

Statewide ITS Performance Measures

Draft Final Report



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Executive Summary

This report documents the initial effort in identifying and reporting statewide ITS performance measures. The Florida Transportation Commission (FTC) asked the ITSFL Advisory Council to identify suitable measures, and an expert Team was assembled to carry out this extensive assignment. It is the intention of the Commission to include the findings of this report in its 2004 *Performance and Production Review of the Florida Department of Transportation* as a newly-incorporated ITS chapter to be continually refined hereafter.

As can be seen in the background and literature review presented in this report, Florida is a recognized leader in performance reporting for its Department of Transportation and now has expanded that reputation to be one of the first states to include ITS in performance reporting. The FTC is now leading an effort to transition from measures that are primarily production (or output) -related to developing more measures that reflect on actual performance, or outcome of investment. At this relatively early stage of ITS deployment throughout Florida, it is much easier and realistic to document and report on *output* and indeed that is what this initial report has recommended. However, in the very near future as the deployment and integration of ITS proliferates in Florida, it will become imperative to quantify and report on more of the *outcome* measures this report has identified.

To kickoff this ITS performance measure evaluation effort, a workshop was conducted that included extensive FDOT and private sector participation. A number of prominent national leaders were also invited to provide guidance, moderate breakout discussion groups, and share their unique insights. Preliminary (or interim) recommendations were generated as a result of this workshop, which were then refined in more extensive interviews with the Districts and Turnpike Enterprise.

In general, much was learned on the type and availability of data needed to best reflect ITS production and performance. More importantly, it is now clearly apparent that the development and reporting of ITS performance must be viewed as an evolutionary process. In other words, what can be reported in the future (due to more extensive ITS deployment, and corresponding commitment and consistency in the required performance data gathering) will greatly exceed and enhance what can be reported now. It is strongly recommended that the measures identified in this report be carefully re-examined and refined (modified, expanded, or new measures added) as needed on an annual basis.

At this time, three general measures have been identified that will form the initial foundation for all subsequent ITS performance reporting in Florida. These measures are

- ***Total Annual 511 Calls,***
- ***Total Annual Road Ranger Stops, and***
- ***FIHS Limited Access Miles Managed by ITS***

For the period April 2003-March 2004, **over 2.8 million 511 calls** were made under the two existing Florida (southeast area and central) systems. Florida's total monthly calls have grown by 85 percent over this period, and now represent just under 29 percent of the nationwide total.

During this same period, **over 310,000 Road Ranger stops** were made along the current 987 miles of coverage. Only four of the Districts currently provide service on a 24-hour/7 days a week basis, and almost all of the 111 total statewide fleet of Road Ranger vehicles are equipped with automatic vehicle location technology.

As of the end of March 2004, **170 miles (or 8 percent) of the limited-access portion of the Florida Intrastate Highway System (FIHS), are managed by ITS.** Three Districts currently have no mileage that can be categorized as FIHS Limited Access Miles Managed by ITS. However, extensive ITS deployment is planned for these (and the other) Districts and the Turnpike Enterprise over the next several years and beyond.

Finally, it can be concluded that as a result of this effort, there is a need to establish a plan for ITS-related data collection that is accepted statewide, adequately funded, and regularly conducted by ALL the Districts and the Turnpike Enterprise. Likewise, before-after traffic data collection studies must be properly defined and formally included as a component of all ITS projects in Florida.

Acknowledgment

Three committees were organized to provide review, oversight, and input during the duration of this statewide effort. The participation of these committees has been greatly appreciated. The committee members are as follows:

ITS Performance Measure Team

- Anita Vandervalk, Cambridge Systematics, Inc. (*Chair*)
- Michael Pietrzyk, Transportation Solutions, Inc. (*Principal Author*)
- Ken Voorhies, Cambridge Systematics, Inc.
- Robert Krzeminski, FDOT Systems Planning Office
- Lorin Krueger, LK Consultants
- Matt D'Angelo, PBS&J
- Hebbani Lokesh, FHWA Florida Division
- Anne Brewer, FDOT District Five
- Jon Cheney, Volusia County Traffic Engineering
- Gene Glotzbach, FDOT ITS Central Office
- Tahira Faquir, FDOT District Four (and most recently ITS Central Office)

ITSFL Advisory Council

- Mark Reichert, Florida Transportation Commission
- Husham Al-Kaisey, Hillsborough County
- Charles Wallace, PB Farradyne, Inc.
- Eric Hill, Metroplan Orlando
- Haitham Al-Deek, University of Central Florida
- Terry Griffith, 3M
- Leslie Griffin, Orlando-Orange County Expressway Authority
- Terrel Shaw, TranSystems Corporation
- Ike Ubaka, FDOT Public Transportation Office

Workshop (October 2003) Planning Subcommittee

- John Taylor and Faustyn Knobloch, RS&H
- Mark Reichert, Florida Transportation Commission
- Robert Krzeminski, FDOT Systems Planning Office
- Lorin Krueger, LK Consultants
- Gene Glotzbach, FDOT ITS Office
- Anita Vandervalk, Cambridge Systematics, Inc.
- Michael Pietrzyk, Transportation Solutions, Inc.

Disclaimer

The opinions and recommendations contained in this report are those of the author and the ITS Performance Measure Team, tasked by ITS Florida and the Florida Transportation Commission to develop such recommendations for the state. To a large extent, the opinions and recommendations included herein have been influenced from discussions during the October 14-15, 2003 ITS Performance Measures workshop held in Orlando, and subsequent interviews with FDOT Central, District and Turnpike Enterprise offices during the data collection phase of this project.

I. Background

Performance measurement is an integral part of transportation system management. Performance measures provide accountability to the public, improve communication between operators and users of the system, and assist in the state's delivery of transportation services. Performance measurement in transportation can be used to set policy, allocate resources, and report on results (before/after analysis of improvement projects).

The primary project partners involved in this statewide effort include the Florida Transportation Commission (FTC), the Florida Department of Transportation (FDOT), and the Intelligent Transportation Society of Florida (ITSFL). The FTC is statutorily charged with evaluating the performance, operational productivity, and fiscal management of the FDOT. On a quarterly basis the Commission undertakes this task, with the fourth quarter report serving as the annual *Performance and Production Review of the Department of Transportation* (24). The annual review is an expanded report, which includes performance measures on 18 major programs within the Department. Up to this point, although newly evolving, the impacts of FDOT's ITS deployment has not yet been reported (except for *SunPass* participation, which was added for the first time in the September 2003 report).

Founded in 1992 as the first formal ITS state chapter of ITS America, ITSFL serves as a mechanism to facilitate communication among its members, ITS America, and other governmental, academic, and private institutions and associations in order to increase the awareness and deployment of advanced transportation technology in Florida. The ITSFL Advisory Council was appointed in August 2001 to assist FDOT in all ITS-related matters by serving as a two-way liaison between the ITS community and FDOT in offering advice and channeling questions. The Commission recently approached the ITSFL Advisory Council and asked them to identify suitable ITS performance measures to assess how effectively the implementation of ITS technologies are addressing the safety and capacity needs of the state's transportation system. It is the intention of the Commission to include the recommended initial ITS performance measures in its 2004 annual report, and subsequently update and refine the recommended ITS performance measures as deployment proliferates and matures throughout the state.

The ITSFL Advisory Council then appointed an ITS Florida member to lead the task of developing performance measures. This leader formed an ITS Performance Measures Team, comprised of representation from the FDOT Central Office Planning and ITS offices, district ITS offices, expressway authorities, and other experts from around the state. An advisory committee comprised of broader representation was also established to review the work of the Team. A smaller sub-set of the Team was established specifically to plan a workshop, described later in this document. The smaller team was instrumental in finalizing a draft of the Interim Recommendations Report.

II. ITS Performance Measure Initiatives

Within the State of Florida, ITS and non-ITS transportation performance measure initiatives have occurred and remain ongoing. Led by the FTC since the early 1990's, and more recently by the FDOT ITS and Planning Offices, various related activities have preceded and coincided with this particular effort, as noted below. Likewise, on a national scale, several other states and the U.S. DOTs have placed priority on operational performance and the need to monitor and report, with such national examples noted at the end of this section.

A. Statewide

Florida Transportation Commission

In 1990, the State Legislature first directed the FTC to establish a performance monitoring process. The need to create such a process was primarily due to a financial crisis that caused a lack of confidence in the FDOT in 1989. Initially, the Legislature mandated sanctions which would be imposed against the Department if the performance criteria were not met. However, after development of the criteria the FTC recommended to the Legislature that the sanctions be removed. They believed sanctions based simply on numerical evaluations did not provide solutions to a problem and many felt monetary sanctions would penalize the public, not the persons who may have been responsible for a problem. The Legislature accepted that recommendation and instead of sanctions directed the FTC to recommend actions to be taken to improve the Department's performance.

The Commission searched for an existing guide for statewide performance measure development, but quickly found that there was *NOT* an existing model. The decision was made to create a Working Group to develop measures for recommendation and adoption by the Commission using a few pre-determined guidelines. The guidelines followed were simple and few:

- *Measures must be simple and clear to the layperson and easily interpreted,*
- *Measures must be fair to the DOT, focusing mostly on areas within the Department's control,*
- *Measures should focus on areas of most concern to the public user/taxpayers,*
- *Measures should be quantitative to the maximum extent, and*
- *Measures should not create a new data collection, but should use available data.*

The Working Group of 13 members consisted of Commission staff, FDOT Assistant Secretaries and District Secretaries, industry representatives, Partners in Productivity/Tax Watch representative, and a citizen at-large member. Collectively, this group had well over 200 years of transportation knowledge, accumulated from diverse perspectives of engineers, planning, management, contractors, consultants, and policy makers.

The performance measures were adopted by the Commission on December 12, 1991 and

submitted to the Legislature for approval during the 1992 Session, with a recommendation that they not be codified into law. The Working Group, the Commission, and the Legislature all recognized that this first set of measures was by no means a final product and that ongoing refinement would be needed. The Working Group, although changed in composition over the years, has continued to meet and make improvements. Some measures have been dropped, and others added, while keeping a core of consistency for comparison from year to year.

The FTC provides the Governor and Legislature with a detailed annual report each September on the Department's performance known as *Performance and Production Review of the Department of Transportation*. Where concerns have been identified the Department has implemented corrective action or the Commission, the Department, the Legislature and others have worked to find the explanation for the performance concerns and to identify a solution.

Most recently on May 10, 2004 a new Working Group was created to totally re-examine the current performance measures. According to the new Working Group;

- Some performance measures are weak due to the lack of data at the time of development, and more data may now be available to make the performance measures more meaningful,
- The underlying data for some measures may need to be improved upon. (For example, the growing use of district-wide contracts may impact the validity and accuracy of some measures),
- Department business practices are changing and new program areas are emerging (e.g., ITS, State Intermodal System, Electronic Tolling, Asset Management, etc.),
- Some performance measure standards that were a challenge years ago, are now too easily attainable and objectives should be raised or changed,
- There is more data available now than ever, and
- More efficiency measures are needed (e.g., outcome versus output measures).

The goal is to have performance measure recommendations approved by the Working Group by January 2005 to forward to the entire Commission for review. Performance measure recommendations should be reviewed and approved by the Commission so that they can be reported in the September, 2005 report, if possible. (*It should be noted that the findings of this report are intended to establish the initial ITS Chapter for the September 2004 report*).

In particular, the Working Group is focusing on addressing the following questions:

1. Is it still a meaningful measure, and if not, why is it not meaningful?
2. Is there a better way to measure performance in this program area?
3. Can the existing measure be improved upon, and if so, how can it be improved?

4. How often should the measure be reported?
5. Should the standard of the measure be changed, and if so, what should the standard be?
6. Are there Department programs or functions that are not currently measured that need to be? If so, identify and recommend a meaningful performance measure, and identify how often the performance measure should be reported.

FDOT ITS Office

The FDOT ITS Office previously developed, but never officially adopted, a family of proposed performance measures as part of FDOT's *Ten-Year ITS Cost Feasible Plan* (13). These mobility, safety, and agency performance measures/goals (37 in all) were derived from the goals and objectives of *Florida's ITS Strategic Plan* (6), and coordinated with the FDOT's Mobility Performance Measures Program (9) used in the Short-Range Component of the *Florida Transportation Plan*, and linked to national performance measure priorities for safety and mobility identified in FHWA's *Vital Few* report. The link to the five major goal areas of the National ITS Program was also distinctly incorporated into *Florida's ITS Planning Guidelines* (8) and *Florida's ITS Integration Guidebook* (7). This previous work by the Department provided the backdrop and focus for discussions before and during the ITS performance measure workshop (described later in this report).

B. National

As part of the investigation into ITS performance measures, a number of state DOTs (Minnesota, Michigan, Texas, Virginia, Colorado, Arizona, Pennsylvania, California, Georgia, Utah, and Montana) and FHWA regional offices (Madison, WI; Providence, RI; Olympia, WA; Columbus, OH; San Francisco, CA; Sacramento, CA; Albany, NY; Atlanta, GA; Olympia Fields, IL; Santa Fe, NM; Salem, OR; and Baltimore, MD) were contacted for status information.

From those that did respond, many do NOT have a systematic ITS performance measure program in place but several are also now in the developmental stages similar to Florida. Many of the measures that are being utilized are project specific, typically used only to provide justification for implementation, and are not ongoing. Several states, most notably Oregon, Washington, Colorado, Maryland, Georgia, California, and Utah did have some valuable insight to offer.

In finalizing its proposed measures, Oregon required that each be measurable, forecastable, feasible, easily understood, non-temporal, non-geographic, multimodal, relevant, useful, and controllable (23).

For the last seven years, the Washington State DOT Strategic Assessment Office has published their performance report which includes number of incident responses per month, incidents per month with clearance times greater than 90 minutes, number of monthly calls to traveler information service, traveler information website usage per month (including ten most popular camera sites), commute trip reduction by mode, on-time performance for commuter rail and

ferries, and reduction in road closure times associated with automated anti-icing systems (obviously, not a problem in Florida but interesting as far as real-time maintenance performance reporting afforded by application of a new technology). (14)

The Colorado Department of Transportation determined that their eventual ITS performance measures would be used to substantiate which specific ITS program areas would best support pre-established CDOT investment strategies, and to allocate resources accordingly. Investment strategies focused on services and programs to improve mobility, safety, system quality, and program delivery. Colorado has also found that direct measurement of benefits from ITS components is difficult to isolate, but that the creation of a baseline performance standard is necessary to benchmark existing conditions. Additionally, measuring the performance of ITS systems requires appropriate definition of the relevant geographical area or boundaries of the transportation corridor that may be affected (3).

The Coordinated Highways Action Response Team (CHART) program of the Maryland State Highway Department offers an example of what is widely-recognized as one of the most successful, truly statewide ITS programs for incident response and management. Since 1997, CHART has reported on response times, incident durations, and number of assisted drivers. From these factors, reduction in trip delay times, fuel consumption, and vehicle emissions compared to highway users have been estimated (25).

The State of Georgia produces a weekly and monthly performance report for internal Georgia DOT staff, illustrating a number of traveler information and traffic operations statistics associated with NaviGator, the Georgia equivalent to *SunGuide*SM. Some of the traveler information statistics include number of calls taken (per day, by month, by roadway, and by type), average call length, average answering time, and website visits. Traffic operations statistics include number of incidents managed, detection method, and device maintenance trends (availability) over time. Georgia DOT is also developing a business plan for NaviGator which will formalize ITS performance measures. Incident response time, incident clearance time, reliability and accuracy of incident detection, and mean time to failure for detection equipment are expected to be key measures of performance. Occasionally, performance data is published on the NaviGator web site (www.georgia-navigator.com).

The California Department of Transportation (Caltrans) is implementing a statewide performance measures initiative which includes seven outcome indicators that measure overall transportation system effectiveness and efficiency (1). The seven outcome indicators are safety/security, system preservation, mobility/accessibility, reliability, environmental quality, cost-effectiveness, and customer satisfaction. Although not uniquely related to ITS performance, these indicators do provide a very logical and meaningful theme to follow for transportation system performance.

The Utah Traffic Operations Center in Salt Lake City publishes a monthly report of activities and performance. The October 2003 report summarizes the number (by type) of field devices deployed, percent of operational field devices (by type), and presents a number of operational

indicators. Operational indicators such as the number of incident responses (by type), 511 calls, website visitors, number of VMS messages posted, e-mail alerts sent, travel time index (actual travel time as a percent of free flow speed), percent variation of travel time index (over three different times of the day), and average intersection delay (seconds per vehicle per intersection) on arterial streets are included. One of the more unique measures being reported is the number of incidents where traffic signal re-timing was utilized as a response tool (16).

C. Federal

At the U.S. DOT level, mention of several related resources should be made. First, the Federal Highway Administration (FHWA) Office of Operations provides a website for transportation performance measure fundamentals, which includes key steps, major issues, and publications associated with performance measurement (26). Second, the National Cooperative Highway Research Program (NCHRP) has recently published NCHRP Synthesis 311, which provides a snapshot of the state of the practice in operational performance measurement. One of its conclusions points to the need to develop a data dictionary of performance measures to address current inconsistencies in reporting (21). The NCHRP also has a new project (Project 3-68, *Guide to Effective Freeway Performance Measurement*) which will develop a guide on the effective use of freeway performance measures in operating the system and in meeting the informational needs of a large spectrum of local, regional, and national users. Thirdly, the FHWA ITS Joint Program Office has recently unveiled an updated *ITS Evaluation Resource Guide* to include more examples to develop evaluation plans, evaluation strategies, test plans, and final reports (12).

Lastly, the annual *Urban Mobility Report*, published by the Texas Transportation Institute measures for the first time this year the effect of three types of roadway operating efficiencies (each related to ITS technology application) – traffic signal coordination, freeway incident management, and the use of freeway entrance ramp meters. According to this report, despite relatively low national deployment rates at the current time for these types of operational treatments, they alone account for an annual delay decrease of 2 hours per person for all peak period trips (19). The report goes on to project a 15 percent delay reduction, or 13 hours per person annually, if these remedies were to be implemented on all the major roads in the 75 study cities. This reduction, according to the report, would equate to reducing congestion to 1996 levels.

III. Performance Measure Development Process

The development process for ITS performance measures consisted of a statewide workshop (including invited national experts), where preliminary measures were identified and discussed among strategically-organized breakout groups. Ultimately, a general consensus was reached among all workshop participants on the initial list of performance measures, which were refined by the ITS Performance Measure Team.

A. Workshop Description

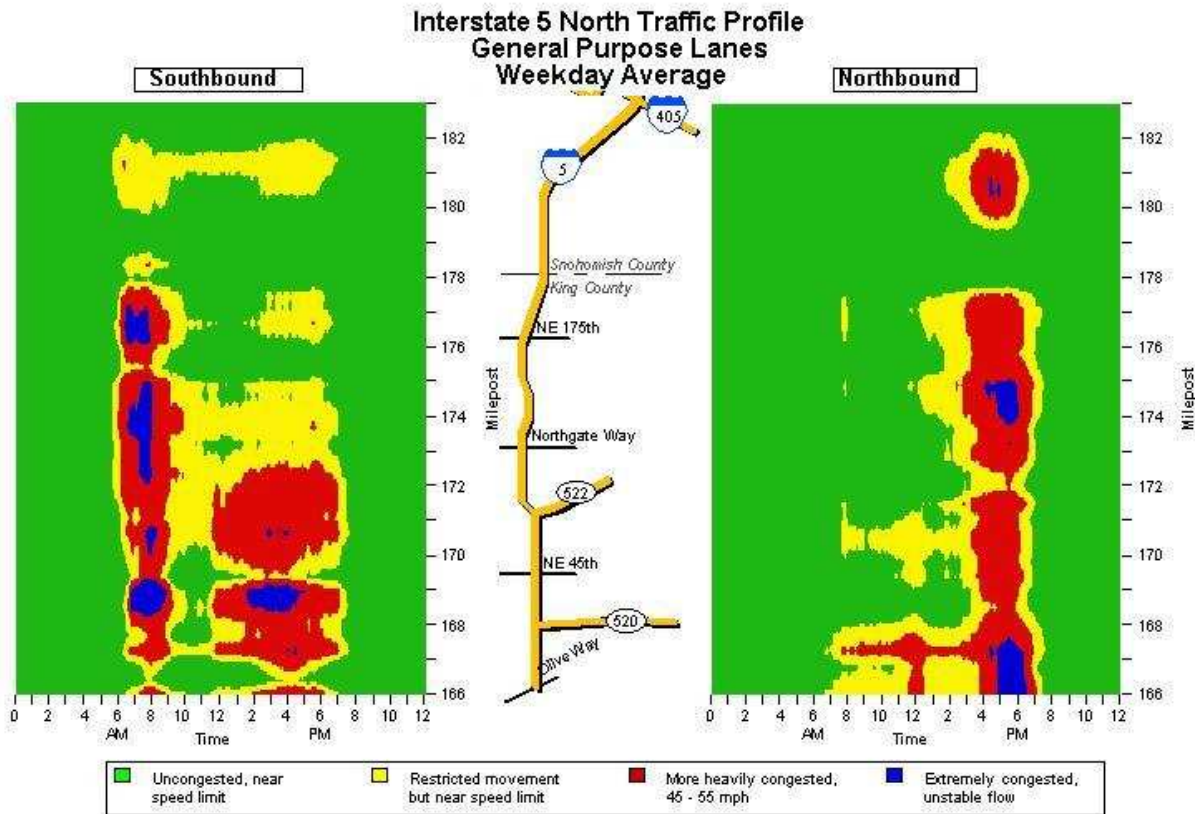
As a prelude to the development of ITS performance measures, a workshop was organized and conducted in Orlando on October 14-15, 2003. Over 50 invited statewide ITS professionals from traffic operations, safety, transit, commercial vehicle operations, and performance management participated in this workshop. Attendance included representation from the seven FDOT District offices, the Florida Turnpike Enterprise, and the Central office.

The workshop began with presentations by a national panel of invited experts in ITS performance measures development. The panel was lead by Joe Peters, Manager of ITS Program Assessment in the FHWA ITS Joint Program Office, Washington, D.C. Other national experts included Mark Hallenbeck-Director of the Washington State Transportation Center at the University of Washington in Seattle, Tim Lomax-Program Manager for Mobility Analysis at the Texas Transportation Institute at Texas A&M University, John Orban-Field Evaluation Leader for Battelle in Columbus, Ohio, and Grant Zammit-ITS Specialist from FHWA's Southern Resource Center in Atlanta. These experts offered ideas and concepts and shared examples of current ITS performance measures being used throughout the country, and how they were being reported.



Workshop Participants Take in Advice Offered by National Experts

Some of the most effective measures were found to be those that could be graphically reported. One particularly striking example given by one of the national panel speakers of a *visual* performance measure was for average weekday travel speeds along the Interstate 5 corridor in Seattle as shown below. In this example, one can quickly get a sense of the most congested areas as shown by the red and blue.



Following the national panel experts, Gene Glotzbach-FDOT ITS Central Office led a panel of state speakers in key areas involved with and impacted by ITS deployment. The state speaker panel included Patrick Brady-FDOT Safety, Gordon Morgan-FDOT Statistics, Tahira Faquir-FDOT Traffic Operations (District 4), Ike Ubaka-FDOT Public Transportation, and Rick Schuman (PBS&J, *iFlorida* Project Manager). These speakers provided examples for existing and future ITS areas of impact from which performance measures could potentially be focused.

Following presentations and insight offered by the members of the national and state panels, workshop participants were then assigned into one of three breakout groups: Operations & Maintenance, Safety, and Mobility.



Operations & Maintenance



Safety



Mobility

Following about 5 hours of intense discussion and debate, these groups were each asked to recommend preliminary performance measures relative to their respective group areas. The workshop summary, including all presentations, is posted on the FDOT ITS Office website:

www.dot.state.fl.us/intelligenttransportationsystems/online%20documents/itsmeasurements/itsmeasurementworkshop.htm.

B. Summary of Workshop Discussions

A consensus was reached on several key issues and assumptions during this workshop. In no particular order of importance these were:

- 1. The development of ITS performance measures is an ongoing process that will be solidified as more and more ITS are deployed over a larger area and across other modes of travel throughout the state (greater proliferation of integrated ITS is expected to provide greater benefits and the ability to document such). Major focus now is the interstate system and selected corridors and intersections.*
- 2. ITS performance measures should be able to measure success in meeting FDOT's ITS Program goals and objectives.*
- 3. Even though ITS performance goals have not yet been formally established in Florida, it is generally believed that ITS goals are to be viewed as an operations tool to better manage congestion.*
- 4. It will be difficult, but not impossible, to isolate the benefits derived from ITS deployment alone.*
- 5. Incident response time is more indicative of ITS performance than incident clearance time.*
- 6. Deployment tracking (output of the Department) measures may be more appropriate now, but as ITS deployment becomes more extensive throughout the state evolving*

measures should be targeted more toward reporting actual performance (outcomes as experienced by the user).

- 7. Performance measures can be used to justify the need for dedicated funding source(s).*
- 8. Any measure that can be reported in economic terms (dollars saved or budget reduced) will be much more effective. Benefit-cost ratios are not performance measures; they should be used for deployment analysis only.*
- 9. ITS performance measures selected for reporting should minimize or eliminate the need for additional data to be collected, and should be stated in terms that are easily understandable to policymakers and the general public.*
- 10. The current FDOT Customer Satisfaction Survey prepared by the FDOT Policy Planning Office should be modified to include questions related to the value put on information provided by ITS.*
- 11. As ITS performance measures are identified, they will fall into one of three categories or levels; primary (those chosen for inclusion in the FTC Report), secondary (those providing more comprehensive details of impacts for FDOT management), and tertiary (for internal FDOT Operations staff use only).*
- 12. Besides actual measures of performance, it will also be important to report ITS benefits through the use of simplified case study examples (e.g., feedback from SunPass and Road Ranger customers).*
- 13. Specific and detailed project performance measurement (and selection of specific project performance measures) should be left up to the appropriate District(s) for internal monitoring purposes, but develop understandable standardized measures to report general statewide ITS performance.*

Additionally, significant discussion and reference during the workshop was made to customer satisfaction surveys. It should be noted that the FDOT Policy Planning Office conducts a biennial customer satisfaction survey that began in 2000. The purpose of the survey is to assess customer requirements and expectations for key issues, as identified by the customer groups. Telephone surveys (15 minutes each, approximately 1,650 respondents) are used for Florida residents, visitors to Florida, and commercial drivers. Mail-back surveys (typically 40 percent response) are used for governmental officials (three are identified in each county). Property/business owner surveys are hand-delivered and picked-up. Different questions are used for each customer group. An overview of survey results is posted at www.dot.state.fl.us/planning/customers/customer_survey.htm. ITS has not yet been identified as a key issue by any of the customer groups, and the opportunity may exist to add a

very generic question or two on ITS (perhaps related to awareness of SunPass, Road Rangers, or 511 traveler information).

C. Initial Performance Measures

In concluding this workshop, each breakout group presented their respective ITS performance measures (long-list) for future consideration by the Team. These were as follows:

Operations & Maintenance

- Number of incident management (Road Ranger) responses
- Average time to clear incidents
- Number of 511 calls during times of incidents
- Number (or percent) of lane-miles equipped with ITS components suitable for emergency management
- Percent electronic transactions for transit payment
- Percent transit trips on-time
- Percent participation of commercial motor carriers in electronic screening
- Number (or percent) of commercial motor carriers that are electronically by-passed at weigh stations

In addition, the group recommended to add customer satisfaction survey question(s) for ITS (e.g., Road Ranger comment cards), account for the number (or percent) of traffic signals that are computerized and provide progression, and include case studies to document success stories in ITS deployment.

Safety

- Response time for incidents
- Clearance time for incidents
- Reduction in number of secondary incidents
- Reduction in work zone crashes (when ITS is applied)
- Reduction in pedestrian and bicycle crashes (when ITS is applied)

Mobility

- Percent person-hours of delay*
- Percent truck-hours of delay*
- Reliability measured by Buffer Time Index (95th percentile travel times compared to average)*
- Number of Road Ranger assists
- Number of media partnerships
- Frequency of 511 calls and related web site hits

* Measures can be provided for top-ten commuting corridors, top-ten transit routes, top-ten Interstate corridors, or top-ten freight corridors, as desired. *Measure* where this data is available, and *estimate* where data is not available, but clearly distinguish between the two when reporting. Standards and targets for mobility are needed to

assess effects from ITS if congestion gets worse. Also under mobility, but as a follow-up to the workshop discussions, two other system measures for ITS versus non-ITS corridors have been suggested; vehicle-miles of travel/vehicle-hours of travel (speed index) and passenger-miles of travel/vehicle-hours of travel (throughput index).

In addition, the group recommended adding questions to customer satisfaction survey (awareness of traveler information, usefulness of information, and satisfaction with the level of information being provided).

IV. Preliminary Recommendations and Implementation Test Plan

Given the current stage of statewide ITS deployment in Florida (see www.dot.state.fl.us/IntelligentTransportationSystems/), under ITS Deployments, modest and simplified performance measures will be most appropriate at this time. In other words, the consensus was to condense the initial long list of performance measures into an interim list that could be reported. Furthermore, 2004 should be established as the baseline year for measuring and comparing ITS performance throughout the State.

A. Interim Performance Measures

Based on insight gained from the workshop, review of pertinent literature (including other state examples and current Federal priorities), and further committee discussion and input from key workshop participants, the following interim ITS performance measures were recommended by the ITS Performance Measure Team to move forward into the Data Collection Phase:

- **Number of 511 calls during times of incidents**
- **Number of Road Ranger responses during times of incidents**
- **Average incident response time (as defined by FHP CAD reports)**
- **Average incident clearance time (as defined by Open Roads Policy)**
- **Percent of actual versus planned ITS deployment (as defined by FDOT Ten-Year ITS Cost Feasible Plan), conducted on an annual basis**
- **Reliability of travel time, as measured by Buffer Time Index for top-ten travel corridors (in each District)**
- **Delay, as measured by passenger-miles of travel/vehicle-hours of travel (ITS versus non-ITS equipped corridors)**
- **Percent of electronic toll and/or transit payment transactions to total transactions**
- **Percent of electronic by-passes at truck weigh stations**

Additionally, it is recommended that stories of ITS success in Florida could also be documented in brief narrative, and the existing biennial Customer Satisfaction Survey should be considered as a means to gauge general awareness and benefit of ITS services. It is also recommended that a statewide workshop occur each year to review and assess the performance, and modify (as necessary) the statewide performance measures for ITS.

B. Implementation Test Plan

Following the identification of the interim ITS performance measures, further refinement of these measures took place and the Team worked closely with each District over the ensuing six months

to seek the available performance data that could feed these measures. A 6-step implementation test plan was outlined as follows

1 – Review Recommended Measures with Districts – The ITS Performance Measures (PM) Team reviewed the recommended measures with each district at Working Group and associated meetings. Phone calls to district ITS engineers supplemented discussion at Working Group and ITS Strategic Plan meetings.

2 – Finalize Initial Measures – ITS PM Team modified measures per district suggestions and secured statewide consensus on which initial measures to carry forward into next step. This included making initial recommendations on specifics related to the measures. For example, the recommended measure *number of 511 calls during times of incidents* was revised to specify number of 511 calls *per hour* during times of incidents. Geographical coverage of reporting was also considered here.

3 – Review of Data Availability – Districts (with assistance from ITS PM Team) reviewed availability of data to support reporting of recommended measures. During this period Central and District offices reviewed availability of data to support reporting on the measures at their respective levels. Data questions such as availability, frequency, quality, and timeliness were addressed.

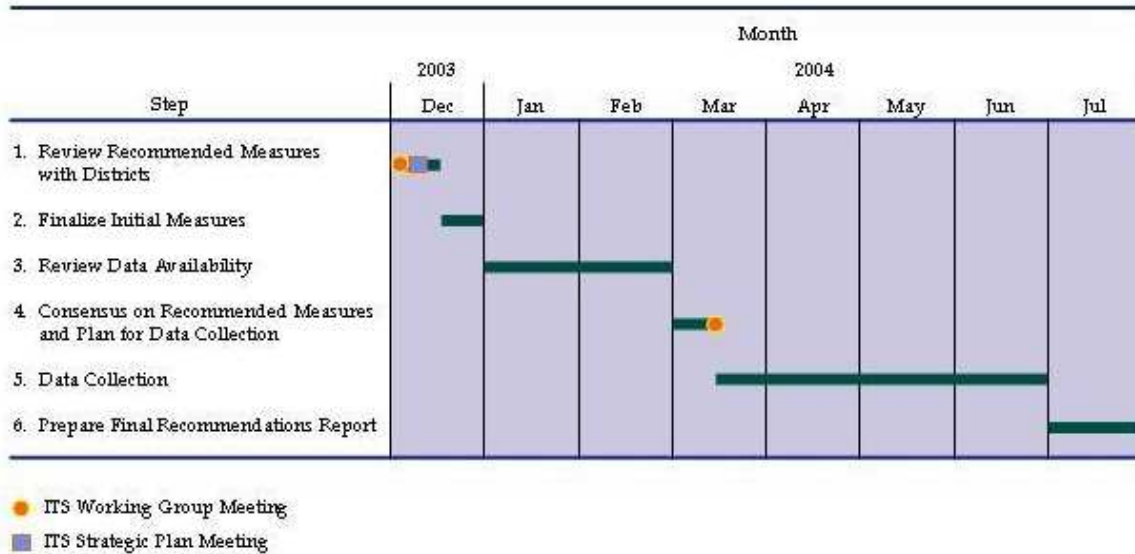
4 – Consensus on Recommended Measures and Plan for Data Collection – This occurred at an ITS Working Group meeting with the districts where the measures were finalized and an agreement was made to begin data collection.

5 – Data Collection – Districts, with assistance from Central Office and ITS PM Team collected information to support reporting the measures. Central ITS and Planning offices also compiled statewide data, as appropriate.

6 – Prepare Final Recommendations Report – ITS PM Team summarized the statewide reports and prepared a final recommendations report for Florida Transportation Commission to include in 2004 *FTC Performance and Production Review* report.

The following shows the schedule used.

ITS Performance Measures Implementation Test Plan



It was anticipated by the Team that a number of issues also need to be discussed further during implementation testing. In no particular order of importance these issues are:

- Statewide archiving requirements and responsibilities for ITS data
- Goals for tolerable delay (what specifically are we trying to accomplish with ITS?)
- Affected area of influence and reporting for ITS (metropolitan areas only, key bottleneck areas only, District versus District, State AND local operating agencies?)
- How to isolate the impacts attributable to ITS?
- How to measure ITS integration?
- Extent of ITS instrumentation versus operating performance, and what is defined as fully-instrumented?

V. Data Collection and District Interviews

The purpose of the data collection phase was to utilize FDOT District (including Florida's Turnpike Enterprise) and Central Office input to further scrutinize and refine the interim ITS performance measures, and to assess the existing availability of appropriate data to feed these measures. The collective results of this input and specific performance measure issues are noted below.

A. District and Central Office Interviews

Each District was asked to identify a primary, and sometimes secondary, contact for ITS data related efforts. A general questionnaire (included in the appendix of this report) was developed and used for each District interview. Typically, the Districts were asked to complete the questionnaire, follow-ups were then conducted either by phone, e-mail, or in-person. Sometimes multiple follow-ups were needed to fully assess status of related program/project, availability of pertinent data, or understanding of the measure itself. As related to the interim ITS performance measures, interviews were also conducted with the FDOT Public Transportation Office (PTO), the Commercial Vehicle Operations (CVO) representative of the central ITS office, the FDOT Transportation Statistics Office, and the two 511 service providers to the FDOT. All of these contacts have been listed in a separate section immediately following the appendix of this report.

B. Data Collection Issues

For each of the interim ITS performance measures, various issues were encountered during the interviews and/or data collection effort. These issues were either basically resolved and did not impact the interim measure as originally defined, required a significant clarification or further refinement of the measure, or directly impacted the use of the particular measure at this time. The following summarizes the basic issues and characteristics existing for each interim measure.

Total Annual Number of 511 Calls

In Florida, there currently are two 511 (traveler information) service providers; Tellme Networks (www.tellme.com) (Interstate 4 corridor in central Florida, including Brevard, Lake, Orange, Osceola, Volusia and an eastern portion of Polk Counties) and SmartRoute Systems/Westwood One (www.smartraveler.com) (Palm Beach, Broward and Miami-Dade counties in southeast Florida). The southeast Florida service started in July 2002, whereas the central Florida service began earlier. Ultimately, this type of service will be offered statewide, with Martin and St. Lucie counties being added as early as next year to the South Florida 511 service. The southeast Florida service contract is managed by District 6, and covers District 6 plus Broward and Palm Beach counties in District 4. The central Florida service contract is managed by District 5 and covers the central Interstate 4 corridor. Both services were offered before the eventual conversion to the present 3-digit, 511 system. Each service also offers web-based traveler information. Significant improvements (e.g., interactive voice response (IVR), intensified awareness marketing,

multimodal trip planning applications, expanded real-time speed and travel time data gathering capabilities, and website enhancements) are underway for both systems. As described in the remainder of this section, the total *monthly* number of calls for each service can be provided at this time, this measure of quantification will be utilized for purposes of this report.

Data on call statistics is available, but detailed information on usage is currently obtained primarily through the service providers (or PBS&J, a consultant for the 511 Deployment Coalition). It was desired to obtain and report the total annual number of 511 calls by hour of the day, by origin of call. However, usage by hour of the day over the entire year is not currently being routinely compiled for either service. Likewise, origin of calls is not compiled (except by route request of caller and wireless carrier versus landline callers for southeast Florida service only). Examples of current 511 data compilation capabilities are provided in the appendix of this report.

The central Florida system is a *hosted* system that allows transparent handling of all caller demand (i.e., theoretically, there is no capacity limit on incoming calls). In southeast Florida, there is no capacity for overflow calls (i.e., caller can get busy signal). The new voice-activated system currently being developed for southeast Florida may also become *hosted* and eliminate the overflow capacity problem. No statistics are available for the number and frequency of these missed calls.

Total Annual Number of Road Ranger Assists

While the Department began providing service patrols and roadside assistance to motorists during the reconstruction of I-95, the Department officially began funding the Road Ranger Program in December 1999. Bid out to private contractors, the Road Rangers are roving vehicles which patrol congested areas and high incident locations of the urban freeway, and provide **free** roadside assistance to disabled or stranded motorists, remove debris and abandoned vehicles, and assist with maintenance of traffic during times of incident management. The overall objective of this program is to help reduce travel delay associated with incidents by providing quick response to motorists in need. The total annual number of Road Ranger stops will be utilized in this report.

All of the Districts and the Turnpike Enterprise currently operate a Road Rangers Program. However, the services provided, hours of operation, fleet size, and coverage are not consistent among these entities. The extent and automation of service documentation and general record-keeping varies greatly. Road Ranger Log Forms are generally the same, but there is wide variation on what information from the form is electronically recorded. Some Districts, but not all, routinely breakdown assists by Road Ranger route, shift, or corridor. Likewise, the types of Road Ranger assists being provided are not delineated in the same manner across all programs. It should also be noted that one District's Road Rangers Program currently does not provide traffic control assistance during incidents.

Because of the varying types of assists currently being recorded, the total annual number of Road Ranger stops (combination of ALL assist types) will be utilized for purposes of this report. Location summary of stops will not be addressed or noted at this time, however extent of Road Ranger coverage for each District will be documented in tabular and map (see appendix) format.

Average Annual Incident Response and Clearance Time

Again, since all Districts and the Turnpike Enterprise currently operate a Road Rangers Program (although, as previously mentioned, one District does not assist in incident management), it should be possible to automatically document response and clearance times. However, for the most part now, this type of information is only manually noted on the Road Ranger Log Forms, and it is difficult to transfer and compile the response data electronically. Since the data required for this type of measure is currently not easily retrievable and able to be compiled, this measure will not be reported on at this time.

Debate is still ongoing as to whether both response AND clearance time is affected by the application of ITS. The workshop indicated response time is most appropriate ITS-related performance measure and represents a safety measure as well. Clearly, response time is directly affected by the presence and integration of detection and communication technologies. Clearance time, some would say, is more affected by jurisdiction/response agency policy and a clear understanding and commitment to that policy by ALL incident responders. Also, the Florida Statewide Traffic Incident Management Group is currently identifying best practices and reporting standards for clearance time performance under a separate project.

Several definitions were required in order to properly assess the value of this type of measure. First of all, for clarification and consistency an *incident* is defined as any event occurring within the roadway right-of-way that requires a response AND includes notification to FDOT. *Response time*, to be consistent with the intent of response time definition in the *Open Roads Policy*, is defined as that time that begins with incident notification (to FDOT) and ends with arrival of FDOT to the scene of the incident. Further, *notification time* and *arrival time* will most likely have to be determined by FDOT/TMC records. As FDOT, FHP and local responders continue to work together and response systems become better coordinated, it is desirable that the response time being tracked migrate to the point in time when the *first responder* from any responding agency arrives on the incident scene. However, at this point it is only possible to document the FDOT Road Ranger response time. District 4 and District 6 are currently upgrading to an automated data collection system for their respective Road Ranger Programs, which should greatly ease documentation associated with this kind of measure and provide a prototype for other Districts.

Percent FIHS Limited Access Miles Managed by ITS

All Districts and the Turnpike Enterprise are committed to the deployment of ITS. Each has embarked in various stages and pace, in accordance with the *FDOT Ten-Year ITS Cost Feasible*

Plan, with this deployment. Clearly it is important to report ITS deployment progress on an annual basis, but once again a number of aspects of this measure need to be defined and/or clarified. The number of FIHS Limited Access Miles Managed by ITS and the percentage of the total FIHS mileage for each District will be reported.

First, it was determined that the basis for ITS tracking and deployment reporting by District will be based on the percent of Florida Intrastate Highway System (FIHS) limited-access mileage contained in each District that is managed by ITS. When and if ITS are deployed on non-limited access FIHS and off the FIHS by the Districts or integrated with local government ITS, then base mileages for the (percent) FIHS Limited Access Miles Managed by ITS will be adjusted accordingly to reflect this expansion of deployment. The FIHS limited-access mileage in each District was reviewed and modified as necessary by each District, and the approved mileage is broken down by facility for each District in the appendix of this report. Second, known as



, the FIHS Limited Access Miles Managed by ITS are defined as (centerline) mileage that includes ALL of the following attributes:

1. Traffic probes and/or sensors,
2. Real-time traffic information reporting coverage,
3. Real-time incident response capabilities, and
4. Availability of real-time traffic data to FDOT

Additionally, ALL of these attributes must be continuously operated and maintained (permanent systems), permitting contiguous coverage of the mileage noted in order to meet the definition. Minimum spacing for traffic sensors, and extent (or saturation) of traffic probes is not specified, only that the sensors and/or probes are placed such that continuous and contiguous coverage of the claimed FIHS Limited Access Miles Managed by ITS is maintained. Temporary or portable ITS is not to be included in this mileage, but instead should be properly footnoted for reference in the performance reporting. If temporary or portable ITS are expected to be permanently and immediately installed without losing any service capabilities for any reasonable length of time (no less than 6 months), then it can be included in the mileage. ITS under construction is NOT to be included.

The use of these criteria to define FIHS Limited Access Miles Managed by ITS is illustrated by the Palm Beach ITMS in District 4. This project, which began operations in 2003, covers the 44.2 miles of I-95 in Palm Beach County. The system meets all the criteria for FIHS Limited Access Miles Managed by ITS, however, the traffic sensors are mounted on portable platforms that can be moved short distances to accommodate construction phasing. District 4 states that they currently plan to replace the ITMS devices with permanent equipment after construction is completed in 2007, although a project to do so has not been defined. It was determined that since the traffic sensors provide continuous coverage and the District plans to provide permanent equipment then the Palm Beach ITMS project will be included in the FIHS Limited Access Miles

Managed by ITS. At a later date, if the District does not provide permanent ITS, then this Palm Beach County mileage should be deleted.

Travel Time for Peak Periods

No District or the Turnpike Enterprise currently collects travel time on a regular comprehensive basis. Although some are currently investigating the reliability and accuracy of automated methods to capture this type of data (e.g., ITS traffic sensors archived data files, probe vehicles w/electronic toll tags, GPS, cell phone technology, etc.), no systematic process, schedule, and funding have yet to be identified. Simulated or derived/modeled travel times were determined to be not acceptable at this time. Therefore, at this time, this measure will not be included.

Ideally, it is desirable to capture this information, generally during peak periods along pre-defined travel segments on the limited-access portion of the FIHS system BEFORE and AFTER the deployment of ITS. Then, as ITS are deployed incremental benefits over time attributable to ITS (in this case perhaps less variability and more reliability in travel times) could be best defined by a measure such as the *Buffer Time Index* (BTI). The BTI identifies the percent of extra time (or variation in travel time) a driver would have to allow for unpredictable congestion in order to arrive at their destination on-time, 95 percent of the time (i.e., $BTI = ((95^{\text{th}} \text{ percentile travel time}) - (\text{average travel time})) / (\text{average travel time})$). Obviously, the lower the BTI the better and this trend should be achieved with the deployment of ITS.

In 2000, the Transportation Statistics office developed the Florida Reliability method which was derived from the Department's definition of reliability of a highway segment as the percent of travel from one point to another that takes longer than the expected travel time plus an acceptable additional time. (36) For example, a corridor is rated in terms of the percent of time that travel from point A to B falls below an 'acceptable' time. They tested several methods of data collection to report on the measure for major corridors within the state including travel time and delay runs and the use of existing traffic monitoring equipment. Data collection recommendations included the need to collect data over a four week period at 15 minute intervals to provide an adequate sample size. It was determined that the best available data (most efficient to collect) would come from deployed ITS systems.

Prior to the deployment of ITS, data collection would be relatively more cumbersome and the sampling less robust. Following the deployment of ITS, data collection should become inherently automated, less costly, more comprehensive, and easier to retrieve, compile and analyze.

Average Annual Passenger-Hours of Delay

Likewise, this type of traffic data is not currently being collected. For all the same collection requirements noted above for travel time, this measure will not be included at this time. However, once captured, this measure can be used to directly estimate many of the anticipated economical benefits of ITS such as reduced fuel consumption, less emissions, and lost wages. A

standard method for calculating passenger delay is also needed; however, it is anticipated that average auto occupancy and transit vehicle ridership factors used by local MPOs will be used in the eventual passenger delay calculations.

As part of its statewide mobility measures program, the FDOT Statistics Office also investigated reporting of statewide delay. Data derived from Statewide Telemetered Traffic Monitoring Sites is used to compile statewide averages of delay defined as the difference between the anticipated travel time (free flow speed) and the estimated travel time (average daily speed). Free flow speed is defined as posted speed plus 5 mph and Average Daily Speed is calculated using volume / capacity. The current objective included in the Department's Short Range Component of its Florida Transportation Plan is to maintain the rate of change of delay per person on the FIHS. Again, corridor specific data along ITS corridors will be necessary to evaluate the benefits of decreased passenger hours of delay as a result of ITS deployment.

Percent of Electronic Toll/Transit Payment Transactions

The current *FTC Performance and Production Review* (section 7C) contains the percent of



participation. Even though several of Florida's public transit properties offer electronic fare payment (EFP) options, usage data is not currently being collected. The FDOT PTO Office preferred two other measures at this time; Percent AVL-Equipped Transit Fleet, and Percent of Eligible Signalized Intersections on State Facilities with Operational Transit Signal Priority (TSP) Systems. Both of these pending measures are now being compiled by the FDOT PTO, and may be included in a future year report. ITS transit-related performance will be eventually documented and reported on a statewide basis (preferably within this annual report, or at the very least integrated under existing transit system performance reports).

The first PTO preferred measure, Percent AVL-Equipped Transit Fleet, is straightforward and relatively easy to compile. The second PTO preferred measure currently defines eligible signalized intersections as those intersections that serve primary transit routes and are located in a moderately congested corridor. This criterion will be used to identify a first-cut of eligible intersections, and eventually PTO hopes to work with each District Traffic Operations Office to develop additional criteria that could be used to identify and rank eligible intersections. More importantly, this measure will also serve as the first real integration of ITS, traffic engineering, and transit operations.

Percent of Electronic By-Passes at Truck Weigh Stations

Known as *PrePass*®, Florida's Cooperative Vehicle-Highway Automation System (CVHAS) is in its relative infancy stage of development, in that very few commercial carriers are currently participating. Consequently, it is not reasonable to report this type of measure at this time. However, discussion of such a measure has definitely stimulated performance measure thinking among Florida's CVO industry. It is now anticipated that when the time is right, the most appropriate performance measure(s) will be clearly identified and fully embraced.

C. Recommended Best Current ITS Performance Measures and General Practices

Given the current state of data availability and other related data issues noted above for each of the interim ITS performance measures, it is recommended that the following three measures be selected and reported at this time:

- **Total Annual 511 Calls** (by month, by Service Area, State Total)
- **Total Annual Road Ranger Stops** (by District, State Total)
- **FIHS Limited Access Miles Managed by ITS** (by District, State Total)

These three measures provide the most representative depiction of the present state of ITS deployment in Florida, albeit only from an output/production perspective. As expected, actual ITS performance is difficult to measure and report at this time. Appropriate measures directly related to ITS outcome/performance will gradually evolve over time following more extensive deployment, greater integration of operations and services, and commitment to an expanded performance data collection and reporting program throughout the state.

These three measures form the initial foundation for regularly reporting ITS activity and progress in Florida. They should and will be expanded in the future. On an annual basis, both reported by the FTC and more extensively by the FDOT ITS Office, data for these (and future) measures should be re-captured and reported in similar fashion in order to build yearly trends. The previously described interim ITS performance measures should be re-visited annually to determine the current availability of data, and the capability and meaningfulness of reporting. Also, each year altogether new measures (both output AND outcome related) should be identified and assessed for inclusion. However, priority should always be placed on the improved quality and understandability of ITS performance reporting, not on the sheer number of performance measures that can be added each year.

Further recommendations for ITS data collection, related policy, and other ITS performance reporting specifics are noted in the *Recommendations for Future* (section VII of this report).

VI. Performance Measure Findings

This section of the report describes the most significant findings related to each of the three recommended ITS performance measures. Additional background information and coverage mapping for these measures can also be found in the appendix of this report.

Total Annual 511 Calls

Since July 2000, when the Federal Communications Commission (FCC) designated 511 as the 3-digit telephone number for traveler information, 21 locations in 20 states are operational (32). Over one million calls per month are now being made to these existing systems, currently available to over 56 million Americans (17). It's interesting to note that the level of monthly 511 calls now being made in Florida represent just under 29 percent of the nationwide total. The ultimate goal is to provide coverage throughout the U.S. by 2010. The most popular content on most 511 systems is traffic and road conditions, alternate route information (during incidents), construction information, weather-related problems, and public transportation information/options.

In Florida, two areas of the state currently offer this service to travelers; southeast (Miami-Dade, Broward, and Palm Beach counties) and central (the Interstate 4 corridor in Brevard, Lake, Orange, Osceola, Volusia and an eastern portion of Polk Counties) Florida. The ultimate goal is to provide complete and seamless service within Florida (and throughout the nation). In the appendix of this report, geographic coverage maps are included for existing and near-term future 511 systems.

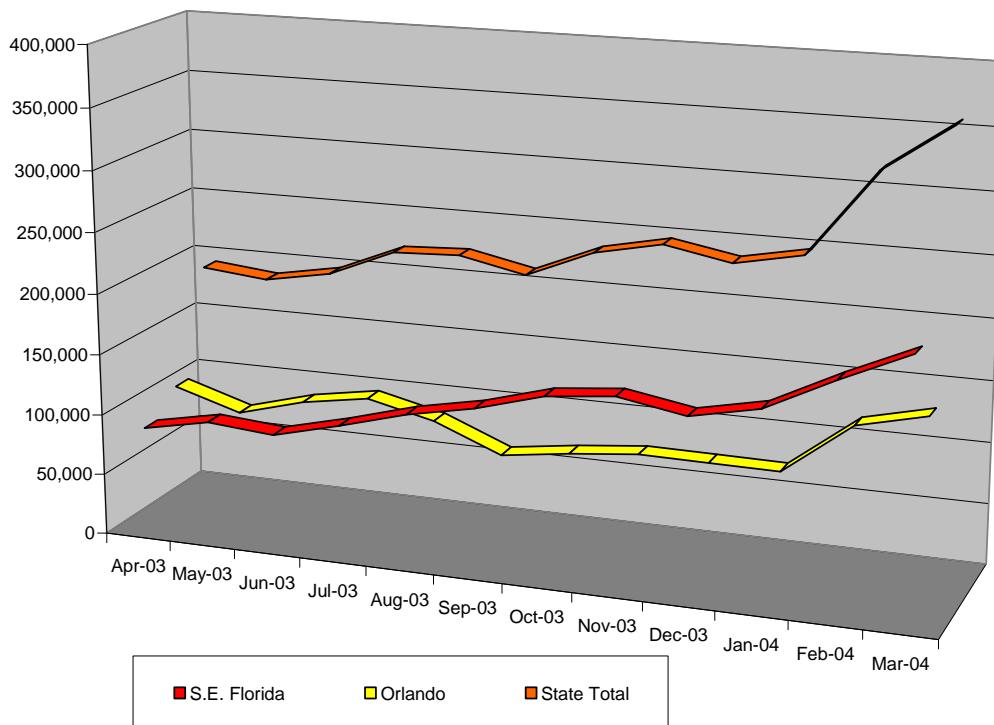
For the period April 2003-March 2004, over 2.8 million 511 calls were made under the two Florida systems (see figure below). The southeast Florida system handles 57 percent of the monthly statewide calls. However, according to the May 2004 *National 511 Progress Report*, the central Florida system, currently covering only a single roadway (approximately 50 miles along Interstate 4), "receives some of the highest call volumes per capita (in the nation)." Customer satisfaction is very high for first-time and repeat users. According to the national report, "in southeast Florida 80 percent of the current users said the 511 system was either most or second most important source of transportation-related information". Also, "in southeast Florida, over 97 percent of survey respondents reported changing their route at least once based on information from 511".

As can be seen in the following graphic, August 2003 marked the first month since both systems have been operating where calls for the central Florida system were exceeded by the southeast Florida system, and this trend is continuing. Also, total statewide monthly calls have been increasing every month during this reporting period, with an overall annual increase of 85 percent. As can be seen from the appendix information, the highest single-hour volume of calls during this reporting period for the central Florida system was 1,561 (between 4-5 p.m.), although

any unusual conditions that may have created this particular level of calling are not readily known.

The most compelling story on 511 usage (for the southeast Florida system) comes from the most recent annual evaluation conducted by the University of Central Florida. The report findings concluded from a user survey that travelers called the 511 system an average of once a day, and if this rate reflects true usage, then “no more than 5,000-7,000 different travelers are currently calling 511 in southeast Florida”(28). Clearly, many more could still be utilizing this service and tremendous growth in caller demand will eventually be realized with greater marketing and outreach.

Monthly 511 Calls



Total Annual Road Ranger Stops



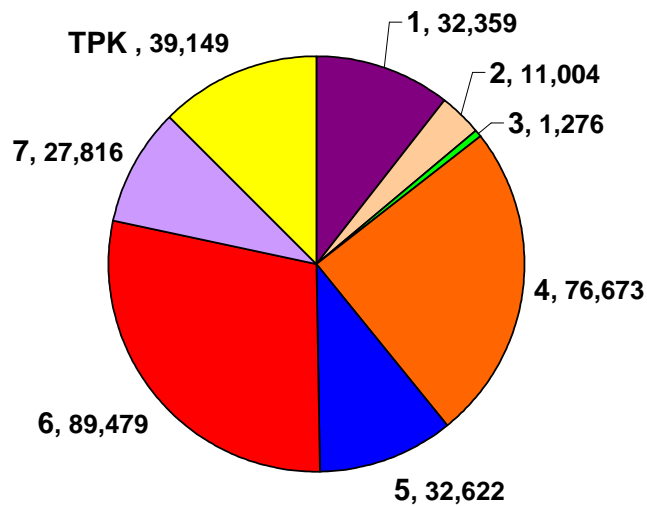
For the period April 2003-March 2004, over 310,000 Road Ranger stops were made statewide along 987 miles of coverage, as summarized in the following table and graphic. Only four of the Districts currently provide Road Ranger service on a 24/7 basis. Also, the vast majority of the 111 total statewide fleet of Road Ranger vehicles are equipped with automatic vehicle location capabilities. See figures below for breakdowns by District.

Road Ranger Stops

District	Total Annual Stops	Total Fleet Vehicles	Fleet Coverage (centerline-miles)	Hours of Operation
1	32,359	21 (6 w/AVL)	241	24/7
2	11,004	8 (all w/AVL)	84	5:30-10 a.m. and 3-7:30 p.m., 5 days/week
3	1,276	1 (w/o AVL)	11	6 a.m.-8 p.m. M-F, 7 a.m.-7 p.m. Sat., 9 a.m.-5 p.m. Sun.
4	76,573	22 (all w/AVL)	111	6 a.m.-7 p.m. M-F, 24 hours/day on weekends & holidays
5	32,622	9 (all w/AVL)	53	24/7
6	89,479	30 (all w/AVL)	90	24/7
7	27,816	6 (all w/AVL)	52	24/7
Turnpike Enterprise	39,149	14 (all w/AVL)	345	6-10 a.m. and 4-8 p.m., 7 days/week
Statewide	290,770	111	987	Varies


AVL = automatic vehicle location

Total Annual Stops By District



FIHS Limited Access Miles Managed by ITS

As of the end of March 2004, 170 miles (or 8 percent of the limited-access portion of the FIHS) are managed by ITS, as summarized in the following table and graphic. Thus, one could also

generally conclude that approximately 8 percent of the ultimate  has been completed. Three Districts currently have no mileage that can be categorized as *FIHS Limited Access Miles Managed by ITS*. However, extensive ITS deployment is planned for these (and the other) Districts and the Turnpike Enterprise over the next several years and beyond. (See below)

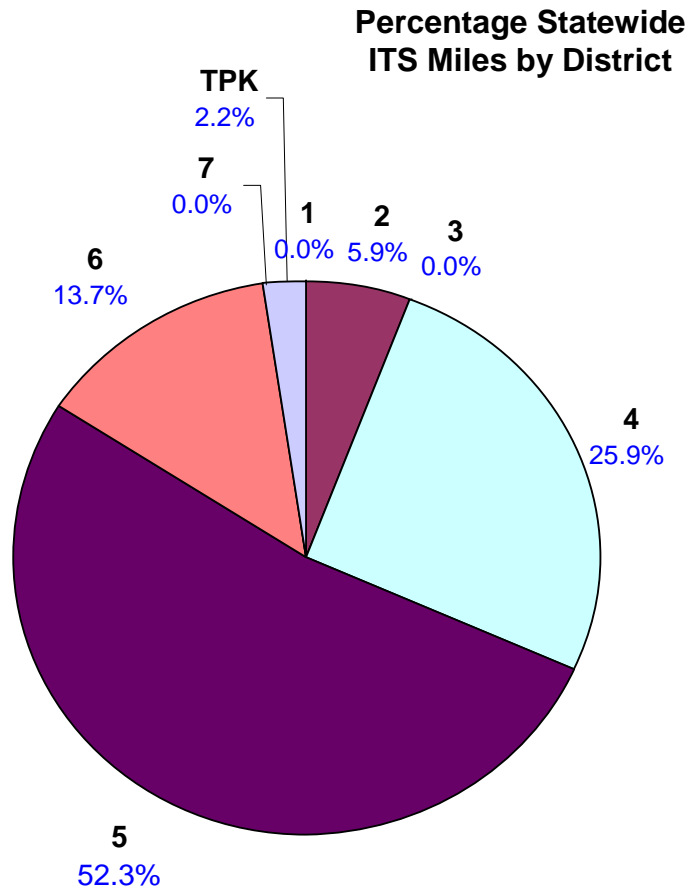
FIHS Limited Access Miles Managed by ITS by District

District	Total ITS Miles	Total Limited-Access FIHS Miles	Facility, Extent, and Location
1	None	222.9	See Footnote (1)
2	10.0 (2.7%)	372.3	I-10: 10.0 miles (Duval Co.)
3	None	242.2	
4	44.2 (21.7%)	203.2	I-95: 44.2 miles (Palm Beach Co.). See Footnote (2)
5	89.0 (23.1%)	386.1	I-4: 7.8 miles (Osceola Co.), 24.6 miles (Orange Co.), 14.1 miles (Seminole Co.), and 28.0 miles (Volusia Co.) I-95: 5.5 miles (Volusia Co.), and 7.0 miles (Brevard Co.) SR-528: 2.0 miles (Brevard Co.)
6	23.3 (28.5%)	81.7	I-95: 17.3 miles (Miami-Dade Co.) SR-826: 6.0 miles (Miami-Dade Co.)
7	None	166.5	
TPK	3.8 (0.8%)	446.7	SR-91: 3.8 miles (Orange Co.)
Statewide	170.3 (8.0%)	2,121.6	

Percent indicated under Total ITS Miles column is based on District limited-access FIHS miles

(1) The I-4 Portable Intelligent Transportation System is being utilized through the construction work zones in Polk County. The approximate limits of this temporary system are from MM 28.2 – MM 56, which is 27.8 miles. This system became operational in 2003, and is scheduled to remain in place until the end of construction on I-4 in Polk County.

(2) This I-95 portable system will be in place until 2008 (anticipated completion of widening). It is the intention of District 4 to immediately transition to a continuously operated and maintained permanent system beyond 2008, however funding is not currently available.



VII. Recommendations for the Future

Further recommendations can be made at this time regarding data collection, related policy, and other ITS performance measuring and reporting specifics. One general overall statement can certainly be made as a result of this initial effort into the development of ITS performance measures... ***for the most part, the deployment of ITS in Florida is just beginning; and accountability for investment in ITS must now be represented in accurate, understandable, yet evolving (and improving) performance measures as deployment proliferates.*** In the future, these initial measures are expected to increase in number, but much more importantly reflect the actual outcome (or performance) of ITS investment. To the greatest extent possible, it will be imperative over time to identify measures that address both direct economic, operational, safety, and mobility benefits attributable to ITS, and basic growth of ITS deployment and related user services. It will also be critical to formally establish realistic goals for each measure, and report annual progress toward attainment of these goals. Finally, goals for customer satisfaction with the services provided by ITS deployments must also be defined and reported.

A. Data Collection Plan

As a result of this initial effort, there is a need to establish a plan for ITS-related data collection that is universally accepted, adequately funded, and regularly conducted by ALL the Districts and the Turnpike Enterprise. This detailed data collection plan should be developed separately from this report, but several objectives can be outlined at this time. The Plan should address both the short term and long term technical and policy issues associated with ensuring adequate data collection, analysis and use. As a minimum, data currently not available for the interim measures, particularly response time of Road Rangers and travel time and delay for key segments of limited-access FIHS corridors, must start to be collected.

For the recommended current measures, 511 calls need to be recorded by hour of the day and Road Ranger stops need to be broken down by type of assist (standard categories to be determined by FDOT ITS Working Group) and also by hour of the day. For 511 calls, user feedback and consumer attitudes must be ascertained, most likely through added questions on the existing biennial FDOT Customer Satisfaction Survey or more regularly through new more extensive surveys. For Road Ranger stops, the summarized findings from the new *feedback* section of FDOT website for Road Rangers should be incorporated (www.dot.state.fl.us/trafficoperations/rrangers/rdranger.htm).

The Data Collection Plan must identify ultimate data sources and methods to analyze this data once fully deployed ITS systems produce necessary and reliable data (such as travel time and speed). The Plan must also investigate and recommend data sources which could be used in the interim. For example, GPS data could be collected – close coordination with ongoing efforts in the FDOT Traffic Engineering office should be ensured. Issues such as consistency of these

interim data sources when compared to ultimate should also be considered. Also, the FDOT Incident Management Software should be used to fill in gaps with respect to statewide data.

Finally, BEFORE (baseline) and AFTER traffic data collection studies must be initiated for ITS. Travel time and delay data need to be gathered for key segments of at least the limited-access portion of the FIHS in each District and the Turnpike Enterprise prior to the deployment of ITS. Likewise, regular monitoring of these same measures in the same locations needs to be done following deployment. For consistency, further discussion needs to take place on the most appropriate methods and sampling technique for data gathering during the BEFORE conditions because baseline conditions are very important. A usable methodology for collecting BEFORE travel time data has been developed for the *I-95 HOV Monitoring Study*, conducted bi-annually by Districts 4 and 6. The need and methodology for AFTER condition monitoring should be emphasized in the *FDOT Statewide Quality Assurance Plan for ITS Deployments* (29). Specifically, in regards to travel time measurement, FDOT should adopt a measure for travel time reliability. The most widely used reliability measure and the one preferred by FHWA is the *Buffer Time Index* (BTI) and it should be considered for use by FDOT. A Data Collection Plan addressing who, how, and when data is to be collected with clearly defined responsibilities should be developed within the next few months following adoption of the PM's by the FTC.

B. Policy Issues

As a matter of internal policy and formal commitment, FDOT must adopt the use and publication of statewide ITS performance measures and approve to annually assess the need for refinement. The primary objective of this adoption process must be to move as realistically as possible from initial output/production measures to a mixture of measures that quantifies outcome/performance of ITS investments. This policy must also stress the need for consistency of data collection across all Districts and the Turnpike Enterprise. The FDOT ITS Office must be responsible for annual ITS performance reporting, in cooperation with all the Districts, the Turnpike Enterprise, and the FDOT Transportation Statistics Office. Likewise, the continuance of an annual statewide workshop for ITS performance measure review and update is strongly recommended.

ITS performance reporting must be mainstreamed by including a separate, new chapter in the annual *FTC Performance and Production Review* of the FDOT. A stand-alone statewide ITS performance report should also be annually published and widely distributed. Measures for statewide reporting should remain high-level; however, Districts should be encouraged to develop more detailed, project-specific measures for internal monitoring of ITS performance.

C. Other

Reporting Period

In order to be consistent with the *FTC Performance and Production Review*, the reporting period for all future ITS performance should match the corresponding fiscal year period (July 1-June 30) of each report. The April-March period was chosen simply as a matter of convenience for this initial ITS performance reporting effort.

Geographic Reference

For future geographic reference and electronic mapping limits of ITS deployment and coverage of ITS user services, mile point designations should be used throughout. Mile points are a component of the existing FDOT linear referencing system (county-oriented), and most commonly used to locate data in a database. The mile point in the Florida Roadway Characteristics (RCI) database is recorded as a number with three significant decimal places. Coverage mapping for each District and the Turnpike Enterprise, such as included in this initial report, must be continued for *visual* presentation of annual ITS deployment growth.

Benefits of ITS

Throughout the development of the ITS PM's much debate regarding what would happen without ITS occurred. ITSFL will be conducting case studies to demonstrate the benefits of ITS for some specific corridors and incidents.

Consistent Framework

Another recommendation to ensure continued consistency among performance measures used within the Department is to develop a cross walk indicating how the Department's Long Range Goals (as contained in the Florida Transportation Plan) coincide with those adopted by the ITS Office and finally how the ITS Performance Measures and goals feed into the larger framework. More specifically, the update of the FDOT Statewide ITS Strategic Plan should include the use of the findings of this ITS Performance Measures report and incorporate these recommendations.