# Brevard County
# Advanced Traffic Management System (ATMS)

# Concept of Operations

**June 2015**
**Version 2.0**

Prepared for:
Space Coast Transportation Planning Organization
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# List of Acronyms

| | |
|---|---|
| ADMS | Arterial Dynamic Message Sign |
| APL | Approved Products List |
| ATMS | Advanced Traffic Management System |
| CCTV | Closed-circuit Television |
| CR | County Road |
| ConOps | Concept of Operations |
| DMS | Dynamic Message Sign |
| EOC | Emergency Operations Center |
| EVP | Emergency Vehicle Preemption |
| FDOT | Florida Department of Transportation |
| FHP | Florida Highway Patrol |
| FON | Fiber Optic Network |
| GIS | Geographic Information System |
| GPS | Global Positioning System |
| GUI | Graphical User Interface |
| I-95 | Interstate 95 |
| IT | Information Technology |
| ITS | Intelligent Transportation Systems |
| LAN | Local Area Network |
| NITSA | National ITS Architecture' |
| PRG | Priority Request Generator |
| PRS | Priority Request Server |
| RTMC | Regional Traffic Management Center |
| RWIS | Roadside Weather Information Station |
| SCAT | Space Coast Area Transit |
| SCTPO | Space Coast Transportation Planning Organization |
| SITSA | Statewide Intelligent Transportation System Architecture |
| SR | State Road |
| TED | Time Estimated Departure |
| TERL | Traffic Engineering Research Lab |
| TIM | Traffic Incident Management |
| TMC | Traffic Management Center |
| TSP | Transit Signal Priority |
| US | United States (Highway) |
| VDS | Vehicle Detection System |
| WAN | Wide Area Network |

# 1. Overview

## *1.1 Identification*

This document will serve as the Concept of Operations (ConOps) for the Advanced Traffic Management System (ATMS) Expansion for Brevard County. The existing and proposed ATMS projects, devices and system components are discussed, as well as the relationships and responsibilities of the various agencies utilizing the data and video obtained through this system.

## *1.2 Document Overview*

A ConOps document includes the proposed environment of the system and the system utilization by stakeholders and associated agencies. It specifically describes the ATMS and components that are already in place or are being proposed for future deployment in Brevard County to support the needs of the agencies and the public.

This document is organized as follows:

Section 1 – Overview
Section 2 – Referenced Documentation
Section 3 – Current System Situation
Section 4 – Justification and Nature of the Changes
Section 5 – Concepts for the Proposed System
Section 6 – Operational Scenarios
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Section 8 – Analysis of the Proposed System
Section 9 – Glossary

The development and management of the Brevard County ATMS Concept of Operations is based on a number of guidelines and builds upon planning, reports, and documentation developed prior to the development of this Concept of Operations, including:

- State and Federal Guidelines
- Project Planning Reports
- FDOT ITS Strategic Plan
- Brevard County ITS Strategic Plan
- Space Coast TPO Master Plan

The development of this Concept of Operations and other project management materials for the Brevard County ATMS project were developed in accordance with guidelines and information presented at the Florida Department of Transportation's (FDOT) SEMP website, which can be found at the following link:

http://www.dot.state.fl.us/trafficoperations/ITS/Projects_Deploy/SEMP.shtm

The development of this Concept of Operations document was prepared as required by State guidelines and systems engineering processes as defined in the following documents:

- Deliverable 1-10: Technical Memorandum, Florida's Statewide Systems Engineering Management Plan, Version 2, March 7, 2005.
- Technical Memorandum: Writing a Project Systems Engineering Management Plan (Version 4, September 29, 2006).

## *1.3 System Overview*

The Brevard County ATMS system is a collaborative effort between FDOT District 5, the Space Coast Transportation Planning Organization, Brevard County Signal Maintaining Agencies (The City of Melbourne, the City of Titusville, the City of Palm Bay and Brevard County) as well other County stakeholders. This system consists of the design and construction of ITS infrastructure and ITS sub-system components along the arterial corridors in Brevard County, Florida. The following corridors are currently instrumented with the ITS devices and communications as shown in the table below:

| Corridor | Segments | | Total Fiber | | ADMS | CCTV | Signals | BlueTOAD | Wireless Pucks | Adaptive |
|---|---|---|---|---|---|---|---|---|---|---|
| | Extents | Extents | Feet | Miles | | | | | | |
| **US-192** | Simon Rd | I-95 NB | 5,050 | 0.96 | 0 | 1 | 0 | 1 | 0 | No |
| | I-95 | Dairy Rd | 22,300 | 4.22 | 4 | 4 | 12 | 6 | 113 | Yes |
| **Wickham Rd** | Shoppes Drive | Jordan Blass Dr | 18,809 | 3.56 | 2 | 7 | 12 | 0 | 390 | Yes |
| | Pineda Plaza Way | Sarno Rd | 29,704 | 5.63 | 1 | 10 | 14 | 0 | 0 | No |
| | Sarno Rd | Ellis Rd | 8,100 | 1.53 | 0 | 1 | 5 | 4 | 53 | Yes |
| | Ellis Rd | US-192 | 7,600 | 1.44 | 1 | 1 | 2 | 0 | 8 | Yes |
| **Suntree Blvd** | Wickham Rd | US-1 | 2,300 | 0.44 | 3 | 1 | 0 | 0 | 0 | No |
| **Palm Bay Rd** | Hollywood Blvd | Palm Bay Rd | 635 | 0.12 | 0 | 1 | 1 | 0 | 0 | Yes |
| | Shopping Ctr. Dr | Palm Bay Rd | 752 | 0.14 | 0 | 1 | 1 | 0 | 0 | Yes |
| | Minton Rd | RJ Conlin Blvd | 23,900 | 4.53 | 3 | 7 | 15 | 7 | 90 | Yes |
| **Minton Rd** | Emerson Dr | Norfolk Pkwy | 4,142 | 0.78 | 0 | 3 | 2 | 2 | 36 | Yes |
| | I-95 | Emerson Dr | 6,000 | 1.14 | 1 | 0 | 6 | 0 | 35 | Yes |
| **(Under Construction)** | I-95 | Milwaukee Ave | 9,016 | 1.71 | 0 | 0 | 4 | 0 | 0 | No |
| **SR 520** | I-95 SB | Range Rd | 7,966 | 1.51 | 2 | 1 | 6 | 0 | 0 | No |
| | Range Rd | Clearlake Rd | 5,400 | 1.02 | 0 | 0 | 0 | 0 | 0 | No |
| | Clearlake Rd | US-1 | 7,200 | 1.36 | 1 | 3 | 5 | 3 | 82 | Yes |
| | US-1 | Tropical Trail | 9,000 | 1.7 | 0 | 3 | 7 | 3 | 53 | Yes |
| | Tropical Trail | S. Banana River Dr | 13,600 | 2.58 | 0 | 4 | 12 | 2 | 112 | Yes |
| **Plumosa St** | SR 520 | Merrit Island TOC | 4,800 | 0.91 | 0 | 0 | 0 | 0 | 0 | No |

| Corridor | Segments | | Total Fiber | | ADMS | CCTV | Signals | BlueTOAD | Wireless Pucks | Adaptive |
|---|---|---|---|---|---|---|---|---|---|---|
| | Extents | Extents | Feet | Miles | | | | | | |
| **US-1** | Peachtree St | Eyster Blvd | 13,300 | 2.52 | 0 | 3 | 7 | 4 | 42 | Yes |
| | Lake Washington | Babcock St | 13,800 | 2.61 | 0 | 4 | 4 | 4 | 79 | No |
| **SR 50** | Plantation Dr | I-95 | 3,600 | 0.68 | 1 | 1 | 0 | 0 | 0 | No |
| | I-95 | SR 405 | 2,100 | 0.4 | 1 | 2 | 2 | 2 | 34 | Yes |
| **SR 405** | SR 50 | US-1 | 22,300 | 4.22 | 6 | 6 | 6 | 5 | 76 | Yes |
| **SR 518** | I-95 SB | John Rodes Blvd | 2,016 | 0.38 | 2 | 1 | 3 | 0 | 0 | No |
| | John Rodes Blvd | Wickham Rd | 10,200 | 1.93 | 1 | 0 | 0 | 0 | 0 | No |
| | Wickham Rd | Pineapple Ave | 16,500 | 3.13 | 0 | 5 | 7 | 5 | 122 | No |
| **Malabar Rd** | San Filippo Dr | I-95 NB | 1,500 | 0.28 | 0 | 2 | 2 | 0 | 0 | No |
| | I-95 NB | Babcock St | 3,024 | 0.57 | 2 | 0 | 2 | 0 | 0 | No |
| **Pineda Causeway** | I-95 SB | Holy Trinity Dr | 15,078 | 2.86 | 0 | 0 | 4 | 0 | 0 | No |
| **Barton Blvd** | Cedar St | Murrell Rd | 3,378 | 0.64 | 0 | 0 | 4 | 0 | 0 | No |
| **Barnes Rd (Under Construction)** | I-95 | US-1 | 14,836 | 2.81 | 3 | 3 | 4 | 0 | 0 | Yes |
| **Judge Fran Jamieson** | I-95 | Engineering | 5,912 | 1.12 | 0 | 0 | 2 | 0 | 0 | No |
| **Fiske Blvd** | SR 520 | E.O.C. | 11,708 | 2.22 | 1 | 0 | 3 | 0 | 0 | No |
| **SR-3 (Courtenay Parkway)** | SR-528 | Fontenberry Rd | 19,043 | 3.61 | 0 | 1 | 14 | 0 | 0 | No |
| **SR 46** | Ontario Blvd | US-1 | 10,100 | 1.91 | 4 | 2 | 0 | 0 | 0 | No |
| **SR 406** | I-95 | US-1 | 14,750 | 2.79 | 3 | 1 | 0 | 0 | 0 | No |
| **Singleton Ave** | SR 406 | SR 405 | 6,000 | 1.14 | 2 | 0 | 0 | 0 | 0 | No |
| **SR 524** | I-95 | Industry Rd | 16,000 | 3.03 | 5 | 1 | 0 | 0 | 0 | No |
| **Totals** | **39 Segments** | | **391,419** | **74.13** | **49** | **82** | **168** | **48** | **1325** | |

**Table 1 - Existing System Infrastructure and Devices**

The relevant ITS sub-systems are defined as: a communications system consisting of fiber optic cabling and wireless communications segments, a Closed Circuit Television (CCTV) camera system, a travel-time data collection system, an Arterial Dynamic Message Sign (ADMS) system, and an adaptive signal control system for the traffic corridors. These systems are inclusive of central control software, local software, and hardware (such as but not limited to controllers, servers, computers and switches). Figure 1 below outlines the system overview of the proposed and existing Brevard County ATMS system.

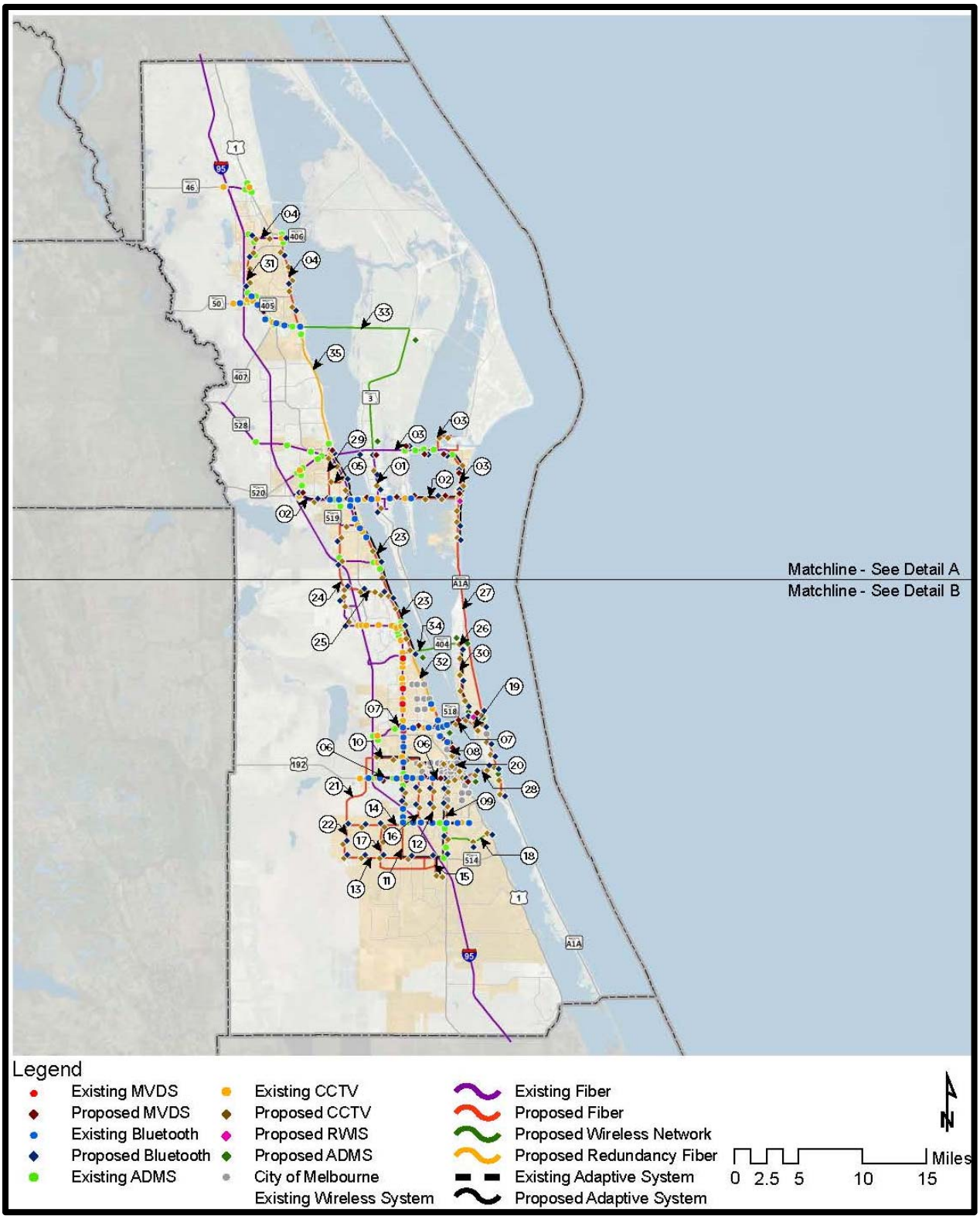


**Figure 1 - Countywide ITS Map Including Existing and Proposed**

In addition to the projects highlighted in the above figure, it is being recommended that Transit Signal Priority (TSP) be implemented throughout the County along with Emergency Vehicle Preemption (EVP). These upgrades to the existing signal system and associated vehicles would allow the SCAT bus fleet and local emergency vehicles to have priority at implemented intersections, which would result in more reliable transit route times and faster response to incidents by emergency vehicles.

The Brevard County ATMS system is being installed to more effectively and proactively manage traffic throughout the County. The communications system being installed will provide the local agency operations centers with the ability to communicate to the field devices within their jurisdiction and allow them to receive data and video images and control the devices. Each sub-system will provide benefit to both the operations center personnel as well as the motoring public. Operations personnel will utilize the devices to find areas of congestion, identify the cause of the congestion, provide motorists with traffic information related to the cause of the congestion, and dispatch emergency responders. These actions will decrease congestion within the area of the incident, decrease emergency responder notification times, decrease incident durations and result in more accurate and reliable travel times throughout the County.

The following outlines the roles and responsibilities for the system:

- ***Project Sponsors*** – Agencies that are involved in funding the system and defining the system goals, objectives, and requirements for Brevard County. The Sponsors include the following:
    - Florida Department of Transportation, District Five
    - Space Coast Transportation Planning Organization (SCTPO)
    - Brevard County Department of Public Works
    - Space Coast Area Transit (SCAT)

- ***User Agencies*** – Agencies that will utilize the devices and infrastructure installed under this system for traffic monitoring, congestion management, traffic incident management, performance measures and data collection, and roadway improvement. The User Agencies include the following:
    - Florida Department of Transportation, District Five
    - Brevard County
    - Space Coast Area Transit (SCAT)
    - Space Coast Transportation Planning Organization (SCTPO)
    - Brevard County Department of Public Works
    - Brevard County Emergency Operations Center
    - City of Titusville
    - City of Melbourne Traffic Engineering
    - City of Palm Bay
    - County and Local Emergency Responder Agencies

- ***Maintenance and Support Agencies*** – Agencies that will be responsible for maintaining the system equipment and infrastructure. The Maintenance and Support Agencies are as follows:
    - Florida Department of Transportation, District Five
    - Brevard County Department of Public Works
    - City of Titusville
    - City of Melbourne Traffic Engineering
    - City of Palm Bay

- ***Operating Centers*** – Facilities that will perform central command operations utilizing central software, local software, and hardware that will control the ITS devices implemented as part of this project. The Operating Centers associated with this system are as follows and as shown in Figure 2 below:
    - Florida Department of Transportation, District Five (View Only)
    - Brevard County TMC
    - Brevard County Emergency Operations Center
    - City of Titusville
    - City of Melbourne Traffic Engineering
    - City of Palm Bay

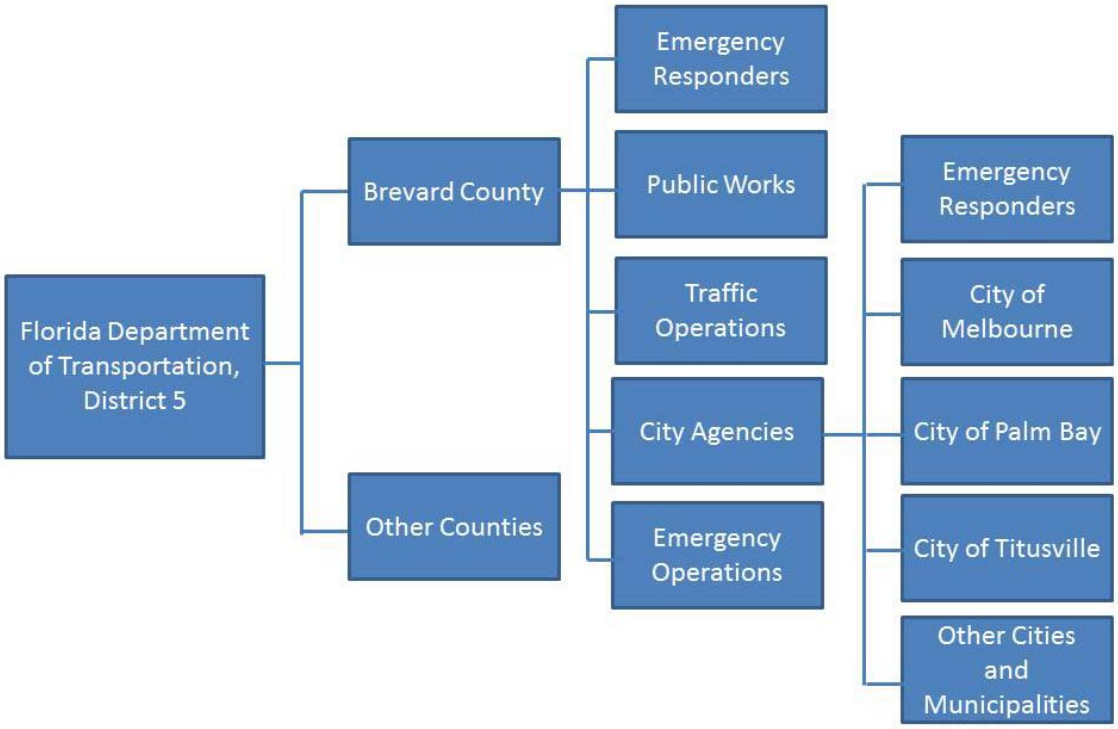


**Figure 2 - Overview of Brevard County and Relevant Agencies**

### *1.3.1 Agency Contact Information*

- Florida Department of Transportation, District Five
  719 S. Woodland Blvd.
  DeLand, FL 32720-6800
  Phone: 1-800-780-7102

- Brevard County Department of Public Works
  2725 Judge Fran Jamieson Way, A211
  Viera, Florida 32940-6605
  Phone: (321) 617-7202

- Brevard County Traffic Operations
  580 Manor Drive
  Merritt Island, Florida 32952
  Phone: (321) 455-1440

- Brevard County Emergency Operations Center
  1746 Cedar Street
  Rockledge, Florida 32955
  Phone: (321) 637-6670

- City of Melbourne Traffic Engineering
  2901 Harper Road
  Melbourne, Florida 32904
  Phone: (321) 608-7360

- City of Palm Bay Public Works
  1050 Malabar Road
  Palm Bay, Florida 32907
  Phone: (321) 952-3437

- City of Titusville Public Works
  445 South Washington Avenue
  Titusville, Florida 32796
  Phone: (321) 567-3846

- Space Coast Area Transit
  401 South Varr Avenue
  Cocoa, Florida 32922
  Phone: (321) 633-1878

# 2. Referenced Documentation

The following documents, of the exact issue shown, form a part of this document to the extent specified herein. In the event of a conflict between the contents of the documents referenced herein and the contents of this document, this document shall be considered the superseding document. Additionally, noted documents will be developed in support of, or in conjunction with, the preparation and definitions of this Concept of Operations.

| DOCUMENT | DATE | CONTACT |
|---|---|---|
| Statewide Intelligent Transportation System Architecture (SITSA) update project | February 20, 2006; Version 2 | Florida Department of Transportation<br>Intelligent Transportation Systems Office<br>605 Suwannee Street, M.S. 90<br>Tallahassee, Florida 32399-0450<br>(850)-410-5600 |
| Brevard County ITS Strategic Plan | 28-Jul-08<br>Version 4 | Brevard County Public Works Engineering<br>2725 Judge Fran Jamieson Way<br>Building A211<br>Viera, Florida 32940-6605<br>(321)-633-2077 |
| Brevard County Traffic Signal Maintenance and Compensation Agreement | 27-Aug-02 | Florida Department of Transportation<br>719 S. Woodland Blvd.<br>Deland, FL 32720<br>1-800-780-7102 |
| City of Melbourne, City of Palm Bay, and City of Titusville Traffic Signal Maintenance and Compensation Agreement | 13-Sep-02 | Florida Department of Transportation<br>719 S. Woodland Blvd.<br>Deland, FL 32720<br>1-800-780-7102 |
| Off System Maintenance Agreement | Sep-10 | Florida Department of Transportation<br>719 S. Woodland Blvd.<br>Deland, FL 32720<br>1-800-780-7102 |
| Brevard County ATMS Preliminary Systems Engineering Management Plan | 25-Jul-11 | Brevard County Public Works Engineering<br>2725 Judge Fran Jamieson Way<br>Building A211<br>Viera, Florida 32940-6605<br>(321)-633-2077 |
| Brevard County ATMS Operations and Maintenance | 14-Apr-11 | Brevard County Public Works Engineering<br>2725 Judge Fran Jamieson Way<br>Building A211<br>Viera, Florida 32940-6605<br>(321)-633-2077 |
| City of Melbourne, City of Palm Bay, and City of Titusville Interlocal Agreement for ITS Maintenance | June, 2012 | Brevard County Public Works Engineering<br>2725 Judge Fran Jamieson Way<br>Building A211<br>Viera, Florida 32940-6605<br>(321)-633-2077 |
| Brevard County Fiber Sharing Agreement | July, 2012 | Brevard County Public Works Engineering<br>2725 Judge Fran Jamieson Way<br>Building A211<br>Viera, Florida 32940-6605<br>(321)-633-2077 |
| Space Coast TPO ITS Master Plan | 22-Jan-15 | Space Coast Transportation Planning Organization<br>2725 Judge Fran Jamieson Way<br>Melbourne, Florida 32940-6605<br>(321) 690-6890 |

**Table 2 - Referenced Documentation**

## *2.1 Local Agreements*

In addition to the applicable documents identified above, local agreements in place that may have some bearing on the project are defined below:

- Traffic Signal Maintenance and Compensation Agreements
  The "Traffic Signal Maintenance and Compensation Agreements" established between FDOT District 5 and other agencies is the governing document outlining the roles and responsibilities of each entity as it pertains to signalized intersections. This agreement includes all definitions of responsibilities as they pertain to all, "…traffic signals, traffic signal systems (central computer, cameras, message signs, and communications interconnect), school zone traffic control devices, intersection flashing beacons, illuminated street name signs, and the payment of electricity and electrical charges incurred in connection with operation of such traffic signals and signal systems…" Due to the evolving nature of ITS and the interchangeability of ATMS's and signal operation, responsible roles for the maintenance of this project are loosely defined. As a result, the definitions of the "Off System Maintenance Agreement" were developed to further clarify the line of system definitions and responsible roles of each agency.

- Off System Maintenance Agreement
  The "Off System Maintenance Agreement" between FDOT District 5 and Brevard County is the governing maintenance agreement document between the two agencies for non-state roads identified as a part of this project. These corridors are specifically identified as Wickham Road, Minton Road, and Palm Bay Road. This agreement establishes various responsibilities and conditions required of and by these agencies per, during, and post construction of the project.

- *Fiber sharing agreement with FDOT District 5*
  A fiber sharing agreement defining roles and responsibilities between FDOT District 5 and Brevard County for sharing, accessing, and utilizing fiber owned by each agency as well as the process and requirements for installing fiber on each agency's right of way.

- *Interlocal agreement between Brevard County and Cities within the County*
  Brevard County has developed the ITS Interlocal Agreement document between the various cities within the County in conjunction with the development of this project's RFP. The intent of this document is to define all roles and responsibilities of each agency (city or county) as they pertain to this project's and future ITS related county-city cross-jurisdictional boundary efforts. This document defines ITS related elements as opposed to signal operational elements with the intent to clearly define the boundaries of the two systems. Federally funded technical support and equipment will be provided to the regional ITS network outside of the standard signal operations and maintenance agreements. This support will focus solely on the continued operations and maintenance of the Brevard County ITS fiber optic network. The ITS Interlocal Agreement developed by Brevard County in conjunction with all cities within the County establishes the newest rules to be adhered to by each agency.

# 3. Current System Situation

## *3.1 Background, Objectives, and Scope*

Brevard County currently has existing ITS infrastructure consisting of various ITS sub-system components that connect via fiber optic network, copper interconnect and/or wirelessly along Brevard County roadways. The roadways which have existing ITS devices and communications infrastructure are listed in Table 1 of this document.

Brevard ITS subsystems are defined as a wireless, copper interconnect and/or Fiber Optic Network (FON) system, a Closed Circuit Television (CCTV) camera system, Arterial Dynamic Message Signs (ADMS) system, Roadway Weather Information Station (RWIS) system, a travel-time data collection system, and an adaptive signal control system for the traffic corridor. The overall system consisting of the existing ITS infrastructure and the future ITS infrastructure defined in this document should be considered the Brevard County ATMS.

## *3.2 Operational Constraints of Existing Situation*

The existing system, although considerable, is not sufficient to ease congestion throughout many areas of the County. Additional roadways must be instrumented and roadways which already have some ITS instrumentation must be upgraded to include more travel time, CCTV and ADMS capabilities. The additional infrastructure and devices shown within Figure 1 will provide the local agencies with the ability to more efficiently and effectively monitor traffic in real-time and relieve congestion through the use of the adaptive signal controllers and providing motorists with traffic information on the ADMS.

## *3.3 User Profiles*

The Brevard Advanced Traffic Management System will have six different user types. The user types and profiles are as follows-

***ITS Operator-*** This user will access and control the ITS devices to monitor and manage traffic flow on the arterial corridors throughout the County. The ITS operator will be able to pan, tilt, and zoom the cameras, post messages to the dynamic message signs, ensure the traffic signal control system is working properly, and gather data collected by the vehicle detection system. The operator will also verify the overall health of the system and dispatch maintenance crews to fix any ITS devices that are not functioning properly. The Operator will also assist Emergency Response Teams to decrease emergency response times and manage the traffic while an incident is occurring.

***ITS Device Maintenance Personnel-*** This user will be responsible for maintaining the ITS and adaptive signal control field devices and ensure the device downtime is minimal. This user will access the ITS devices routinely and verify each device systemwide is operational and fully functional. The ITS Device Maintenance Personnel will generally be the County's Traffic Systems Technician(s), however, the City's Traffic Sign/Signal Technician(s) and any other personnel agreed upon by the Cities and County may perform maintenance as well.

***ITS Network Support Personnel-*** This user will access the network and ensure the network is operational and fully functional. This user will also be responsible for implementing any

necessary network updates or device integration and is responsible for the overall architecture of the system. This user will also verify the fiber optic network is stable and free from any fiber cuts or damages.

***Traffic Operation Engineers and Personnel-*** Traffic operation engineers will be able to analyze and utilize the ITS data to make decisions in real-time and on future roadway and safety projects. The analyzed data will be used to make roadway and safety improvement decisions in areas that are congested regularly or may have re-occurring incidents.

***Emergency Response Personnel-*** Dispatchers for emergency responders who have the capability to view the traffic videos and receive travel time information will be capable of analyzing the roadways near an incident scene to determine the best route for the responders to take to arrive on scene in an expeditious manner.

***Motoring Public-*** The motoring public will directly benefit from the Brevard ATMS system by utilizing traveler information disseminated from the system to avoid congested areas and make travel route decisions. The public will be informed of incidents and congestion via the ADMS sub-system and will receive comprehensive traffic information via Florida 511 (FDOT's Real Time Traveler Information System). The information provided on Florida 511 includes but is not limited to incidents, construction, weather hazards or other useful information such as road closures, etc. that will improve their commute and travel times. The public will also benefit from the adaptive signal control system by experiencing less congestion due to the real-time coordination of the signals along the corridors.

## *3.4 Support Environment*

The Brevard County ATMS ITS and adaptive signal control devices will be supported and maintained by various agencies under existing agreements. The County is primarily responsible for maintaining the ITS devices. The City of Titusville, the City of Palm Bay, and the City of Melbourne currently hold an Interlocal Agreement for ITS Maintenance with Brevard County that allows the Cities to access the County's ATMS server and adjust traffic signaling within their jurisdiction if necessary. For normal business operations, the City must provide a request in writing to adjust any ITS devices installed by the County. In emergency situations, the Cities may be required to provide maintenance on ITS Devices within their jurisdiction upon County approval. Brevard County maintains all other ITS devices that are not FDOT owned within Brevard County unless otherwise specified in an executed Interlocal Agreement.

# 4. Justification and Nature of the Changes

## *4.1 Justification for Changes*

Over 500,000 people live within Brevard County and many of these individuals commute to and from work, shopping centers, restaurants, and other businesses on a daily basis. As is the case throughout the country, the majority of these commutes are made in automobiles, which means that the local roadways are frequently inundated with vehicles. This heavy traffic volume leads to congestion, stalled vehicles and traffic crashes, which further decrease the capacity of the roadway.

Intelligent Transportation Systems are an integral part of providing innovative services, which help alleviate traffic congestion on local roadways and provides traffic information to motorists in Brevard County. The regional agencies (FDOT District Five, Brevard County, and the Cities of Titusville, Palm Bay, and Melbourne) have agreed that traffic operations will be monitored and controlled in a shared environment. The deployment of a regional ATMS using ITS, TSP, EVP, and adaptive signal control technologies will improve transportation efficiency, promote safety, increase traffic flow, reduce emissions, and improve traveler information across jurisdictional boundaries within Brevard County.

The most current version of the Regional ITS Master Plan has shown the corridors listed within Table 3, on the following page, as the highest priority corridors for ITS improvements. A larger, more legible, version of this table can be found within the ITS Master Plan document.

| | Local Road Name | FROM | TO | Fiber Mileage | Short, Mid or Long |
|---|---|---|---|---|---|
| **TMC** | | | | | Short |
| **Operations and Maintenance Resource Shortening** | | | | | Short |
| **1** | Courtenay Pkwy | SR 528 | Cone Rd | 4.710 | Short |
| **2** | SR 520 Bridge | Milford Point Dr | SR A1A | 3.306 | Short |
| **3** | SR A1A | Minutemen Causeway | South of George King | 8.700 | Short |
| **4** | US 1 (Titusville Area) | SR 406 | SR 405 | 6.199 | Short |
| **5** | Dixon Blvd | Clearlake Rd | SR 5/US-1 | 1.157 | Short |
| **6** | SR 500/US-192 | Dairy Rd | SR 5/US-1 | 2.881 | Short |
| **7** | Eau Gallie Causeway | SR 5/US-1 | SR A1A | 3.114 | Short |
| **8** | SR 5/US-1 | Babcock St | University Blvd | 6.420 | Short |
| **9*** | Babcock St | Malabar Rd | Nasa Blvd | 6.510 | Short |
| **10** | Ellis Rd/Nasa Blvd | W of I-95 SB | SR 5/US-1 | 7.202 | Short |
| **11** | Minton Rd | Malabar Rd | Emerson Dr | 3.924 | Mid |
| **12** | Dairy Rd | Palm Bay Rd | SR 500/US-192 | 2.993 | Mid |
| **13** | Malabar Rd | Palm Bay Pkwy | West of San Filippo | 6.126 | Mid |
| **14** | Emerson Dr | St Johns Pkwy | N Minton Rd | 3.917 | Mid |
| **15** | San Filippo Dr | Foundation Park Blvd | Malabar Rd | 1.206 | Mid |
| **16** | Hollywood Blvd | Palm Bay Rd | SR 500/US-192 | 3.110 | Mid |
| **17** | Jupiter Blvd | Emerson Dr | San Filippo Dr | 6.690 | Mid |
| **18** | Port Malabar Blvd | Babcock St | SR 5/US-1 | 3.204 | Mid |
| **19** | Riverside Dr | Falcon Dr | Eau Gallie Causeway | 1.121 | Mid |
| **20** | Hickory St | New Haven Ave | SR 500/US-192 | 1.000 | Mid |
| **21** | St. Johns Pkwy | Emerson Dr | Ellis Rd | 5.200 | Mid |
| **22** | Palm Bay Pkwy | Malabar Rd | Emerson Dr | 2.500 | Mid |
| **23** | SR 5/US1 | Pineda Causeway | South of Barnes Blvd | 8.954 | Mid |
| **24** | S Fiske Blvd/Stadium | Summer Path | Barton Blvd | 5.902 | Mid |
| **25** | Viera Blvd | Stadium Pkwy | SR 5/US-1 | 3.026 | Long |
| **26** | Pineda Causeway | SR 513 | SR A1A | 0.466 | Long |
| **27** | SR A1A | Minutemen Causeway | Pineda Causeway | 7.741 | Long |
| **28** | Melbourne Causeway | SR 5/US-1 | SR A1A | 2.386 | Long |
| **29** | SR 501 | SR 520 | SR 528 | 3.638 | Long |
| **30** | SR 513 | Eau Gallie Causeway | Pineda Causeway | 5.175 | Long |
| **31** | South St | SR 50 | S Singleton Ave | 3.449 | Long |
| **32** | SR 5/US-1 | Lake Washington Rd | Pineda Causeway | 4.000 | Long |
| **33** | SR 3/SR 405 | SR 528 | US-1 | 17.000 | Long |
| **34** | Pineda Causeway | SR 5/US-1 | SR 513 | 4.000 | Long |
| **35** | SR 5/US1 | Cidco Rd | SR 405 | 8.370 | Long |

**Table 3 – ITS Master Plan Priority List**

Proposed ATMS improvements within this document and the ITS Master Plan have been based in part on this analysis. The resultant proposed project list is provided below along with the mileage for each project and total mileage of these projects.

## *4.2 Description of the Desired Changes*

The communications network for the Brevard ATMS will primarily utilize underground fiber optic cable. This fiber optic network will have sufficient excess capacity to provide connectivity for the various transportation and traffic agencies throughout the County. The backbone ATMS network will consist of a 1-Gigabit per second (Gbps) Ethernet communications network, which is expandable to 10 Gbps for future scalability, which may be needed for future initiatives such as Vehicle to Infrastructure (V2V) data exchange and Autonomous Vehicles.

This project will also include ITS device installation such as CCTV, DMS, travel time data collection, adaptive signal control systems, TSP, and EVP components. The ITS devices will be installed and integrated on the corridors listed within this document and integrated into the existing ITS network and infrastructure.

## *4.3 Change Priorities*

The highest priority of the change is the expansion of the communications network for the Brevard ATMS. This will provide multiple agencies with access and control to the existing ITS devices and the new ITS devices that will be installed under this project. The next highest priority is the device installation and integration that will increase the County's roadway visibility.

## *4.4 Changes Considered but Not Included*

The intent of the Brevard County ATMS is to optimize the movement of people and goods throughout the County on arterial and interstate roadways. As such, there are many enhancements that could be made in an effort to make the system as technologically advanced and robust as possible. However, the proposed expansion projects, technologies, and methodologies have been developed with the understanding that funding for the deployment, operations and maintenance of the system is limited and as such must make the best use of the funds available. As a result, anything thought to be excessive in cost or requiring excessive maintenance has been excluded from consideration.

## *4.5 Assumptions and Constraints*

The equipment and software chosen for this project will be compatible with the components that already exist for Brevard County to provide a homogeneous system that facilitates the operation and maintenance of all ITS devices. All applicable devices will be listed on the FDOT Statewide Approved Products List (APL), which will ensure they have been tested by the FDOT Traffic Engineering Research Lab (TERL) and certified to meet FDOT Standards.

All proposed projects listed within this document are dependent on the programming of funding and the availability of funding at the start of Design and Construction. Funding levels will determine whether portions of the project must be removed and installed under future projects. The ability of the operating and maintaining agencies to provide adequate staff and maintenance is also dependent upon availability of sufficient funding. Without funding for

operations and maintenance of the system, the system will not operate as proposed and will therefore not provide the benefits stated throughout this document.

# 5. Concepts for the Proposed System

This section describes the anticipated operation of the Brevard ATMS.

## *5.1 Background, Objectives, and Scope*

The continued expansion of the Brevard County ATMS System will provide traffic management, congestion management, traffic incident management, and traffic information assets and benefits to user agencies and the motoring public. The proposed system, when complete, will include a communications network along with CCTV, ADMS, travel time, and adaptive signal control components throughout Brevard County. The system components and project limits are shown in Figure 1 of this document.

Upgrades to existing signal intersection detection and installation of CCTV cameras will further upgrade the overall management system of these corridors by allowing remote access and control of the sub-systems through the WANs. The adaptive signal control, timing plans analysis, and development for the traffic management of the signalized intersections throughout the corridors shall be generated and refined through adaptive signal timing operations. These upgrades will allow Brevard County to operate and maintain the corridors in a more efficient and cost-effective manner.

Upon completion of each of the Brevard ATMS projects, the ITS devices will be accessible and controlled from the Brevard County and City of Melbourne TMC facilities as well as other operator agencies as appropriate. The Brevard County ITS devices will also be accessible from the Florida Department of Transportation, District Five Regional Traffic Management Center (RTMC) but not able to be controlled by their personnel.

## *5.2 Operations Policies and Constraints*

**Brevard County**

Brevard County currently operates an unofficial TMC at the Viera Government Center. The equipment consists of County refurbished HDTVs and computers that allow for ITS monitoring and management using vendor software. Operations staffing is severely limited as staff currently serve both operations and maintenance roles and are consumed with maintenance requirements alone.

Brevard County is responsible for the operation and maintenance of approximately 400 traffic signals within their jurisdiction. The County has standardized to Naztec controllers as the accepted signal controller in the area. The County can remotely monitor and communicate with all signals connected to the fiber optic network using Naztec's ATMS.now signal management software. All other signals utilize wireless communications.

Due to staffing limitations, the County, like most other agencies does not engage in active signal adjustments or other ITS strategies, despite having the technology to do so.

**City of Melbourne**

The City of Melbourne operates and maintains 67 traffic signals with Naztec controllers from their TMC, with a back-up location at City Hall. All signals are independent of the County and exist on a network outside of the City network. Currently ten signals are connected to fiber,

allowing for remote control (using ATMS.now) and monitoring. All other signals are actively monitored, but communicate via a wireless link. In addition, nine CCTVs have been installed at City intersections as part of previous ATMS expansion projects.

**City of Palm Bay**
The City of Palm Bay has no current or planned TMC or ITS deployment other than a single CCTV at Malabar Rd and San Filippo Dr. The City currently uses Naztec controllers at all 25 signals it operates and maintains. Signal timings are coordinated based on GPS clocks.

**City of Titusville**
The City of Titusville has no current or planned TMC or ITS developments at this time. The City operates and maintains 42 traffic signals in which 8 of them are owned by the City. There is currently no coordination among the eight signals controlled by the City, but four are connected to the Brevard County ATMS and the City intends to install Naztec controllers at the other five and will bring them online thereafter.

**Other Local Municipalities**
All other Brevard County municipalities' signal operations and maintenance roles are handled by the County via interagency maintenance agreements. No other organization other than those mentioned above have ITS deployments.

## *5.3 Description of the Proposed System*

ATMS field devices throughout Brevard County will provide traffic surveillance and control capabilities, traffic incident management capabilities, and enable the dissemination of traffic information. Proposed device locations and quantities are shown in Figure 1 as depicted earlier in this document. The exact locations and quantities of each of these devices will be determined by stakeholder involvement, budget availability, and a more thorough design. The field devices will connect either wirelessly or via fiber optic network and provide roadway visibility to Brevard County and associated agencies.

### *5.3.1 Traffic Signals*
Traffic signal hardware on regionally significant corridors will continue to be connected to the Brevard ATMS and will be upgraded to be compatible with the signal management software, as applicable. All traffic signal upgrades will consist of the replacement of the traffic signal controller. Any traffic signals which are not already connected to the network will be interconnected using fiber optic communications along the corridor. Signal detectors, which require an upgrade, will consist of a combination of either inductive loops, video detectors and wireless magnetometers.

All users of the system will be able to observe the operation of a traffic signal; however, only the operating agency will have the authority to modify the traffic signal operation. In the future, each agency may choose to grant control authority to qualified regional operators.

### *5.3.2 Closed-Circuit Television Cameras*
CCTV cameras will be deployed throughout the network to provide video traffic surveillance from the Brevard County and City of Melbourne TMC facilities as well as the FDOT, District 5 RTMC. The CCTV cameras can pan, tilt, and zoom (PTZ) to allow system users to observe traffic patterns, locate and respond to incidents, adjust traffic signal timings, and verify the

operation of other ITS devices. While the CCTV cameras will not provide entire coverage of the roadway network, they will provide coverage of major intersections, large stretches of major corridors, and areas known to be prone to congestion or other problems.

All system users will be able to observe any CCTV camera on the network. All traffic operations agencies will be able to control any CCTV camera; however, priority for PTZ control will be given to the operating agency operators. Other agency users will be given lower priority to perform PTZ functions. The higher priority user can take over PTZ control at any time, however, the lower priority user will still be able to view the video from the camera. Users can be assigned priorities as well that will dictate the permissions and control capabilities of the user.

### *5.3.3 Arterial Dynamic Message Signs*

Proposed projects will include the deployment/replacement of ADMS along arterials. These signs will provide information on the status of the interstates and corridors so travelers can make informed decisions before committing to entering the roadway. These signs can also be used to provide travel information and alerts (America's Missing: Broadcast Emergency Response [AMBER], Silver, etc.) to the public. FDOT currently owns and controls full size DMS on I-95 and ADMS on the arterials in Brevard County. The development of an information dissemination master plan for the County may be necessary to ensure that the devices are procured and deployed in an efficient and beneficial manner.

### *5.3.4 Adaptive Signal Control*

As part of the proposed projects, some intersections within the project limits will be upgraded to use an adaptive signal control system which collects traffic and pedestrian data from vehicle detection devices on a 24 hours a day, 7 days a week basis and utilizes it real-time to configure the timing of the intersection. The real-time system takes in the full view and needs of each intersection individually and then makes adjustments to optimize traffic in all directions during normal traffic conditions and congested traffic conditions.

### *5.3.5 Roadway Weather Stations*

Future project deployments may include the installation and integration of RWIS on local area bridges and overpasses to detect high wind speeds during poor weather conditions. RWIS can help agencies detect unsafe wind conditions during dangerous storms, especially hurricanes and make evacuation decisions as well as bridge and causeway closures if necessary. The use of these devices also alleviates local police departments of the need to have officers stationed on the bridges to manually monitor the wind speeds and allows these officers to be more effectively utilized elsewhere.

### *5.3.6 Transit Signal Priority and Emergency Vehicle Preemption*

One suggested improvement to Brevard County's transportation system is Transit Signal Priority (TSP) proposed to be installed and implemented for the Space Coast Area Transit (SCAT) fleet of buses. The necessary Intelligent Transportation System (ITS) architecture and strategies for achieving these TSP goals are described within the context of this concept of operations. The granting of priority will be conditioned upon a set of operator defined constraints (e.g., late arriving buses, etc.). The project will also make available the GPS technology for Emergency Vehicle Preemption (EVP) at the intersections. In order for emergency vehicles to utilize the EVP, they will need to be fitted with preemption equipment. If emergency vehicles do not have preemption equipment, the TSP can be implemented and EVP can be disabled until emergency vehicles are properly equipped. The EVP functionality will always take precedence over TSP.

Because the county does not currently utilize TSP or EVP, the following subsections detail the system in greater detail. It should be noted that prior to the installation of TSP, SCAT would need to complete its deployment of its AVL system.

### *5.3.6.1 TSP/EVP Logical Architecture*

The proposed TSP system consists of two primary logical components based on NTCIP 1211: a *Priority Request Generator (PRG)* and a *Priority Request Server (PRS)*. The conditional TSP system will use a distributed architecture with a conditional PRG on the bus and a PRS at the traffic signal which serves the request. The primary functions of the PRG are as follows:

- To determine whether a vehicle is in need of preferential treatment (priority) at a signalized intersection according to operator-defined criteria (e.g., late arriving buses, etc.)
- To communicate the vehicle's request for priority and its current location and speed information to the PRS
- To produce a log of all priority requests for processing and continued monitoring by SCAT

The primary functions of the PRS are as follows:

- To receive multiple Priority Requests from different PRG's.
- To produce an estimate of the vehicles calculated time for service desired at the signalized intersection. This estimate, measured in seconds, is intended to represent the vehicles arrival time at the intersection and can range from zero (0) (representing a request for immediate service) to sometime in the future.
- To prioritize all the different Priority Requests based on the request vehicle's class, vehicle level, and time of service desired.
- To generate a Service Request defining the strategy to be used by the Traffic Signal Controller to provide priority to the SCAT bus, or provide pre-emption to emergency vehicles.
- To communicate the Service Request to the Traffic Signal Controller to be processed by the Coordinator.
- To produce a log of all the Priority Requests received and Service Requests generated by the Priority Request Server for review by partnering agencies.

**System Components**

The TSP system will include five primary components: the SCAT Operations Center, select SCAT buses, preemption communication devices, a possible future Brevard County Traffic Management Center (TMC), and Naztec NEMA TS1/TS2 Traffic Signal Controller. The functional roles of the SCAT Operations Center and select SCAT buses will be expanded upon with the implementation of conditional TSP.

**SCAT Operations Center**

The SCAT Operations Center's functional role includes determining the thresholds for generating a TSP request (e.g. bus lateness thresholds) on each route. Bus position is reported to the Operations Center every 30 seconds to two minutes. A future AVL system would be better suited to monitor and determine bus lateness, as the bus position updates every second.

**Select SCAT Buses**

The select SCAT buses would house the future AVL system and the on-board preemption vehicle control unit. The AVL system compares the vehicle position to scheduled position to determine bus lateness every second and communicates bus lateness to the on-board

preemption unit. The preemption vehicle control unit communicates the priority requests to signalized intersections. The preemption vehicle control unit together with the AVL system serves as the PRG.

**Preemption Communication Devices**
Preemption GPS vehicle equipment system will calculate the bus speed, direction, and latitude position. This information, along with the bus identification information, is transmitted to the Preemption GPS intersection equipment when the bus enters the intersection's range, with updates conducted every second. Once the Preemption GPS intersection equipment receives this information, a priority request is sent from the Preemption GPS phase selector located in the controller cabinet to the traffic signal controller.

**Brevard County TMC**
As suggested in Task 3, a new, regional traffic management center (TMC) may be proposed for Brevard County. The TMC would have no functional role in the data exchanges to request and implement signal priority. If the County regional partners decide to purchase the Naztec ATMS TSP module, the TMC would provide a physical location for remote configuration of the Naztec NEMA TS1/TS2 traffic signal controller (i.e. timing plan, TSP response strategies allowed) and preemption settings (i.e. vehicle IDs allowed, trigger locations), as well as retrieval of field PRS logs. If this module is not purchased, this function would be performed at each individual intersection TSP is implemented.

**Naztec NEMA TS1/TS2 Traffic Signal Controller**
The Naztec NEMA TS1/TS2 traffic signal controller is configured with the time of service desired (TSD), time of estimated departure (TED), and the timing parameters. Based on a priority request from the preemption phase selector, the traffic signal controller has the primary responsibility for processing and implementing the service request subject to earlier TSP requests or higher level priority requests (e.g., railroad and emergency vehicles). The traffic signal controller together with the Preemption GPS intersection equipment serves as the PRS.

### *5.3.6.2 TSP Strategies*
The TSP system could utilize two configurable TSP signal strategies: green extension, and early green/red truncation. During green extensions, the signal controller extends the green time for the bus arriving at the end of the normal green time. During early green/red truncations, the signal controller will shorten the duration of the non-priority phases, and return the green time for a bus arriving during the red interval.

The granting of either strategy will be conditioned upon the meeting of operator definable criteria. The implementation of the conditional TSP system would require the following set of criteria:

- Bus is in-service;
- Meets bus lateness criteria;
- Meets first-come, first served criteria if multiple TSP requests;
- Exceeds minimum time between successive TSP requests (aka re-arm or re-service);
- Meets TSP parameters;
- Meets signal operator criteria for maximum green extension and TSP minimum phase green;
- Would not be served during a rail or emergency pre-emption event; and

- Meets time of day criteria (as needed).

Other TSP signal strategies such as special phase insertion and phase skip are not proposed with the implementation of conditional TSP. In addition, all minimum times including pedestrian clearance intervals are not modified during the servicing of TSP requests.

### *5.3.6.3 Physical Architecture of the TSP/EVP system*

The physical architecture for the conditional TSP system is illustrated in Figure 3 and includes the following five system components:

- SCAT Operations Center;
- SCAT Bus/PRG;
- Preemption Communications Devices;
- Brevard County TMC; and
- Traffic Signal Controller/PRS.

SCAT considers Automated Vehicle Location (AVL) implementation a priority in the region and an RFP is proposed to be released in late 2016 for equipping the entire transit fleet with AVL features. Based on the physical architecture noted above, the TSP service request will begin with the proposed SCAT AVL system collecting and monitoring bus position and bus schedule. Based on bus schedule and bus position data, the measurement will be calculated and checked against operator-defined TSP criteria (e.g., number of minutes behind schedule). If the bus meets the criteria, the SCAT AVL system will send a message to the Preemption vehicle control unit allowing TSP requests to be generated. The preemption unit will generate a TSP request and information such as latitude, longitude, speed, heading, vehicle ID, and priority level (i.e., low for TSP) will be sent from the preemption radio to the preemption phase selector as a priority request.

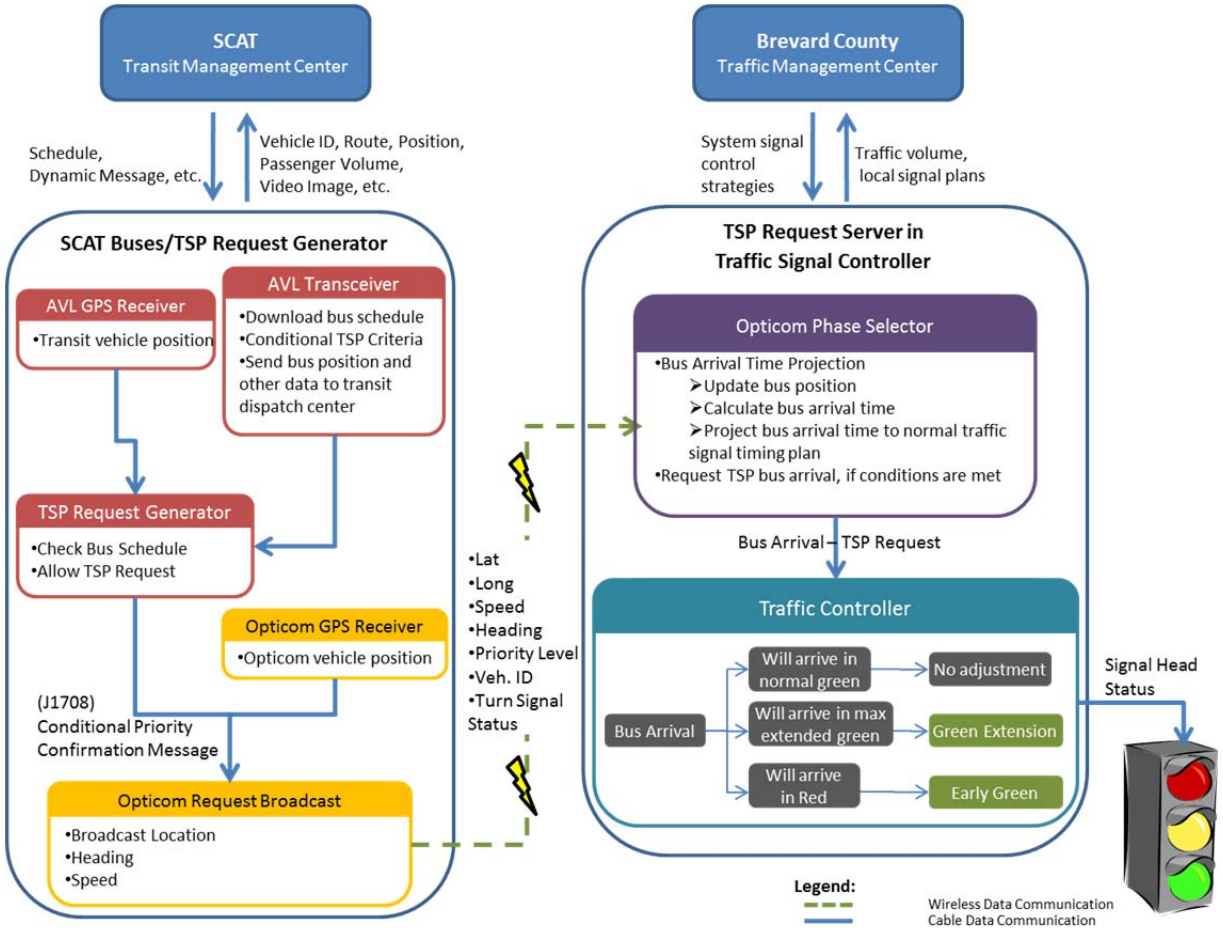


**Figure 3 - TSP Physical Architecture***

* Note that for the purposes of this figure, the Opticom system is shown as the preemption system. However, the final determination of the preemption system has not been determined.

After the phase selector receives the TSP request and related information from the preemption radio unit, the phase selector will resolve the request against any other TSP or emergency vehicle requests. The estimated bus arrival time at the stop bar is calculated based on continuously updated bus position data sent from the on-board preemption radio unit. The phase selector will output a pulsing signal corresponding to the phase to be served when the time of service desired (TSD) corresponds to a value configured in the phase selector.

The Naztec controller will interpret the pulsating input as the TSD value, which is input into the Naztec controller along with the time of estimated departure (TED). The TSD in the phase selector (in the Preemption GPS system) corresponds with the TSD in the Naztec controller. The TSD is the predicted bus arrival time and is projected into the normal traffic signal timing plan by the controller to determine the bus arrival time relative to the timing plan.

If the bus arrival time is projected to fall in the normal green time of bus phase, the normal signal timing plan will not be adjusted. If the bus arrival time is projected to fall in the maximum extended green time, the green signal will be extended until the maximum extended green time

is reached. If the bus arrival time is projected to fall in the red time of the bus phase, the green signal will return early to the bus phase. The green times for non-bus phases will be shortened to provide an early return of the green signal to the bus phase with the minimum green time for those non-bus phases being maintained. During the servicing of either green extensions or early green/red truncations, the traffic signal will remain in coordination.

During the servicing of more than one TSP request at the same intersection, the phase selector will address this event on a first come-first served basis. The phase selector will also address the servicing of high priority calls from emergency vehicles by immediately overriding all low priority TSP calls. The servicing of repeated TSP service requests is prohibited through an operator-defined value (aka, re-arm or re-service). This value defines the minimum amount of time required between successive TSP service requests. After servicing of the TSP request, the local traffic signal controller will return to normal operations.

The TSP service request process described above is illustrated graphically in Figure 4 on the following page. This process is automatic for SCAT buses in service and will not require driver activation or active management by signal operators other than the retrieval of system component logs for monitoring purposes.

The Naztec NEMA TS1/TS2 controller's coordinator will require a controller firmware upgrade to provide TSP functionality.

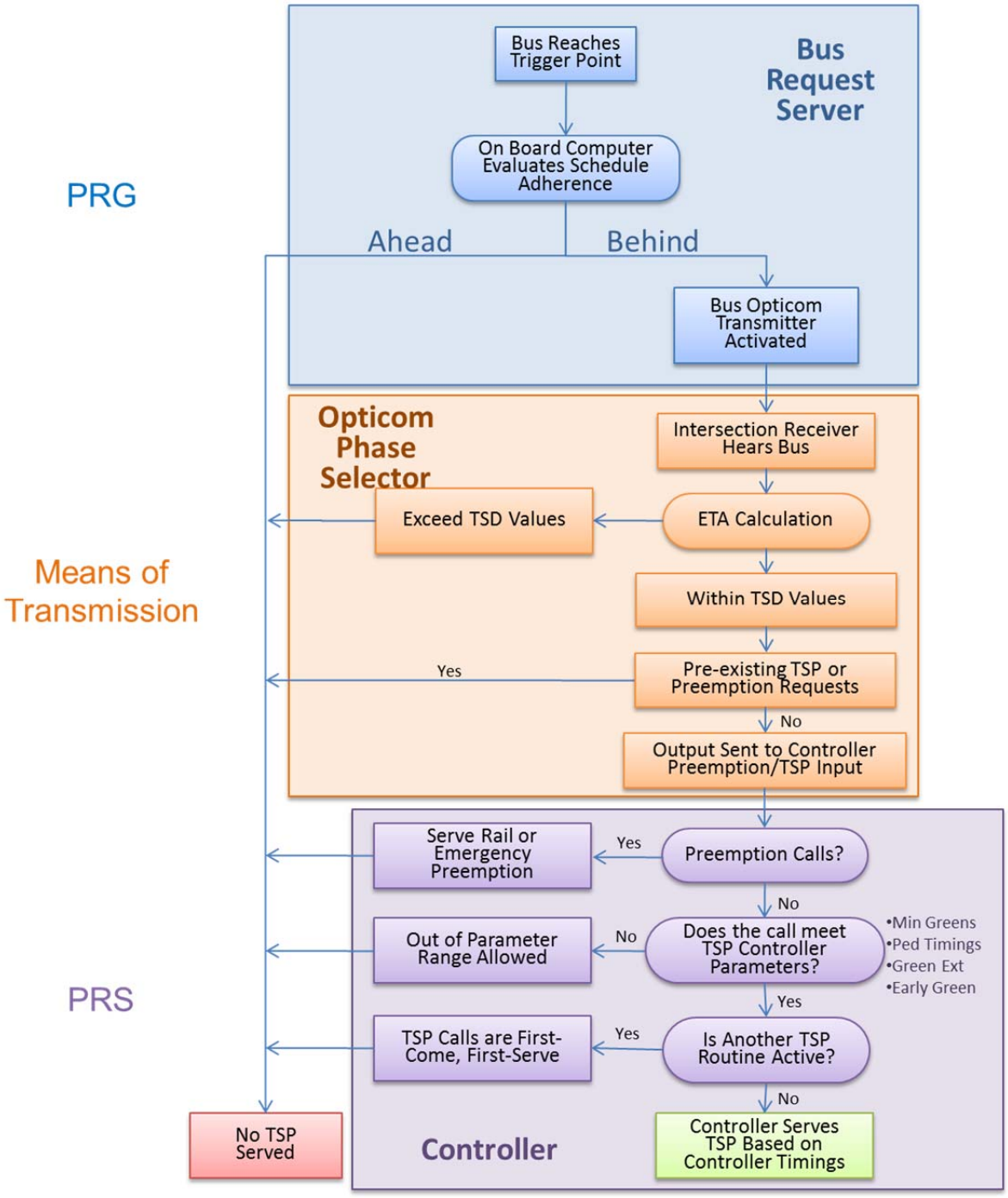


**Figure 4 - TSP Service Request Decision Diagram***

* Note that for the purposes of this figure, the Opticom system is shown as the preemption system. However, the final determination of the preemption system has not been determined.

## *5.4 Modes of Operation*

The Brevard County TMC is currently staffed from 7:30am – 4:30pm Monday through Friday excluding holidays. Other Brevard agencies, and authorized employees of the city/county will be provided access to the regional ATMS from multiple locations throughout the county, with the appropriate network connectivity and login credentials.

Currently, access to system devices is allowed per Table 4 below:

| Agency / Department | Signals | CCTV | Adaptive | RWS |
|---|---|---|---|---|
| Brevard County Traffic Operations | Observe any.<br>Control County Signals | View and operate any camera.<br>Priority rights for County devices. | View any.<br>Can operate County owned devices. | View any.<br>Can operate County owned devices. |
| Brevard County Public Works | Observe any.<br>Control City Signals | View and operate any camera.<br>Priority rights for County devices. | View any.<br>Can operate County owned devices | View any.<br>Can operate County owned devices |
| Brevard County Emergency Operations | Observe any.<br>Control City Signals | View and operate any camera.<br>Priority rights for County devices. | View any.<br>Can operate County owned devices | View any.<br>Can operate County owned devices. |
| FDOT, District 5 RTMC | N/A | View any camera.<br>. | N/A | N/A |
| City of Titusville | Observe any.<br>Control City Signals | View and operate any camera.<br>Priority rights for city devices. | View any.<br>Can operate City owned devices. | View any.<br>Can operate City owned devices. |
| City of Palm Bay | Observe any.<br>Control City Signals | View and operate any camera.<br>Priority rights for City devices. | View any.<br>Can operate City owned devices. | View any.<br>Can operate City owned devices. |
| City of Melbourne | Observe any.<br>Control City Maintained Signals | View and operate any camera.<br>Priority rights for City devices. | View any.<br>Can operate City maintained devices. | View any.<br>Can operate City maintained devices. |

**Table 4 - Agency ITS Device Privileges**

## *5.5 User Involvement and Interaction*

Primary operations of the Brevard County ATMS will take place from the proposed regional TMC, which is proposed to house County personnel, at a minimum. The Cities of Titusville, Palm Bay, and Melbourne will have connectivity to the ITS devices within their jurisdiction. FDOT, District 5 RTMC operators will use the Sunguide software to monitor and operate the components of the system that are owned by FDOT and will also have the ability to view regional ATMS information.

If signal-timing modifications are deemed necessary, staff will communicate those needs to the agency responsible for the specific traffic signals; all signal modifications will be performed by the owning agency or their authorized agents.

Future efforts will develop regional timing plans and agencies roles and responsibilities for operating ITS devices within their jurisdiction that are acceptable to all agencies. Once these plans are developed and approved, authority will be granted to qualified personnel to invoke these plans in response to incidents, accidents, evacuations, or other emergencies.

Currently, the Cities of Melbourne, Palm Bay, and Titusville hold an Interlocal Agreement for ITS Maintenance with Brevard County. This Agreement defines the roles and responsibilities of the agencies and coordination efforts for maintaining signals and the County's ITS Device.

## *5.6 Support Environment*

The infrastructure and device components of the ATMS are currently being maintained by the City and County agencies as detailed in Section 5.2 of this document. Future deployments will be maintained by the County unless an agreement is executed between the County and the local agency responsible for the portion of the network the deployment will integrate with.

## *5.7 Future Agency Connectivity*

The agencies listed below are involved in traffic management, incident management, or emergency operations in Brevard County. Access to the ATMS and field devices will allow faster, more efficient and coordinated responses to incidents and emergencies. Depending on each agency's individual needs, various levels of access and control for field devices can be provided in the future. It is envisioned that this and future projects will allow the following agencies to remotely access the system.

**Brevard County**

- Brevard County TMC
- Brevard County Department of Public Works
- Space Coast Area Transit
- Brevard County Emergency Operations Center
- Brevard County Road and Bridge Division
- Brevard County IT Division
- Brevard County Operations and Maintenance (O&M) Division
- Brevard County 911 – Public Safety Communications
- Brevard County Fire and Rescue
- Brevard Sherriff's Department
- Brevard County/ Mobility
- Space Coast Transportation Planning Organization (TPO)

**Other Organizations**

- City of Cape Canaveral
- City of Cocoa
- City of Cocoa Beach
- City of Indian Harbour Beach
- City of Rockledge
- City of Satellite Beach
- City of West Melbourne
- Town of Grant-Valkaria
- Town of Indialantic
- Town of Malabar
- Town of Melbourne Beach
- Town of Melbourne Village
- Town of Palm Shores
- Florida Highway Patrol (FHP)
- Melbourne International Airport
- The Cape Canaveral Port Authority

- Patrick Air Force Base
- Cape Canaveral Air Force Station
- Kennedy Space Center

# 6. Operational Scenarios

Day to day operations and maintenance of the Brevard County ATMS will include a number of operational scenarios that involve utilizing the ATMS system. The following is a brief description of certain scenarios and how they may be handled utilizing the Brevard County ATMS System.

***Normal Operations***: During normal operations, traffic will be free flow and there will be no congestion present. All cameras show free-flowing traffic images, the travel time system will not detect any congestion or decreased travel times, and the adaptive timing signal system will maintain its current signaling configuration. The TSP and EVP system will provide priority to transit and emergency vehicles as they approach signalized intersections. There will be no actions required by the operator other than to monitor the system for any maintenance issues or potential changes in traffic.

***Peak Congestion Operations:*** During peak congestion operations, traffic will be slow and congestion will be present. Camera images will show congested areas on highly traveled intersections, the travel time system will detect increased travel times, the ATMS and adaptive control signal systems will detect increased traffic volumes and the signal timings will be adjusted by operators or automatically depending on the instrumentation. The TSP and EVP system will provide priority to transit and emergency vehicles as they approach signalized intersections. The operator will be required to view camera images and ensure traffic is flowing consistently and there are no incidents present. If there is an incident present or an obstruction of traffic, for example a disabled vehicle, the operator will need to dispatch the proper personnel and post the incident information on ADMS upstream of the incident to alert motorists to the situation.

***Incident and Event Operations:*** During normal or peak congestion operations, an incident can occur and cause major delays on roadways. If an incident occurs or there is a local event being held, one or more travel lanes may be impacted and onlookers will slow down to view the incident. This results in traffic slow- downs and congestion in the area of the incident. Camera images will show congested areas at the incident site and areas surrounding the incident. The travel time system will detect increased travel times, the ATMS and adaptive control signal systems will detect increased traffic volumes and the signal timings will be adjusted by operators or automatically depending on the instrumentation. The TSP and EVP system will provide priority to transit and emergency vehicles as they approach signalized intersections. The operator will need to dispatch the proper emergency services personnel if they are not already on the scene and post incident/event information on ADMS upstream to alert motorists to the situation. The operator will be required to view camera images and potentially take over signal control if there is an intersection blocked. There may also be instances where the operator will need to work with FDOT, District 5 RTMC operators under incident conditions, Amber/Silver Alerts, hurricane evacuations, as well as coordinating route plans for major events.

***Maintenance Operations***: The operator should verify each device at the beginning of every shift to ensure connectivity and optimal uptime. If a device is polled (communications is attempted) and is not working properly, the operator should contact the proper maintenance personnel and dispatch them to the site for repair. The maintenance worker should contact the operator when the repairs have been made to ensure the device is online and fully functional. Repairs should be performed as soon as possible as to ensure the highest percentage of availability for system devices, infrastructure and components. Delays in repair can result in operators not having the capabilities they need during incidents, events and/or emergencies.

# 7. Summary of Impacts

Throughout the construction of the proposed projects, there will be impacts to the current traffic situation due to possible lane closures and slower traffic conditions. However, once this system is in place, the motorist will have an improved and more efficient means for traveling the Brevard County system.

Because devices, technologies, and components similar to the products already deployed will be utilized, there should be no direct impact on the existing system. As the system is brought online, normal traffic operations may be slightly impacted until operators and Traffic Operations personnel fully understand how to use the system. Once this training is complete and each agency fully understands their roles and responsibilities for operations and maintenance, the system should reduce the time spent on signal timing and configuration as well as provide optimal visibility to Brevard roadways thus, improving incident response times.

# 8. Analysis of the Proposed System

ITS systems are a beneficial and integral part of providing innovative services to transportation customers. Brevard County plans to continue to deploy a regional ATMS in accordance with national and statewide ITS architectures and standards and to operate it from the Brevard County TMC as well as providing view and control capabilities as stated within this document. Brevard County will operate traffic signal systems using innovative software, currently ATMS.now, and FDOT District Five will use the SunGuide® software for operation of the systems on limited access roadways. This project provides for the deployment of the expansion of the overall ATMS within Brevard County and the development of interlocal agency plans for operating and maintaining the ITS devices and signal components.

The stakeholders in the region are confident that the regional ATMS will result in improved transportation efficiency and safety; increased traffic flow; reduced emissions; and improved real-time traveler information. The Brevard ATMS expansion will also increase traffic monitoring, traffic management, and traffic information dissemination capabilities countywide and provide traveler information to the Florida ATIS system and Florida 511 Real Time Traveler Information System.

# 9. Glossary

***Advanced Traffic Management System (ATMS) –*** A system comprised of communications media, devices, and components which work together to allow operations personnel to monitor and manage traffic along corridors or throughout regions. ATMS normally refers to a system deployed on arterial roadways rather than a Freeway Management System, which is deployed on limited access facilities.

***Concept of Operations –*** The stakeholders' vision of how the system will operate in actual practice (standard operating procedure). The concept of operation is a document that defines, in sequence, how the subsystems and institutions will operate with each other for each incident or situation. It identifies and defines the roles and responsibilities of the systems and subsystems of each agency, and the physical environment. It is very useful as a starting point for the development of an ITS project. The concept of operations is frequently drawn up as a flow diagram.

***Federal Highway Administration (FHWA) –*** An agency of the USDoT that funds and regulates highway projects.

***Intelligent Transportation System (ITS) –*** Electronics, communications, or information processing used singly or in combination to improve the efficiency or safety of a transportation system.

***ITS Architecture –*** Defines how systems functionally operate and the interconnection of information exchanges that must take place between these systems to accomplish transportation services.

***National ITS Architecture (NITSA) –*** A common established national framework for ITS interconnectivity and interoperability.

***Stakeholders –*** Anyone with a vested interest or "stake" in the project or system. This includes public agencies, private organizations, special interest groups and traveling public.

***SunGuide®*** – The software program utilized by all FDOT Districts to monitor and control their ITS devices, create incident reports, view video images, and manage incidents on their system.

***Traffic Management Center (TMC) –*** The hub where all information from an ATMS or FMS system is directed to and disseminated from. TMC Operations personnel reside in the TMC and utilize the data and video images received to monitor and manage traffic and incidents along the roadways being covered by the system.