample of 400 adults, age 18 and over, in each of the seven FDOT Districts. Set criteria required that respondents must drive at least three times per week on freeways to participate. The purpose of this survey was to gauge awareness and perceived value of the traffic management services offered by FDOT, including Road Rangers services, dynamic message signs, and 511 traveler information. The surveys provide a benchmark against which to measure changes in awareness and perceptions in the future. Each interview lasted approximately 10 minutes.

For each District, a written report summarizing the telephone survey findings and displaying the appropriate graphic (chart or table) for each question was prepared. The reports also contain an analysis of each question by various demographic subgroups (i.e., geographic, age, type of freeway use). Finally, the reports contain an overall summary, and identify key findings. A statewide summary report was also produced.

Summary of the Survey Findings

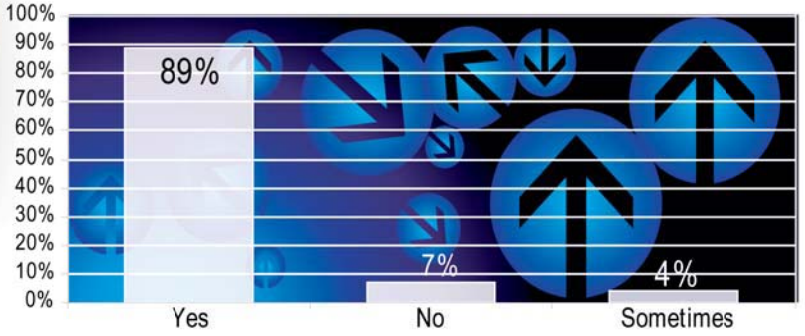
- Radio is the predominant source for traffic information.

How often do you listen to radio traffic reports?



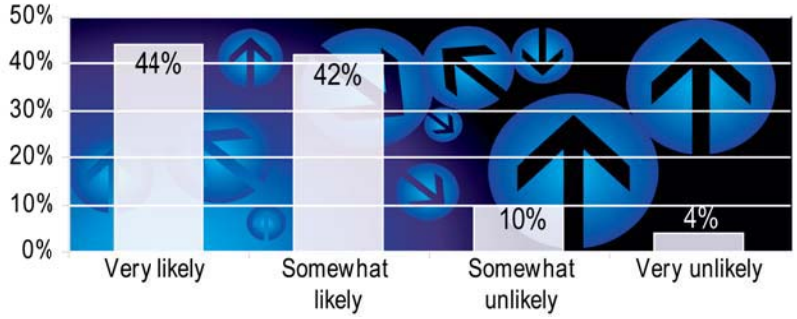
- Dynamic message signs are easy to read, useful, and trusted by the many Florida drivers who rely on them.

Are the dynamic message signs easy to read?



- 511 has proven to be useful by those who aware of the service.

How likely are you to change your route based on based on 511?



- About half of Florida freeway drivers know about Road Rangers, yet less than half of them know how to request one. Among those who know about them, Road Rangers are a much appreciated service.

Are you aware of the Road Ranger units provided by FDOT?

- There are several viable strategies to consider for using dynamic message signs to promote and enhance 511, and vice versa.
- Targeted marketing strategies can increase awareness and usage levels for all of FDOT's ITS services.

This 2006 survey task will provide the baseline for future ITS customer satisfaction surveys. It is expected that statewide surveys will be conducted approximately two years apart. The survey techniques used will be evaluated and may be modified for the next statewide survey. The survey data, however, should be collected so that a comparison to the 2006 baseline can be made. It is recommended that each District review their survey results, and address any issues or problems in customer service delivery that are revealed.

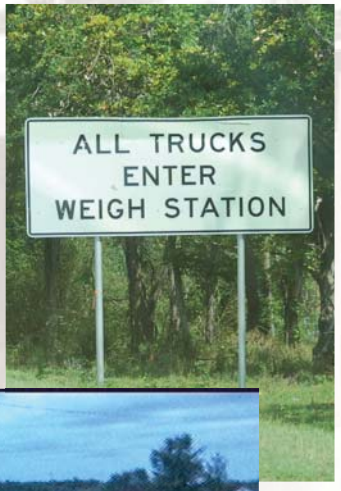
FLORIDA BEGINS IMPLEMENTATION OF ITS FIRST BYPASS DETECTION SYSTEM

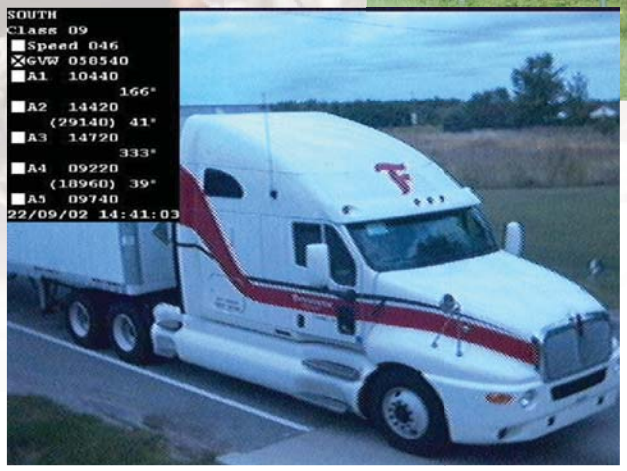
By Michael Akridge, FDOT and
Richard Easley and Sharon Easley, E-Squared Engineering

In Florida, as with many states in the U.S., trucks are required to meet legal requirements for weight and size. The FDOT Motor Carrier Compliance Office (MCCO) is charged with enforcing Florida's statutes that relate to commercial vehicle weight and size.

Most of us are used to seeing the weigh stations for commercial vehicles along the highway as they are the most common method of verifying if vehicles are within legal limits. The weigh stations are equipped with weigh-in-motion (WIM) scales and static scales. As trucks enter the weigh station they drive over the WIM; if their weight seems to be above the legal limit, they are directed to the static scales where their legal operating weight is determined. (Although WIMs are very accurate for determining the weight of a vehicle, most states, including Florida, only allow citations to be written based on static scale measurements.)

The weigh station/scale system works fine as long as the vehicles come through the weigh station. But what if they don't? There is a high probability that if a truck is deliberately running overweight, the driver may decide to take a route that avoids the weigh station. Because of primary and secondary roads, there is usually at least one alternate route around every weigh station. While it might seem logical to build weigh stations on the alternate routes, that just isn't feasible. The cost for such facilities, including purchasing the right-of-way and construction, can easily exceed $5 million. By comparison, the bypass detection system can cost as little as $300,000, depending upon the configuration. In response to this reality, Florida's MCCO is installing a weigh station bypass detection system (to be operational in August 2006).





The first installation is near the Punta Gorda weigh station on I-75 in Charlotte County. The system is designed to detect possible overweight vehicles which exit before the Punta Gorda WIM facility and re-enter I-75 after the Punta Gorda facility. The system is designed to screen all commercial vehicles using the exit and entrance ramps before and after the weigh station and to categorize them as either 'potential violators' or 'non-violators.' Law enforcement personnel will focus their attention on potential violators. Potential violators are any vehicle that appears to violate Florida's weight or dimension requirements or purposefully avoids the WIM scale.

HOW THE SYSTEM WORKS

The entire bypass detection system will be automated. WIM technology will determine vehicle weights. Each truck exiting the interstate at either of the two exits just before the weigh station (northbound and southbound) will trigger cameras to take an image of the truck's license plate. Optical character recognition software will convert the license plate image into numbers which can be stored as data. License plate numbers of all trucks using these exits will be stored. Additionally, if the WIM sensor indicates the truck is overweight, this will trigger a side view camera to capture a digital image of the overweight vehicle. The system will then join these three pieces of data and send an image, via wireless communication, to the MCCO computer located at the Punta Gorda weigh station. The image will consist of the digital photo of the vehicle, superimposed with WIM data and the license plate number. Those trucks that are overweight will trigger an alert to the weigh station personnel.

One last component of the system is the logic programmed into it to decide which data is stored for later analysis for those trucks that are operating within legal limits (non-violators) but for some reason bypass the weigh station. As previously noted, the license plate numbers and time stamp are captured and stored for all trucks that exit I-75 before the MCCO weigh station. This same data is also captured for all trucks that enter I-75 after the MCCO weigh station. The system then goes back to the database and 'looks' for a license plate match at both the exit and entry points around the weigh station. If a match is found, the time stamps are compared. If the time differential between exit and re-entry to the interstate is less than a predetermined time (e.g. three to five minutes), it can be reasonably assumed that the reason for exiting the interstate was not to refuel or eat or conduct some other business, but most probably to bypass the weigh station. Data for these trucks will be stored for later analysis.

Because the system is Internet-based, the data captured for the potential violator can also be accessed from (or transmitted to) the laptop mounted in each of the MCCO enforcement vehicles. In addition, all data captured (violators as well as non-violators) are sent to, and stored at, servers located at FDOT MCCO Headquarters in Tallahassee. It's important to note that it is not a crime to avoid a weigh station by circumventing it with an alternate route; however, this system captures data on non-violators and allows FDOT personnel to identify the trends of various carriers. This can lead to targeted inquiries as to why a motor carrier consistently bypasses the weigh station.

The bypass detection system will be a very cost effective method of augmenting the current MCCO weight enforcement efforts in the Punta Gorda area. The system will utilize existing infrastructure to the greatest extent possible. This first bypass detection system will serve as a pilot and a model which can be used at several other locations across Florida. In addition, these types of systems can be used on non-interstate routes where the local community is concerned about roadway damage caused by overweight trucks or load posted bridges.

SunGuide℠ Software Development—

Reaching Milestones

By Trey Tillander, FDOT and
David Chang, PBS&J

The phased rollout of the FDOT's SunGuide℠ Software continued in fiscal year 2005-2006, with successful deployments of the software at regional transportation management centers (TMCs) in Jacksonville on October 10, 2005, and Miami on November 7, 2005.

Software enhancement also progressed with the development and release of support for proportional fonts for dynamic message signs, and additional functionality for closed-circuit television (CCTV) cameras, incident management, travel time, center-to-center (C2C) communications, and data archiving. These enhancements were deployed in the District 2 Jacksonville, District 4 Broward County and District 6 Miami TMCs.

The product of three years of development and testing, the SunGuide Software enables Florida's TMCs to integrate numerous hardware, software, and network applications, as well as exchange data and video with other TMCs. Because SunGuide standardizes common TMC functions, it helps the various District facilities become more interoperable—a goal of ITS across Florida and throughout the nation.

Jacksonville TMC

Miami TMC

SunGuide is a ready-made software system for use by any TMC in Florida, so a new facility is compatible with existing TMCs the day it opens. New users have no development expense for the operating software; it was FDOT's intent to incur that cost only once, but use the program at numerous locations. As improvements are made for any given user, other SunGuide users across Florida gain those benefits without added expense. For this reason, SunGuide Software was selected as a finalist for the ITS America 2006 Best of ITS Awards in the category of "Return of Investment."

SunGuide Software Release 1.1 was deployed for the first time on June 13, 2005, in Fort Lauderdale at District 4's Broward TMC. This followed successful testing of the software by representatives from the FDOT ITS Program and Southwest Research Institute (SwRI), of San Antonio, Texas, the FDOT's software development contractor.

Later, the development team conducted SunGuide Software Release 2.0 factory acceptance testing at SwRI's lab on November 1-3, 2005. Another prospective user, Lee County, plans to incorporate the software as part of the Lee County Bridge Incident Management System.

Other project highlights include the start of development on the SunGuide Software Performance Measures and Road Rangers modules. Preparations are also underway to deploy the software at the Traffic Engineering Research Lab (TERL) in Tallahassee, where it will form part of the test bed for new ITS devices and their network compatibility in the TMC environment. This also permits TERL to conduct independent verification and validation of the software and its interfaces.

SunGuide evolved from similar development efforts in Texas and Maryland, where those states' DOTs worked to produce comprehensive TMC software based on an open architecture and the ability to manage multiple subsystems. The objective there, as it was in Florida, was to invest in the software development once, then use the program many times at multiple facilities. With SunGuide, the operators at a TMC can perform various incident management tasks, obtain data from traffic detection devices, control CCTV cameras along the freeway, display that video on any of several screens, and alert motorists using highway advisory radio, dynamic message signs, or 511 advanced traveler information systems.

SunGuide is designed to be flexible and expandable to match the individual needs of the 12 TMCs the FDOT plans for the state as well as other satellite TMCs. Though each facility will serve a different community's travel needs, each one will be able to collect, assess, and manage real-time traffic data and video, then disseminate meaningful and accurate transportation management information to both the motoring public and commercial vehicle operators.

As the various SunGuide deployments take place, important ITS goals for Florida will be realized. There will be integration of statewide ITS hardware, software, and network applications, plus a reliable means for C2C communications across the state. SunGuide allows operators in one TMC to interact with and control devices in another, as long as they have secured the necessary authorization.

In addition, SunGuide provides a basis for statewide incident management when events such as hurricanes or other disasters strike an entire region of the state. In such cases, TMCs will have the tools to support emergency management, evacuations, and related tasks.

As an information source, SunGuide will support a Web-based service for tourists, commuters, and other highway users needing information about traffic conditions. Equally important, SunGuide Software will be a primary tool for collecting the data necessary for operational performance measures. This data will enable stakeholders, from policy makers to TMC operations personnel, to measure the performance of Florida's surface transportation systems. This historical and real-time data will be used in studies and on-going analyses as an input for continuous improvement of transportation operations.

The SunGuide era continues and FDOT looks forward to additional TMC deployments and new supporting modules in the coming year. Through use of the SunGuide Software, FDOT continues to strive for more efficient TMC operations and a greater level of service to our customers—the traveling public.

TERL Begins Evaluation, Approval of ITS Devices for Use in Florida

By Liang Hsia, FDOT and
Dave Hodges, PBS&J

With the rapid pace of ITS deployment and new technologies emerging across the transportation industry, evaluation, testing, quality assurance, and certification of devices and systems has become a key component of the FDOT's ITS Program.

The FDOT Traffic Engineering Research Laboratory (TERL) in Tallahassee was the logical choice to direct the evaluation and approval of the various ITS devices used in Florida. Following an extensive remodeling and renovation of the TERL building in 2005, the laboratory had the new space and equipment available to begin providing this important testing function.

ITS device testing at TERL actually started in April 2006, with the advent of a statewide procurement contract designed to simplify the Districts' procurement of 50 different hardware items necessary for ITS projects. Vendors who responded to the FDOT's bid notice submitted samples of their products to the TERL for evaluation. This evaluation consisted of document reviews, testing, and general verification that the submitted devices met not only the specifications in the invitation to bid, but the needs of the projects that the statewide contract will support.

Since first opening in 1997, the TERL has been the FDOT facility that evaluates the various traffic control signal devices proposed for sale or installation in Florida. Devices that pass these tests are placed on the FDOT's Approved Product List (APL), signifying that they meet the FDOT's specifications and performance requirements. The new ITS Lab at TERL has expanded this evaluation work to include dynamic message signs, closed-circuit television camera systems, vehicle detection equipment, and the different network devices that interconnect them—device servers, Ethernet switches, fiber optic cable, and video encoders and decoders.

Another new mission is the development of a test area equipped with the same SunGuide℠ Software that FDOT Districts are using. In this environment, the TERL will be able to simulate an actual transportation management center (TMC) operation in which the various video, data, and communications systems function with SunGuide and provide operators with the full range of traffic management capabilities. The various system inputs will be displayed on a video wall installed in the lab's TMC, and staff will use workstations equipped with SunGuide Software to control video feeds, traffic data, and other essentials. These operations will provide FDOT with software, hardware, change management, and independent verification and validation capabilities.

The new ITS Lab will enable TERL staff to evaluate ITS software and hardware, verifying that the necessary network communication links are active and compatible with SunGuide. This up-front testing will improve both the material quality and operational effectiveness of ITS equipment and

communications. It affords TERL a platform for ensuring that new devices comply with the FDOT's ITS equipment specifications and are capable of meeting all FDOT requirements.

Ultimately, this evaluation and testing will reduce problems encountered after the ITS devices are deployed. A major cause of hardware and software failure in the field is the unpredictability of the real-world environment. While not every variable can be reproduced in the lab, the TERL test area and TMC can help demonstrate the ITS product's basic functions and its compatibility with other devices in the lab's network. Through this effort, the FDOT is confident that the success rate of actual ITS projects will be improved over time.

Quality assurance plays a vital role in the lab operation. TERL is actively working to achieve the International Organization for Standardization (ISO) laboratory certification—an accomplishment based on the consistent application of proper testing procedures, record keeping, staff credentials, and operations management. Similarly, for each manufacturer seeking product approval, TERL conducts a quality assurance (QA) evaluation of that company and strives to document the kind of practices it follows in product manufacture, testing, and service. Those with successful QA reviews may continue on to the product review and testing stage.

As is done with the traffic control devices, the ITS equipment that TERL has tested, and which meets FDOT specifications, will be placed on the APL. This indicates to the Districts, expressway authorities, local governments, and others that the equipment has passed the evaluations, the vendors' quality assurance plans have been accepted, and the devices are compatible with SunGuide Software in the TMC environment. This alleviates the guesswork for these transportation providers who must develop systems that are interoperable with other deployments and which adhere to common communications protocols and standards.

Another aspect of the TERL expansion is the microwave communications test area. This facility enables TERL staff to test the SunGuide Software's center-to-center (C2C) communications requirements and various communications technologies that facilitate these functions. C2C capability allows data and video sharing between the state's TMCs and is essential for transferring control from one regional TMC to another in an emergency. For this reason, Florida's Statewide Microwave System (SMS) has been upgraded to support video and data sharing between TMCs. Because various communications infrastructures and C2C functions are an integral part of Florida's ITS investment, the ITS Lab will also support the testing, management, and maintenance of SMS devices, and oversee SMS-related contractual services.

TERL is also equipped to host several full-scale research projects that include the Statewide Central Data Warehouse, real-time route diversion, and National Transportation Communications for ITS Protocol projects. These research prototypes will yield practical applications for the FDOT in important subject areas. The Statewide Central Data Warehouse, if deployed, will provide real-time data for statewide performance measures on various ITS deployments.

Tallahassee's Dynamic Message Sign Project—

Getting a Jump on ITS in Tallahassee

By Gene Glotzbach, FDOT

In July 2004, FDOT applied for an FHWA grant to support the Amber Alert process. The grant was made available to implement enhancements to notification and communications systems along highways in order to assist in the recovery of abducted children and provided $400,000 in Federal funds which were matched in state allocated funds to bring the total project budget to $800,000.

The funds will be utilized to place two dynamic message signs (DMSs) on Interstate 10 (I-10) as you approach Tallahassee from the east and west. A third DMS will be installed on US 27 (Monroe Street), a busy thoroughfare leading into downtown Tallahassee. The arterial DMS will be placed prior to Martin Luther King Boulevard, an alternate route into the downtown area. The DMSs will be operated by the City of Tallahassee at their operations center in City Hall.

The structures for the I-10 DMS installations will be full span trusses across one direction of travel. The full span truss was preferred over the cantilevered structure since the cantilevered structure would not allow placement of the DMSs over the center of the roadway for maximum view-ability. The weight of these signs and the placement of the foundation of the cantilevered structure also made it impractical to mount the DMSs over the center of I-10. The full span truss structure allows optimum placement of the DMSs as well as flexibility to reposition the signs over the new roadway section once I-10 is widened to six lanes. The arterial DMS, however, will be mounted on a cantilevered structure.

The DMSs, although being procured for the purposes of supporting the Amber Alert process, can be utilized to provide traffic-related messages to the public. District 3 (Chipley) is finalizing plans and preparing to start a needed widening project for I-10 through the Tallahassee area. The DMSs will play a pivotal role in the maintenance of traffic associated with the construction.

As it turns out, this project will be the prelude to a larger project that District 3 has programmed in the FDOT Work Program for Fiscal Year 2009, which will deploy a freeway incident management system on I-10 between US 90 East and US 90 West. The DMSs supporting the Amber Alert process will give Tallahassee a taste of ITS earlier than would have been accomplished through the FDOT's Five Year Work Program. Communications to the DMSs will be via phone drop to minimize initial costs.

Marrying Applications to Enhance the Benefit of the Tallahassee DMSs

To expand the utilization of the DMSs in Tallahassee, and to provide a test bed for an innovative data collection application on the Interstate, the ITS Program will be developing a solicitation to deploy license plate readers to gather travel times on I-10 and post travel times on the Tallahassee DMSs. The FDOT has done extensive research and conducted several proof of concept projects that support the use of innovative data collection systems utilizing both toll transponders and license plate readers.

The transponder research plays out as you would expect. The greater the number of toll facilities in the area, the greater the number of transponders to draw from. Essentially the proof of concept project for the transponders proved that there is a high enough concentration of toll transponders in the state to get reliable travel time information in most areas of the state except in North Central Florida and the Panhandle.

Since sensors will not be installed along I-10 until the fiscal year 2009 project, this leaves a license plate reader system as the most likely candidate to gather travel times for posting on Tallahassee's DMSs in the near term. A proof of concept test was conducted in the Tallahassee area for license plate readers and, although Florida license plates are difficult to read, enough were processed to provide data to get accurate travel time information. As expected, the great number of specialty plates allowed in Florida make it difficult for license plate readers to process license plates.

However that is not the major problem. The primary problem with reading license plates in Florida is the color contrast between the alpha numeric characters and the background. The proof of concept test concluded that even though Florida license plates are hard to read, the results prove the viability of using license plate readers to gather travel times. The proof of concept also concluded that the matching capabilities of the system would improve with a permanent installation. A permanent installation of the system would provide engineers the capabilities to optimize the placement of the license plate reader cameras to better view the license plates and thus be able to read additional license plates.

Based on the results of the license plate reader proof of concept, the ITS Program will be exploring the possibility of a solicitation to install license plate readers on I-10 in the Tallahassee area. The license plate reader system would be integrated with the Tallahassee DMSs in order to provide travel times to motorists on I-10 between US 90 East and West. The license plate reader system in Tallahassee would serve as a test bed and will help determine the practicality of deploying license plate readers statewide where it is not feasible to deploy traditional sensor technology.

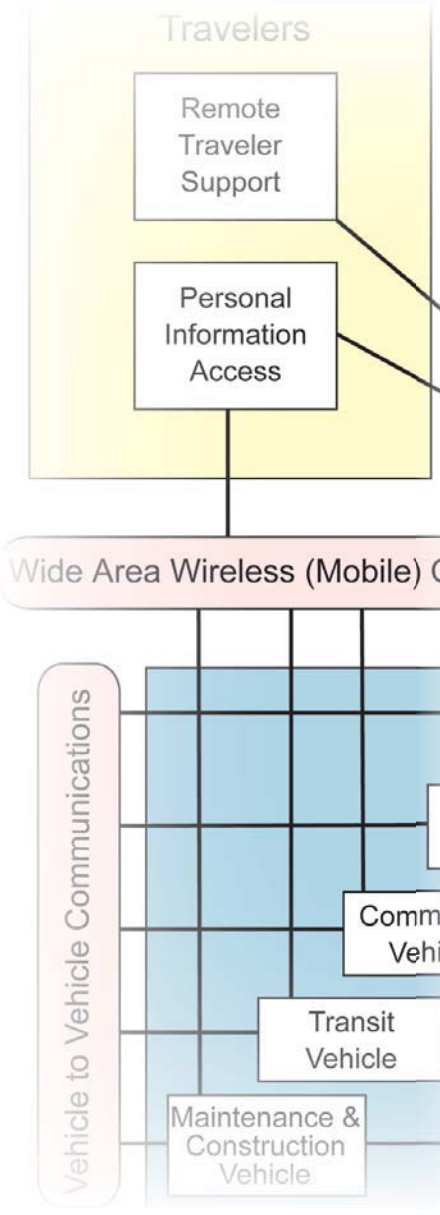
The Tallahassee Dynamic Message Sign Project was let in June and it is anticipated that construction should begin sometime in the fall. It is anticipated that the enhancement project to provide travel times on the signs through the use of license plate readers will go out to a solicitation and timed in such a manner that the readers will be integrated into the DMS project at about the same time as the sign project is complete.

Statewide ITS Architecture Update—

Florida's New ITS Roadmap

By Trey Tillander and Liang Hsia, FDOT and
Tahira Faquir, PBS&J

Over the past year and a half FDOT has been updating its statewide high-level roadmap for ITS.



FDOT began the process of updating the Statewide ITS Architecture (SITSA), a system-level document and database that serve as a blueprint for the planning, design, development, integration, implementation, maintenance, and operation of Florida ITS projects, in early 2005. The SITSA provides a unifying framework to ensure that transportation technologies work together smoothly and effectively on Florida's highways. On February 16, 2006, the Federal Highway Administration formally approved the updated SITSA.

There were four main reasons for the update:

First— The SITSA needed to reflect Florida's current and future ITS Program needs.

Second— Florida's ITS architecture needed to comply with the current National ITS Architecture, which is the "roadmap" for the entire country. Section 5206(e) of the federal Transportation Equity Act for the 21st Century (TEA-21) mandates that ITS projects relying on dollars from the Highway Trust Fund, including the Mass Transit Account, must be part of a regional architecture that conforms to the National ITS Architecture and Standards.

Third— The SITSA needed to reflect integrated operations, maintenance, and security subsystems.

Fourth— The SITSA needed to harmonize all existing regional ITS architectures, which include the Statewide, Districts 3 and 7, and Florida's Turnpike Enterprise; and I-4, I-10, I-75, and I-95 Corridor ITS Architectures.

FDOT embarked on a systematic and detailed process of meeting at each region identified in the SITSA, and its associated stakeholders, to gather the appropriate input. FDOT accomplished this through a series of initial 2-day workshops in each region, in which all local stakeholders were invited

to participate. This was followed up with a 1-day "verification" workshop in each region to review the changes to the SITSA made in the initial workshops, and to gather any other missing information. After each 2- and 1-day workshop, the stakeholders were given an opportunity to review the changes being made to the SITSA as related to their regions and to provide comments.

SITSA
One-Day Workshop Schedule

Florida's Turnpike Enterprise—	August 22, 2005
FDOT Districts 4 and 6—	August 23, 2005
FDOT District 1—	September 1, 2005
FDOT District 2—	September 7, 2005
FDOT District 7—	September 8, 2005
FDOT District 5—	September 26, 2005
Statewide—	September 28, 2005
FDOT District 3—	September 29, 2005

Because reviewing the SITSA in a standard review format can be difficult, the project team developed an interactive Web site (www.consystec.com/florida/default.htm) where reviewers could view their specific areas of the SITSA and provide on-line reviews. The SITSA will continue to be linked to this Web site for easy access by anyone and will continue to have the "Send Your Comments" button so that as stakeholders use the architecture they can notify the project team of any questions or changes they may have.

Also offered at each 1-day workshop was training on the use of the SITSA in project development. This was essentially a "Practical Applications of the SITSA" for the stakeholders, many of whom understood the Federal requirements for using an architecture, but not necessarily how to go about doing so. Overall, this training was well-received and several stakeholders requested the training electronically so that they could share it with others in their organizations.

Florida has made a significant investment in ITS and will continue on that course. In 2002, FDOT committed more than $790 million over a 10-year period to deploy ITS, plus another $140 million beginning in 2005, for ITS operations and maintenance. These efforts, combined with the multi-million dollar investments being made by local governments, expressway authorities, transit systems, and metropolitan planning organizations make an up-to-date ITS architecture imperative to guide Florida's transportation investments.

Statewide Procurement—

Simplifying Equipment Purchases for Districts

By Gene Glotzbach, FDOT and
Ron Meyer, PBS&J

A newly instituted procedure that allows the statewide procurement of ITS equipment will expand the purchasing power of FDOT Districts who need devices for project deployments, operation, and maintenance.

The statewide procurement contract originated with an invitation to bid (ITB) issued by the FDOT in early 2006. The contract will simplify Districts' procurement of 50 different items and pieces of hardware necessary for ITS projects. It will also leverage statewide purchasing power in order to reduce material costs.

The Districts strongly support the ITB concept and had requested it several times; however, it had not been practical to attempt until the recent finalization of statewide specifications for ITS equipment and materials. The decision to adopt a statewide contract was also prompted by a specific need from District 2 to support its I-295 Systems Manager Project.

The ITB for ITS devices was advertised and apparent low bidders identified. The FDOT contacted these low bidders and had them send sample devices to the FDOT Traffic Engineering Research Lab (TERL) for review and evaluation. TERL's evaluation consists of document reviews, testing, and general verification that the submitted devices meet not only the ITB specifications, but also the needs of the projects that the statewide contract will support.

The ITB covered 50 items ranging from fiber optic cable and transient volt surge suppressors to Ethernet switches and dynamic message signs. A primary reason TERL was called on to perform ITS device testing was the fact that the lab already has responsibility for the FDOT's Approved Product List (APL). Mandated by Florida law, the APL is a list of devices that TERL has evaluated and found to conform to the FDOT's published specifications.

TERL also has a test area equipped with the FDOT's SunGuide℠ Software. This means the lab will be able to test the devices' ability to operate within the SunGuide framework. TERL has procedures in place for evaluation and testing based upon years of experience evaluating traditional traffic control devices, such as traffic lights and pedestrian signals.

Once the TERL completes the evaluation of submitted products and documentation, the devices meeting the specifications and deemed acceptable for use will be placed on a term purchasing contract under the ITB procurement process. FDOT Districts, as well as municipal and county governments in Florida, will be able to buy ITS equipment directly from the statewide contract. District 2, for example, will utilize this mechanism to purchase equipment to support construction of the I-295 ITS project. The contract is for a one-year term, with an option to renew for an additional year. It will make such purchases more convenient and assure the buyer that the equipment has demonstrated acceptable levels of quality, functionality, and performance.

CVO Safety and Security in Florida—License Plate Readers in Action

By Michael Akridge, FDOT and
Richard Easley and Sharon Easley, E-Squared Engineering

Unless otherwise pre-cleared, each truck on Florida's interstate system, and some U.S. routes, must come through weigh stations strategically located throughout the state. In calendar year 2006, over 15 million vehicles passed through Florida's weigh stations. With license plate reader (LPR) technology, enforcement officers have the potential to electronically read license plates on all of those trucks and check them for safety and security purposes.

In an era where illegal activities range from stolen vehicles and cargo to kidnapped children to delivery and detonation of weapons of mass destruction; collecting, maintaining, and distributing accurate criminal activity information to law enforcement officers requires utilizing the latest software technologies available. The Florida Department of Law Enforcement (FDLE) is responsible for maintaining and sharing information throughout the state's law enforcement community. The FDLE's core system is the Florida Crime Information Center II (FCIC) which is available to more than 1,000 agencies and 52,000 stations. These include sheriffs' offices, police departments, jails, corrections and probation agencies, state and national criminal justice agencies, the Florida Legislature, and average citizens via the group's Web site. In all, the system processes more than 1.8 million transactions daily.

FDOT's Motor Carrier Compliance Office (MCCO) has developed a system that will improve the safety and security of freight on Florida's highways which will ultimately benefit the citizens of Florida.

The FDOT MCCO recognized the opportunity to extend their capabilities by utilizing LPR technology to query commercial vehicle license plate numbers against the crime information database, on a near real-time basis. The FDOT MCCO system automatically records the vehicle's license plate number as it travels through the weigh station and compares it against known violators in the FCIC II database, and automatically issues an alert to FDOT personnel (and other personnel authorized by FDOT) when the comparison indicates a license plate as a potential violator. In addition to querying the FCIC II database, the FDOT MCCO LPR system is also designed to query the Federal Bureau of Investigations National Crime Information Center (NCIC) database. This is the equivalent of Florida's FCIC II, but on a national basis.

The FDOT MCCO was able to secure funding for this project through a grant with the U.S. Department of Homeland Security (DHS). After securing the funding, the MCCO issued an Invitation to Negotiate and entertained several proposals. TRMI (The Revenue Markets, Inc.) was ultimately selected and eight locations were chosen to prove the weigh station LPR concept. FDOT is one of the first organizations in the country to implement wide-scale LPR technology at high-speed locations throughout the state.

The eight sites selected for the LPR deployment are at various locations across Florida's highway system. They include:

Three full weigh-in-motion (WIM) scale sites – on both sides of the interstate

1. North and southbound Flagler I-95
2. North and southbound Wildwood I-75
3. North and southbound Punta Gorda I-75

Two half WIM scale sites – only in one direction at each location

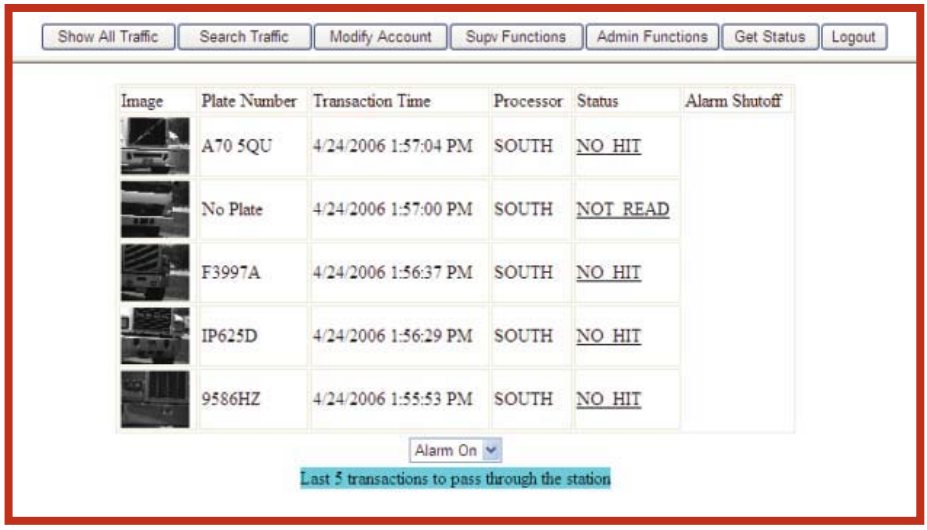
4. Eastbound Pensacola I-10
5. Eastbound Sneads I-10

Two full static scale sites

6. North and southbound Hilliard US 1
7. Eastbound Plant City I-4

One static scale site for both directions

8. East and westbound Pensacola US 90



As part of the LPR system, FDOT installed the following equipment for each direction of travel described at the locations above: black and white camera and enclosure, 500W quartz halogen light, Image Processor (provides all LPR function), loop and loop detector (static scale sites only), conduits from the WIM cabinet (WIM scale sites only) to camera/light, conduits from station house to camera/light (static scale sites only), cabling, media converters (WIM scale sites only), and poles.

The system also includes Optical Character Recognition (OCR) in each weigh station location to convert the largest font numbers and characters on a license plate into data. The license plate image and extracted data are stored in the LPR system database(s). The LPR system then queries against the FCIC II database as well as the NCIC database and issues an alert where appropriate. The LPR system provides two new workstations with new browsers in each of the static scale locations (4 workstations total) for receiving alerts. The cameras provided for the LPR system work 24-hours a day, 7-days a week, in any environmental condition, and the LPR system is required to provide any/all illumination required for operation in any ambient lighting condition.

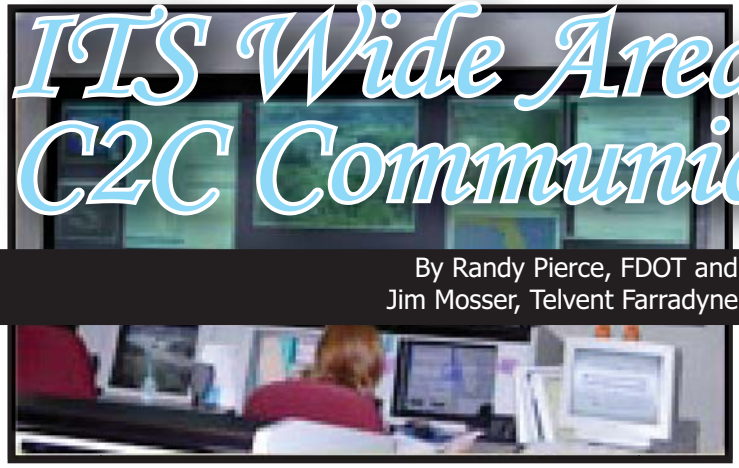
The technology previously described captures a license plate image for each truck as it bypasses the sensors. Using the OCR software, the system attaches data to each black and white image. The data consists of whether or not a license plate was read for the respective truck (if so, it lists the plate number), the time the license plate was read, date and location of the read, and it indicates if the license plate number is or is not in either the NCIC or FCIC databases.

Once the picture is taken and married to the corresponding data, this information is available through the Internet to virtually any location in the world with Internet access. An authorized user can enter the system and check any of the eight sites with the use of a secure password. Also, each weigh station has a computer set up which allows the FDOT weigh station staff to hear an alert should one of the license plate numbers match a plate number in the FCIC or NCIC database. These alerts can be sent to any authorized FDOT personnel via Web browser and/or other SMTP-enabled end-user device connected to the Internet.

In addition to installation of the LPR system, each site is tested prior to acceptance of the project. Installation time averaged about 4 days per site; which included 2 days for burying conduit, installing poles, and running fiber from the WIM cabinets to the stations, and another two days for fiber terminations, computer and camera installations, and initial testing, aiming, and focusing. These latter activities required both day and night work to properly set up illumination and triggering.

Acceptance testing time at present consists of reviewing 36 hours (3 days worth) of images to evaluate performance levels. This can mean reviewing up to 18,000 images per site and is quite time consuming, requiring up to 10 days per site of image review for verifying accuracy. The FDOT requirement is 80 percent accuracy on the LPR system.

The LPR system proved effective immediately after installation. At one of the locations the system alerted the weigh station personnel of a license plate match with FCIC/NCIC databases within minutes of initial operation. While funding continues to be an issue in today's governmental 'do more with less' environment, FDOT would like to expand the LPR system to all of Florida's weigh stations. Doing so will certainly increase the safety and security of Florida's citizens.



ITS Wide Area Network for C2C Communications—Connecting Florida's RTMCs

By Randy Pierce, FDOT and
Jim Mosser, Telvent Farradyne

FDOT's Telecommunications Program is leveraging the existing Statewide Microwave System (SMS) and fiber cable deployed by Districts under the *Ten-Year ITS Cost Feasible Plan* (CFP) to create an ITS Wide Area Network (WAN) for center-to-center (C2C) communications, providing connectivity between regional transportation management centers (RTMCs) statewide.

The ITS WAN will allow sharing of traffic information, dynamic message sign (DMS) information, and video images between Districts. This will be particularly useful for incident management at or near District boundaries and in evacuations or other extreme traffic situations.

The ITS WAN will increase the operational effectiveness and efficiency of those interconnected RTMCs and their operators. This will help maximize the investment and benefits of ITS in Florida, such as enhanced mobility, safety, and coordination. In addition to providing adjacent RTMC traffic information, the ITS WAN provides connectivity to allow for remote command and control of ITS devices, dissemination of traveler information, security, and date archiving after an authentication process..

The District 2 RTMC was connected directly to the District 5 RTMC via the SMS which provided a proof of concept that the SMS could successfully connect two RTMCs. This connection is being migrated to the recently updated SMS data network which will provide additional bandwidth and prepare the way for future ITS WAN equipment to expand this one-to-one connection into a one-to-many connection.

The FDOT Central Office plans to deploy the first segments of the ITS WAN in South Florida between Districts 4 and 6, and Florida's Turnpike Enterprise Pompano RTMCs, and the Traffic Engineering Research Lab (TERL). This South Florida Deployment (SFD) will require the purchase and installation of fiber transport equipment and Gigabit Ethernet Layer

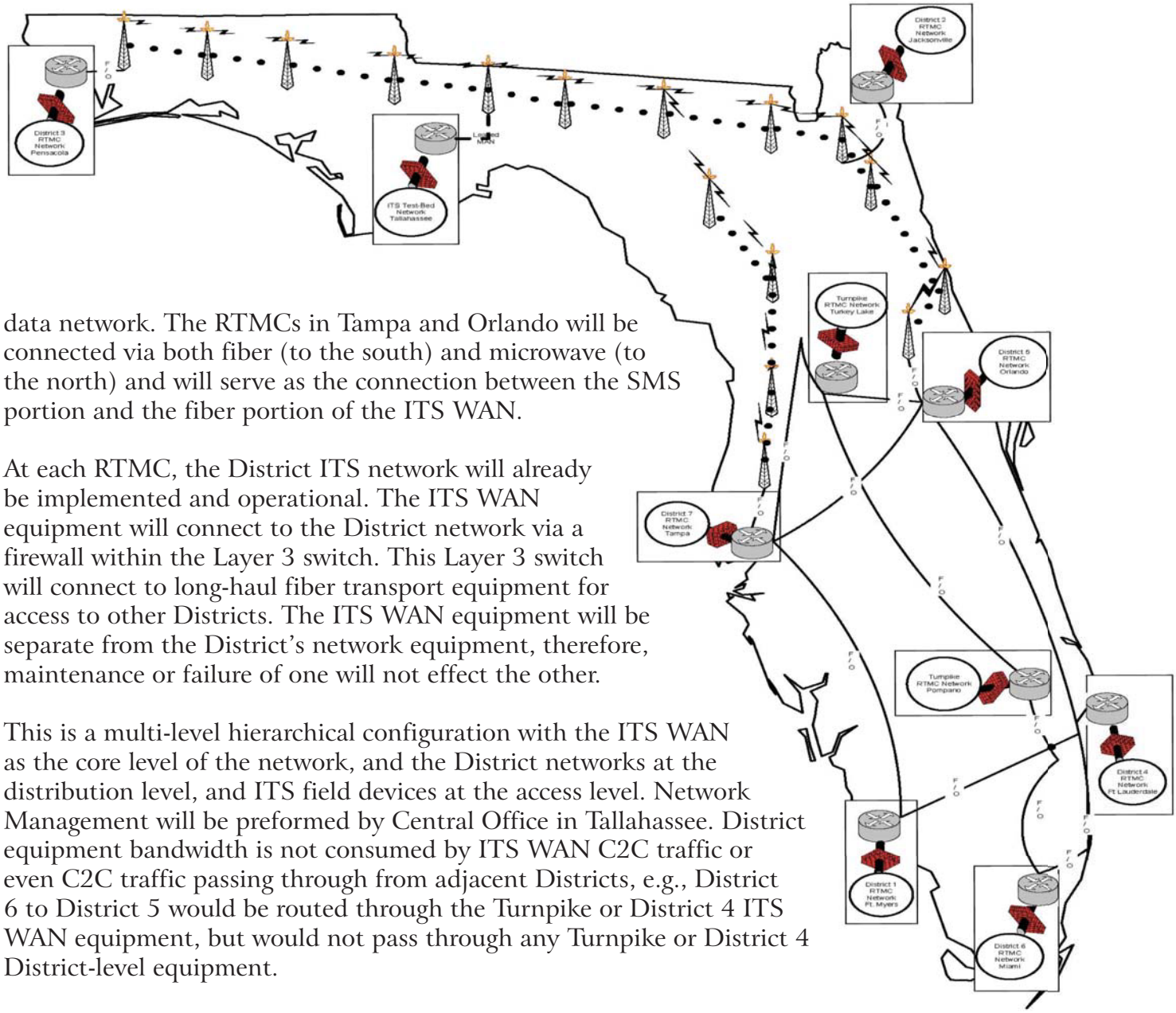
3 switches with firewalls as well as management equipment. Physical connectivity will be provided via fibers in District cables deployed under the *CEP*. The Telecommunications Program has devised a plan where SunGuide℠ software will set up the connections and the Barco Universal Decoder and Wall system will decode the various disparate video streams used by different Districts.

The equipment installed at the ITS test-bed, collocated at the TERL, is essentially the same as required at the RTMCs, plus the equipment required to manage the ITS WAN. The TERL will be connected to the SFD via the SMS. Therefore, this deployment will test both the fiber and microwave connections envisioned for the remaining RTMCs. The connection to the SMS will occur at the McArthur SMS site at the Sunrise exit of Florida's Turnpike. The primary goals for the SFD are to demonstrate the ITS WAN concept with operational RTMCs and provide network management capabilities near the Central Office in Tallahassee at the TERL.

In order to provide this C2C communications, the SMS was recently upgraded with multi-protocol switches capable of bundling multiple T1s together to provide a high bandwidth Ethernet connection. The resultant high-speed data network has the capacity to provide approximately 30 Megabits per second (Mbps) between hub sites and up to 3 Mbps from remote sites to hub sites.

This ITS WAN will connect District ITS networks together while allowing them to operate autonomously. The Central Office will provide the RTMCs in each District with the ITS WAN equipment to achieve connectivity to this WAN. Each District will be responsible for their own ITS network and network access points for other public or private traffic agencies within their District. The ITS WAN will connect District nodes with a high bandwidth network on dedicated fibers deployed by the Districts or through the lower bandwidth SMS data network previously mentioned.

Fiber optic links are being planned for the ITS WAN within the southern two-thirds of the state (south of the Tampa/Orlando area). District RTMCs in the northern one-third of the state will utilize the SMS



data network. The RTMCs in Tampa and Orlando will be connected via both fiber (to the south) and microwave (to the north) and will serve as the connection between the SMS portion and the fiber portion of the ITS WAN.

At each RTMC, the District ITS network will already be implemented and operational. The ITS WAN equipment will connect to the District network via a firewall within the Layer 3 switch. This Layer 3 switch will connect to long-haul fiber transport equipment for access to other Districts. The ITS WAN equipment will be separate from the District's network equipment, therefore, maintenance or failure of one will not effect the other.

This is a multi-level hierarchical configuration with the ITS WAN as the core level of the network, and the District networks at the distribution level, and ITS field devices at the access level. Network Management will be preformed by Central Office in Tallahassee. District equipment bandwidth is not consumed by ITS WAN C2C traffic or even C2C traffic passing through from adjacent Districts, e.g., District 6 to District 5 would be routed through the Turnpike or District 4 ITS WAN equipment, but would not pass through any Turnpike or District 4 District-level equipment.

This design for the ITS WAN makes it scalable and capable of meeting the requirements to connect RTMCs around the state. When complete, these connections will provide FDOT with state-wide video images, incident management, emergency operations services, and performance measures.

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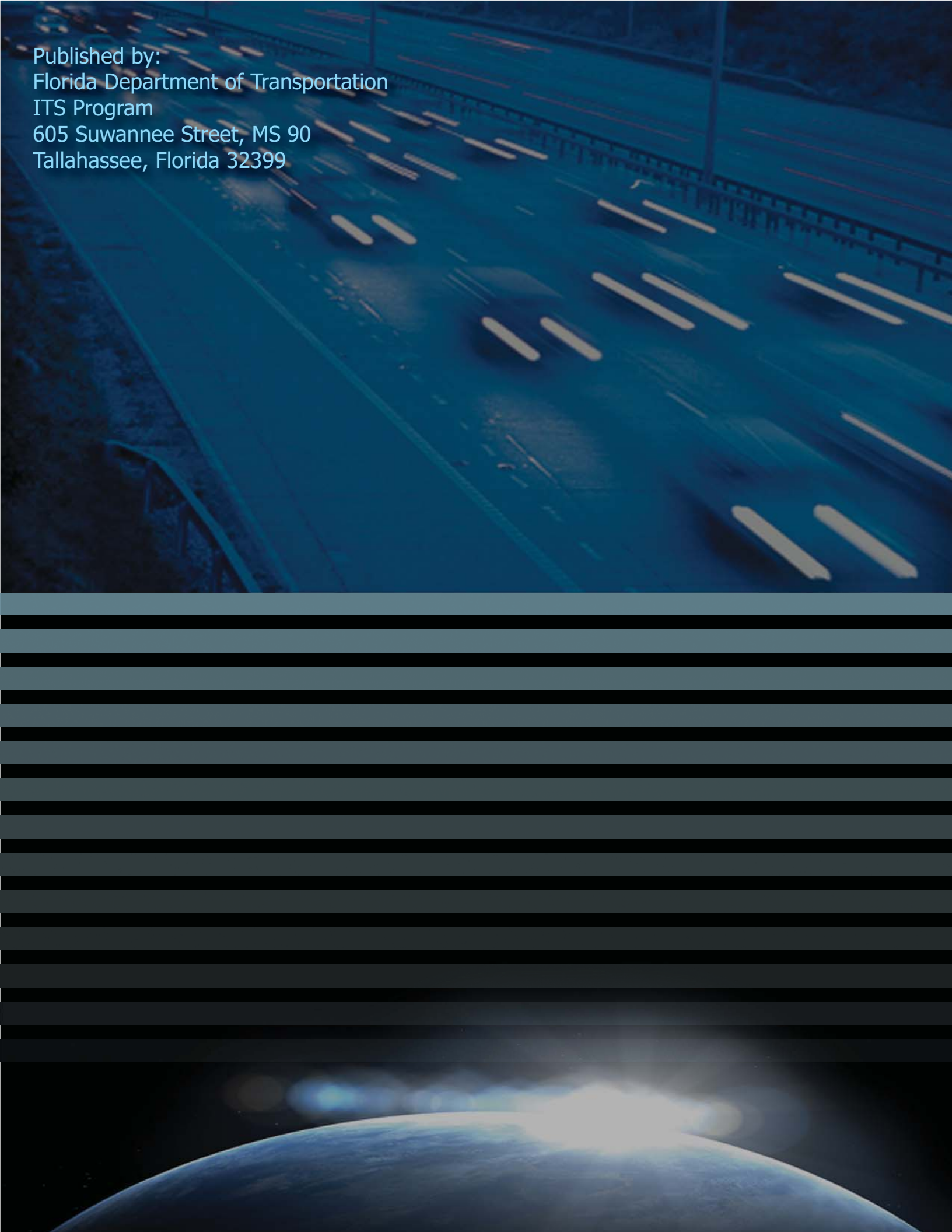

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