

# Technical Memorandum

## Probe-based Data Collection Concept Test Procurement Project

### Probe Data Collection Concept Test Overview

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Version 2



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## List of Acronyms

CCTV.....	Closed-circuit Television
DOT .....	Department of Transportation
E-911 .....	Enhanced 911
FCC.....	Federal Communications Commission
FDOT.....	Florida Department of Transportation
GPS.....	Global Positioning System
I-10.....	Interstate 10
ITN.....	Invitation to Negotiate
U.S.....	United States

## **1. Background and Concept Overview**

Traffic data collection has traditionally been performed by public agencies charged with managing traffic flow, responding to incidents, carrying out planning activities, and maintaining the roadway. Traditional sensor deployments include inductive loop detectors, closed-circuit television (CCTV) cameras, and other surveillance devices used to monitor conditions on roads within agency jurisdictions.

Nevertheless, recent advances in wireless communications and sensor technologies have resulted in increased private sector interest in the development of innovative traffic data collection solutions. Based on these innovations, opportunities have begun to appear for public sector agencies to more cost-effectively supplement and, in some cases, replace traditional traffic data collection infrastructure. More importantly, the existence of these technologies may, over time, result in a shift in the role played by the private sector from that of simple equipment vendor to provider of data products and services.

The purpose of the probe data collection concept test being planned by the Florida Department of Transportation (FDOT) will be to provide validation testing of the data quality attributes (e.g., accuracy, reliability, and timeliness) of travel time/speed data provided by two third party data content providers. The data content providers selected to participate in the concept test shall use as their primary (and preferably exclusive) data sources probe data based on the following two technologies:

- Cell phones as probes (Vendor 1)
- Global positioning system (GPS)-based probes (Vendor 2)

Descriptions of these two technology solutions are provided in *Sections 1.1* and *1.2*.

### **1.1 Cell Phones as Probes**

There have been significant changes in this technology since it was initially researched as part of the FDOT's 2001 report on innovative data collection.<sup>1</sup> At that time, most of these location systems were being developed to support Enhanced 911 (E-911) services to reflect the Federal Communications Commission's (FCC) mandate that cell phone companies be able to geographically locate 911 callers and traffic applications were, primarily, add-ons to the E-911 application.

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<sup>1</sup> Ciccarelli, Armand, *Technical Memorandum No. 1 — Innovative Traffic Data Collection: An Analysis of Potential Uses in Florida* (Version 1, December 2001), Florida Department of Transportation. Available online at [http://www.dot.state.fl.us/Traffic Operations/Traf\\_Incident/Projects\\_CVO/Probes.htm](http://www.dot.state.fl.us/Traffic%20Operations/Traf_Incident/Projects_CVO/Probes.htm)

By contrast, today's technologies mostly rely on data that the cell phone companies already collect. In order to operate and optimize their systems, cellular carriers collect significant amounts of data that reflect the location of individual cellular handsets. For example, they know when a cell phone (either in use or simply turned on) is handed off from one cell tower to another. This data can be used to calculate, within a certain margin of error, the location of the cell phone at the time of the hand-off. All vendors providing data based on this solution use hand-off data and/or other location data from the cell phone providers in conjunction with their own analysis and modeling to derive traffic information.

As of 2001, many in the transportation community are excited about the prospects of using cell phone-based probe systems to provide traffic information. However, while both the business models and the technology appear to be much stronger now than they were in 2001, it is still not clear if these systems will meet the FDOT's expectations. It is for this reason that independent testing of the quality of data provided via this solution is so important.

## **1.2 Global Positioning System-based Probes**

The GPS is a worldwide radio navigation system formed from a constellation of satellites and their ground stations. While only a few years ago accuracy was about 100 meters, today's GPS can pinpoint a location within 20 meters or less. The base data provided by the GPS is location (i.e., latitude and longitude) and time (i.e., as frequently as every 2 seconds). Point velocity, stop durations, space mean speed, and travel time can be calculated using this data.<sup>2</sup>

Global positioning systems are categorized as either active or passive. In passive systems, the GPS information is stored onboard and subsequently downloaded into a database whenever the vehicle is in proximity of a data download device or the onboard storage device's capacity has been met. In active systems, data transfer occurs in real time via an integrated communications system.

“GPS-based technologies are relatively mature and have been coupled with an array of additional data monitoring features that can subsequently transmit these data and receive real-time information.”<sup>3</sup>

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<sup>2</sup> Vaishali Shah and Dr. Karl Wunderlich, *Sources and Applications of Vehicle Probe Data: A Comparative Assessment of Existing Technologies* (October 2004), Federal Highway Administration, page 14.

<sup>3</sup> Shah and Wunderlich, page 23.

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Although recent tests indicate that position accuracy within 50 meters can be consistently achieved, and that data produced by such systems can consequently be used to generate speed and travel-time information for selected routes, the cost of deploying a sufficient number of active GPS systems to generate accurate probe data presents a major obstacle for public agencies interested in implementing this technology. Public agencies are more likely to use a passive GPS to develop large archives of traffic conditions data for use in informing decision-makers. However, based on recent investments by the private sector, the potential exists for data resources to become available that could be utilized by public sector agencies to derive GPS-based speeds and travel times without the need to deploy stand-alone systems of their own. Such data could instead be bought from larger regional data providers who market their data products to a variety of clientele, including state departments of transportation (DOTs) and other transportation-focused agencies.

## **2. Concept Test**

As the purpose of this test is to evaluate the quality of wirelessly collected probe data, no roadside sensor infrastructure will be deployed to support the two content providers' data collection efforts.

As part of this validation testing effort, the FDOT will:

- Select an appropriate test area with both limited-access roadways and arterials. Preliminary roadways include:
  - Interstate 10 (I-10), including the entire length of road in FDOT District 3 consisting of approximately 230 miles
  - Thomasville Road (U.S. Highway 319) from downtown Tallahassee to the Georgia border consisting of approximately 18 miles
  - Monroe Street (U.S. Highway 27) from downtown Tallahassee to the Georgia border consisting of approximately 21 miles
  - Capital Circle from Thomasville Road (U.S. Highway 319) to the Tallahassee Regional Airport consisting of approximately 14 miles
- Determine start/end dates between which data is to be provided
- Release an invitation to negotiate (ITN) to solicit the participation of appropriate third party content providers
- Collect data from existing data collection systems and floating car runs for use in validating the quality of data provided by the two selected content providers
- Evaluate the results

As mentioned above, FDOT staff will take an active role in validating the quality of data provided by two selected content providers. They will do so using a combination of data from existing traffic data collection systems and floating car runs conducted during the course of the concept test. Floating car runs will be conducted by FDOT field staff along select segments of roadway for which data is to be provided. As part of these runs, FDOT staff will use GPS-based devices to log information about the movement of their vehicles through the test corridors. This data will subsequently be used to determine how well travel times/speeds calculated for the control vehicles correspond to travel times/speeds generated by the two content providers.

The results of this concept test will be provided to the FDOT to support future decisions related to the purchase of third party traffic data content.