FDOT

SR 400 (I-4) Project Development and Environment (PD&E) Study
FM No.: 201210-2-22-01 and 432100-1-22-01

beyond the ULTIMATE

Concept of Operations

SR 400 (I-4) from West of SR 25/US 27 to East of SR 472

Polk, Osceola, Orange, Seminole, and Volusia County (16320, 92130, 75280, 77160, 79110)

June 7, 2016

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4 EXPRESS

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1 Overview

The Concept of Operations (ConOps) document discusses the elements of the current and proposed system. These elements include an overview of the existing system, traffic, roadway characteristics of the new system, tolling concepts, design concepts, operations of the system, and the enforcement of the new regulations. A brief description of the scope of the project along with a description of the current system and the elements required to transform the current system to the final future system is discussed in the following sections.

1.1 Purpose of the Concept of Operations

The purpose of this document is to describe the operational requirements for the I-4 Express Lanes. The ConOps will document the consensus built among the stakeholders and is written for the Florida Department of Transportation (FDOT) project development team. The ConOps is a critical component to the systems engineering process that provides the framework for the future development of operational and design requirements.

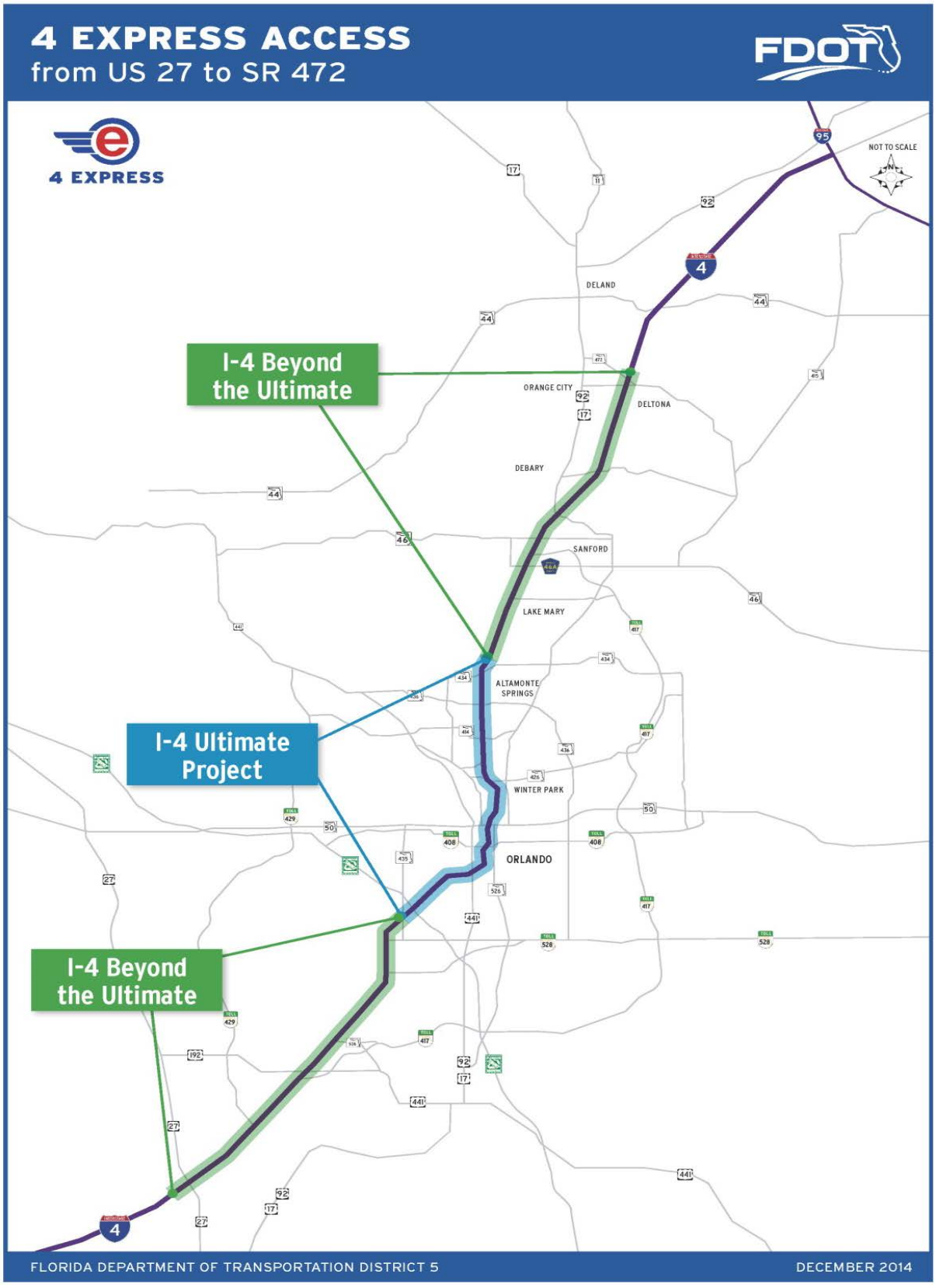
1.2 Scope

The I-4 Express Lane system will be developed under multiple projects. The first project is named "I-4 Ultimate". Expansion projects beyond the I-4 Ultimate project are named "I-4 Beyond the Ultimate". This concept of operations is being developed for the I-4 Beyond the Ultimate (BtU)project. The limits of the I-4 BtU project are from west of SR 35 (US 27) to west of SR 435 (Kirkman Road) and from east of SR 434 to east of SR 472. The locations of the Ultimate and I-4 BtU project can be seen in Figure 1-1. The I-4 BtU project will add approximately 42 miles to the I-4 Express Lane system in its final state making the total system approximately 60 miles in length.

1.3 Background

The proposed improvements to I-4 include widening the existing six lane divided urban interstate to a ten lane divided highway in order to improve safety and traffic operations, enhance connectivity, and improve mobility by providing travel choices to the motoring public. I-4 is an east-west limited access freeway that links the west and east coasts of Florida, from I-275 in Tampa to I-95 in Daytona Beach. Although I-4 is an east-west interstate, through much of the Orlando area it travels in the north-south direction. I-4 spans across six counties in Central Florida, traversing through multiple cities including Lakeland, Celebration, Orlando, Altamonte Springs, Sanford, and DeLand. I-4 is a critical component of Florida's Strategic Intermodal System (SIS), which links seaports, rail, airports, and other intermodal facilities. This aspect of I-4's significance is evidenced through connectivity provided by major junctions with I-275, I-75, SR 429 (Daniel Webster Western Beltway), SR 417 (Central Florida Greeneway), SR 528 (Beachline Expressway), Florida's Turnpike, SR 408 (Spessard Lindsay Holland East-West Expressway), and I-95.

Figure 1-1: 4 Express Project Limits



I-4 serves as the primary corridor in the movement of people and freight between major population, employment, and activity centers in the Central Florida region. When the entire Interstate was fully opened in the early 1960's, it was designed to serve intrastate and interstate travel by providing a critical link between the east and west coasts of Central Florida. Although this role continues to be a crucial transportation function of I-4, the highway also serves large volumes of local and commuter traffic with shorter trip distances. Today, the highway serves as the primary link between hotel/resort complexes and tourist attractions such as Walt Disney World, Universal Studios, Sea World, the International Drive Resort Area, and downtown Orlando. Since I-4 is the only north-south limited access facility that is centrally located between the predominant employment centers and the major suburbs to the north, it has become the primary commuting corridor in the Central Florida metropolitan area.

1.4 Operational Needs

According to the Texas Transportation Institute's December 2012 *Urban Mobility Report*, the Orlando region is ranked 13th highest in the nation for hours of delay and 27th highest in travel time index, which is the ratio of free-flow travel time to travel time in congestion. Orlando is also ranked as the sixth highest region in total peak period travel time and fourth highest in delay per non-peak period traveler. This resulted in a total annual delay of over 46 million hours and an estimated cost of congestion of $1.03 billion.

Growth in Central Florida over the past decades has made it difficult for the transportation system to accommodate travel demand. Traffic congestion and crash incidents have resulted in major delays on the Interstate as well as other arterials surrounding the corridor. Increased congestion levels are experienced outside of the typical morning and afternoon rush-hour periods, affecting mobility levels for more hours of the day and affecting other non-commuter/non-weekday travel. The congestion on I-4 is further evidenced by the less than desirable levels of service on the Interstate as well as the crossroads.

Projections of future population and employment in the region indicate that travel demand will continue to increase well into the future. The ability to accommodate the new travel patterns resulting from growth must be provided to sustain the region's economy. Without the improvements, extremely congested conditions are expected to occur for extended periods of time in both the morning and evening peak periods. Due to these congested conditions, user travel times will continue to increase, the movement of goods through the urban area will be slower, and the deliveries of goods within the urban area will be forced to other times throughout the day. The need for improvements to I-4 is illustrated by the important transportation roles I-4 serves to the Central Florida region and the State of Florida. If no improvements are made to the Interstate, a loss in mobility for the area's residents, visitors, and commuters can be expected, resulting in a severe threat to the continued viability of the economy and the quality of life.

The FDOT is planning to build express lanes in Orlando in order to provide users with a more reliable travel option. The express lanes are additional tolled lanes along the existing I-4 facility that will have limited access to the existing lanes in order to maximize the efficiency of the express lanes. The goal of

the express lanes is to provide users with a transportation option that will provide a reliable travel time by managing demand through the use of tolls for the express lanes.

2 Referenced Documentation

The following documentation is referenced as part of the I-4 Express Lanes Concept of Operations:

- Florida's Statewide Systems Engineering Plan, Appendix R – Concept of Operations Template, March 07, 2005.
- SR 400/ I-4 Project Development and Environment (PD&E) Study, FM No. 432100-1-22-01.
- I-4 Systems Access Modification Report (SAMR) Update – Traffic Technical Report, March 2014
- Manual of Uniform Traffic Control Devices (MUTCD)
- Statewide Express Lanes Handbook
- Statewide Action Plan to Guide Express Toll Lane Implementation
- FHWA Priced Managed Lane Guide
- Turnpike Plans Preparation and Practice Handbook
- 2014 Florida's Turnpike Enterprise General Tolling Requirements
- Texas Transportation Institute December 2012 Urban Mobility Report
- Phase II I-95 Express Lanes System, Software Design Specification, Version 3.0, September 2014

3 Existing Conditions

Within the project limits, I-4 is primarily a six (6) lane limited access facility that runs in the north-south direction. The I-4 BtU Express lanes project will add an additional 42 miles of express lanes within the median of I-4. It will connect directly to the I-4 Ultimate project at SR 435 (Kirkman Road) to the west and at SR 434 to the east. The I-4 Ultimate project was procured as a Public-Private Partnership (P3) and awarded to I-4 Mobility Partners.

The (FDOT) Intelligent Transportation Systems (ITS) Program currently uses technology to manage the project corridor and provide motorists with safer, more reliable roadways. These technologies are deployed along the project corridor and are operated from the FDOT District Five Regional Traffic Management Center (D5 RTMC). The D5 RTMC uses the statewide SunGuide® Software to monitor and control the field devices. There is a regional network of fiber optic communications that connects the D5 RTMC and its respective field devices, as well as other regional transportation partners.

I-4 is operated by FDOT District 5 within the limits of the Beyond the Ultimate project. The Florida's Turnpike Enterprise (FTE) and Central Florida Expressway Authority (CFX) operate roadways that connect to I-4 within the project limits. The D5 RTMC coordinates with the city of Orlando Operations Center, Orange County Traffic Management Center, Seminole County Traffic Management Center, Ocala Traffic Management Center, the Osceola County Traffic Operations Center, and the Florida Turnpike Enterprise (FTE) traffic management center. Procedures currently exist for incident coordination, information dissemination, and sharing data/video between the D5 RTMC and the other TMCs. Each TMC acts as the command and control center for their respective ITS Programs. The ITS Program elements pertinent to the I-4 Express Lanes project includes field devices, software, incident management, traveler information, and express lane management.

3.1 Stakeholders

The major stakeholders affected by the proposed I-4 Express Lanes projects consist of the following:

- Florida Department of Transportation
    - Regional Traffic Management Center
    - Traffic Operations
    - Intelligent Transportation System
- Florida's Turnpike Enterprise
- Central Florida Expressway Authority
- Florida Highway Patrol
- I-4 Mobility Partners
- Local City and County Governments
    - Polk County
    - Osceola County
    - Reedy Creek Improvement District
    - Orange County

  - City of Orlando
  - Seminole County
  - Volusia County
- Local Sherriff and Police Departments
- Local Fire and Rescue Departments

3.2 Existing Support Environment

The existing ITS system is maintained by contractors managed from the D5 RTMC. The ITS Maintenance Contracts include preventative and emergency repair services. The ITS Maintenance Contractors have performance measures for responding to and resolving failures depending on the nature of the failure (e.g., critical versus non-critical). These services are tracked via software (MIMS and OTM) operated out of the D5 RTMC. FDOT also has a contractor that provides roadway maintenance/asset maintenance, which is managed by the FDOT District Five Maintenance Department. The roadway maintenance contractor is contracted to maintain the system according to a level of service established within their scope of services. Roadway and asset maintenance within Polk County is managed by the FDOT District 1 Maintenance Department. FTE has maintenance contracts with vendors to provide toll collection equipment maintenance on all FTE owned and managed toll facilities.

3.2.1 Existing ITS Device and Software

The existing ITS devices along the I-4 corridor are monitored and controlled using the SunGuide® Software. The existing devices consist of Closed Circuit Television (CCTV) cameras, Dynamic Message Signs (DMS), Microwave Vehicle Detection Stations (MVDS), inductive loop detectors, and an extensive fiber optic communications network that connects the system.

CCTV cameras are used for monitoring the roadways in support of incident detection, incident verification, incident clearance verification, and verification of DMS. CCTV cameras provide complete coverage of I-4 within the project limits and the video is shared with the public through the Florida Advanced Traveler Information System (FLATIS) or 511 website.

DMS are used to disseminate event information (incidents, lane closures, weather, etc.), safety messages, travel time messages, and special alerts to motorists along the I-4 corridor.

MVDS and inductive loop detectors are roadway devices that detect the speed and presence of vehicles along the roadway. MVDS use microwave technology to detect when a vehicle has crossed a certain point and records both the speed of the vehicle and number of vehicles that cross that point within a certain time. Inductive loop detectors perform a similar function of recording the speed and number of vehicles within a certain time but they use inductive loops embedded within the pavement.

The fiber optic network interconnects all of the devices within the ITS system so they can communicate with the D5 RTMC. The fiber optic network also allows the D5 RTMC to control the ITS devices.

The I-4 Ultimate project will be operating and will have a fully functional system for toll pricing at the time of integration of the Beyond the Ultimate project. A separate system will also be in place along the I-4 Ultimate system for toll collection and processing. Once integrated the Beyond the Ultimate system will share the I-4 Ultimate systems for toll pricing and toll collection and processing.

3.2.2 Emergency Response Personnel

Traffic Incident Management (TIM) is the process of detecting, responding to, and clearing traffic incidents. TIM for I-4 is handled by FDOT whose operations are conducted from the D5 RTMC. TIM within the district is coordinated by four different entities, which include TIM Teams, Road Rangers, Florida Highway Patrol (FHP), and local fire departments. There are two TIM teams within the project limits: the Volusia/Flagler TIM team and the Tri-County TIM team which is for Osceola, Orange, and Seminole Counties. The TIM Teams consist of personnel from FDOT, FTE, FHP, tow companies, local police, local fire rescue, CFX, the RTMC contract manager, consultants, construction project representatives, the Florida Department of Environmental Protection (FDEP), and asset management companies. The D5 RTMC TIM Team meets bi-monthly. Through the TIM Teams, the D5 RTMC has established excellent working relationships with the incident responders such as the local fire departments and local law enforcement. The TIM Teams have helped to establish quick clearance policies and provide a forum to discuss issues, which results in continuous improvement to incident response within the region. FDOT's Road Ranger patrols and FHP operations along I-4 are dispatched from the D5 RTMC. The local fire departments and law enforcement are dispatched from the 9-1-1 emergency services dispatch center. The local fire departments that serve I-4 within the project limits are:

- Polk County Fire Department
- Osceola County Fire Department
- Orange County Fire Rescue
- Reedy Creek Fire Department
- City of Orlando Fire Department
- Seminole County Fire Department
- Lake Mary Fire Department
- City of Sanford Fire Department
- City of Longwood Fire Department
- Deltona Fire Department and Rescue
- Orange City Fire Department
- Volusia County Fire Department

Each of the local fire departments were contacted and their emergency response responsibilities were reviewed in the context of the future express lanes. The procedure for being able to access and safely respond to incidents within the express lanes was evaluated and discussed with the fire departments. The fire departments were made aware of the project and the plan for accessing the express lanes was coordinated with the fire departments to ensure their ability to respond to all emergencies within the

express lanes and their continued access to the general use lanes. The jurisdictional limits of the fire departments that respond to emergencies along I-4 within the project limits are shown in Figure 3-1. Fire department coverage of the express lanes will need to be revisited in order to resolve any gaps in coverage due to jurisdictional limits. This evaluation will be addressed in a separate attached document to be completed by others.

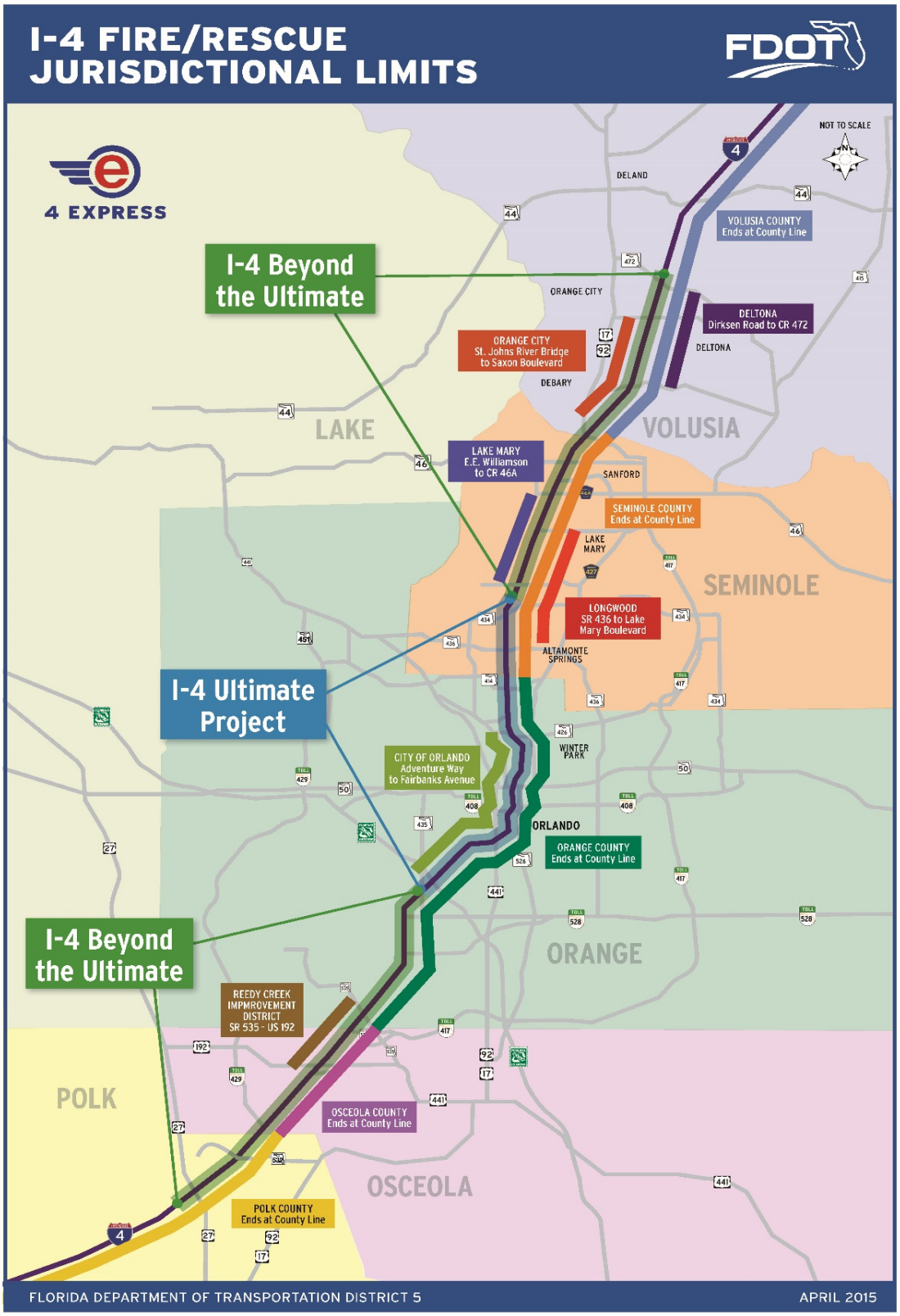
3.2.3 Central Florida Expressway Authority

FDOT currently operates the ITS devices that are owned by CFX. The devices are operated from the D5 RTMC and are maintained by CFX.

3.2.4 FDOT District 1

FDOT District 1 is responsible for maintenance of I-4 within Polk County while the District 7 Road Rangers patrol I-4 within Polk County up to the Champions Gate exit (exit 58) in Osceola County. The District 7 RTMC in Tampa, Florida dispatches the Road Rangers and operates I-4 in Polk County. FHP Troop C provides enforcement and incident response support in Polk County. They are dispatched from the District 7 RTMC.

Figure 3-1: Fire/ Rescue Department Jurisdictional Limits.



4 Concept for the Proposed System

The I-4 Express Lanes will provide additional capacity (Express lanes) along the project corridor, by effectively creating a new facility within the existing facility. These physical changes to the corridor will have a significant impact on the existing operations along I-4. The impacts will result in the need for:

- Additional RTMC Staff – The I-4 Express Lanes will increase the existing workload at the RTMC. The additional workload will occur in the following areas:
  - Day-to-Day Express lanes Operations;
  - Day-to-Day Ramp Signaling Operations (I-4 Ultimate project only);
  - Additional performance reporting requirements;
  - Technical/Engineering analysis to monitor/update various dynamic algorithm parameters and procedures;
  - IT/Software support;
  - Public Outreach/Customer Service Support.
- Additional ITS Maintenance –Maintenance responsibilities in the Ultimate section are the responsibility of the concessionaire. Maintenance requirements for the Beyond the Ultimate projects will need to be assessed based on the procurement process used.
- Additional Incident Management Resources – One key objective is to provide a more reliable trip within the I-4 Express Lanes. This requires additional incident management resources to respond and clear incidents quicker than what is currently provided within the project corridor, as well as address the additional maintenance of traffic resources needed during Express Lane closures.
- Administrative Rules Changes – The proposed I-4 Express Lanes concept requires changes to the existing Administrative Rules regarding Express lanes. The existing Administrative Rules were developed for 95 Express and are undergoing revisions to support multiple express lane facilities throughout Florida including the I-4 express lanes. Changes to the rules will include revising maximum toll allowable.
- Additional Procedures – The I-4 Express Lanes will require new coordination procedures among various stakeholders (TMCs, Emergency Responders, Maintenance, etc.) along the corridor including sharing ITS information with adjacent agencies and partners and incident response coordination.

4.1 Goals and Objectives

Express lanes are an innovative solution to manage traffic congestion and provide travel choices to drivers. The express lanes will include variable toll pricing based on the level of congestion in the express lanes causing the tolls to go up or down depending on the traffic volumes. The toll would be higher during peak periods when demand is greater and lower during non-peak periods when the demand is less. The dynamic tolls help maintain traffic flow by monitoring the volume of traffic using the express lanes. A target speed of 50 miles per hour or greater is intended to be maintained during

operation of the express lanes. The main goal of the Express Lanes is to provide more reliable travel options for motorists.

4.2 Project Segments

Construction on the I-4 Ultimate project began in early 2015 and is expected to be completed by the end of 2020. The Beyond the Ultimate project is currently divided into four segments:

- The first segment will be from west of SR 435 (Kirkman Road) to west of SR 528.
- The second segment will be from east of SR 434 to west of US 17/92.
- The third segment will be from west of SR 528 to west of US 27.
- The fourth segment will be from west of US 17/92 to west of SR 472.

Preliminary engineering on all four Beyond the Ultimate segments will begin in 2015.

4.3 Alternatives Considered but not Included

The possibility of installing reversible lanes was considered for the eastern portion of the project from east of SR 434 to east of SR 472. A separate report entitled *Reversible Express Lanes Evaluation* evaluated the feasibility of implementing reversible lane use within the I-4 Express Lane's Segments 3 and 4 to alleviate congestion in the peak direction of traffic flow during morning and afternoon peak periods. The report evaluated the following alternatives:

- Alternative 1 – 6 General Use Lanes (GUL) + 4 Express Lanes (EL) (No Reversible Lanes)
- Alternative 2 - 6 GUL + 2 EL (No Reversible Lanes)
- Alternative 3 - 6 GUL + 3 EL (with Reversible "Zipper" Lane)
- Alternative 4 - 6 GUL + 4 EL & 6 GUL + 2 EL (No Reversible Lanes)

The report recommended that the Alternative 1 (6 GUL + 4 EL) configuration be implemented throughout Segments 3 and 4 based on the life cycle cost analysis for the movable barrier system, the structural analysis of the bridge system over the St. Johns River, and considering other design, operations, maintenance, and cost factors evaluated in this report. The report can be found in ppendix 1: Reversible Express Lanes Evaluation.

4.4 Proposed Support Environment

The I-4 Express Lanes operations and maintenance will be a multi-agency effort among FDOT District Five (D5), FDOT District 1, Florida's Turnpike Enterprise (FTE), Central Florida Expressway Authority (CFX), I-4 Mobility Partners, Florida Highway Patrol (FHP), and Local Fire and Rescue. A new public-private partnership concession (PPP) procurement is currently planned for the third segment. Similar to the arrangement for the I-4 Ultimate project, the PPP concessionaire could be made responsible for operations and maintenance within the third segment.

4.4.1 Proposed ITS Devices

Additional ITS devices will be added to the project corridor within the general use lanes and to manage the express lanes. FDOT maintenance contractors will maintain the ITS devices within the project limits.

The I-4 Express Lanes will utilize Dynamic Message Signs (DMS) in two (2) functional areas as described below:

- Motorist Information - The TMC Operators will use the DMS to inform motorists with event information that may impact the motorists' decision to divert in or out of the Express Lanes such as for travel times, vehicle alerts, safety messages, construction, and other messages approved by FDOT.
    - Highway DMS (HDMS) – The HDMS will be placed in General Purpose Lanes and Express Lanes.
    - Arterial DMS (ADMS) – The ADMS are on arterial approaches to I-4
- Toll Operations:
    - Toll Amount DMS (TADMS) – The TADMS are full matrix, full color DMS that display the toll amounts for each segment and are controlled by the toll setting software. In addition to the toll amounts, they will display the "CLOSED" and "$0.00" messages as appropriate. Each I-4 Express Lanes entrance will have two (2) Toll Amount Signs; one (1) located before and one (1) located after the ½ Mile Express Lanes Entrance sign.
    - Lane Status DMS (LSDMS) – The LSDMS are full matrix, full color DMS attached to the static guide signs for the Express Lanes entrances. They display the I-4 Express Lanes operational status, such as "OPEN", "CLOSED", or "CONGESTED". The LSDMS will be controlled by the toll setting software. The "OPEN" message is displayed when the express lanes are open and operating normally with minimal congestion. The "OPEN" message is also displayed in emergency situations when the express lanes are open but no toll is being charged. In emergency situations, such as an evacuation, the TADMS will display "$0.00" and the LSDMS will display the "OPEN" message. The "CLOSED" message is displayed when the express lanes are closed for incident management or other reasons. The "CONGESTED" messages are displayed when the I-4 Express Lanes performance drops below the target average speed of 50 miles per hour. Each I-4 Express Lanes entrance will have two (2) LSDMS attached to the two (2) Express Lanes entrance ramp guide signs closest to each Express Lanes entrance ramp.

Vehicle Detection Stations (VDS) will collect real-time traffic volume, speed, and lane occupancy data. The raw detector data will be processed to reduce erroneous data from the data set before it is fed into the dynamic pricing algorithm for calculating tolls. The VDS will be integrated into the TMC's SunGuide® Software for collecting and storing the raw data. This data will also be used by the TMC Operators to detect incidents and can be used to post travel times. Microwave Vehicle Detection Stations (MVDS) will have a maximum detector spacing of one half (1/2) of a mile within the general use lanes.

New pan-tilt-zoom (PTZ) CCTV cameras will be integrated into the existing CCTV control software used by the D5 RTMC to provide complete coverage of the express lanes and general use lanes. The D5 RTMC Operators will use the PTZ CCTV cameras to quickly detect, verify, and monitor incidents in both the Express Lanes and General Purpose Lanes. The PTZ CCTV camera spacing will provide 100% coverage of the Express Lanes, General Purpose Lanes, emergency access points, incident investigation sites, and ramps with Ramp Signals.

Additional VDS will be installed within the express lanes at one third (1/3) of a mile spacing to collect data that will be used estimate the demand for the express lanes. New static CCTV cameras will be added to confirm the messages and toll amounts posted on all DMS used for communicating the express lane price and status. The FDOT Express Lane Software (ELS) is under development and will be used to set operating modes, process the raw detector data for input into the dynamic pricing algorithm, set the toll amounts, and control the LSDMS and TADMS directly.

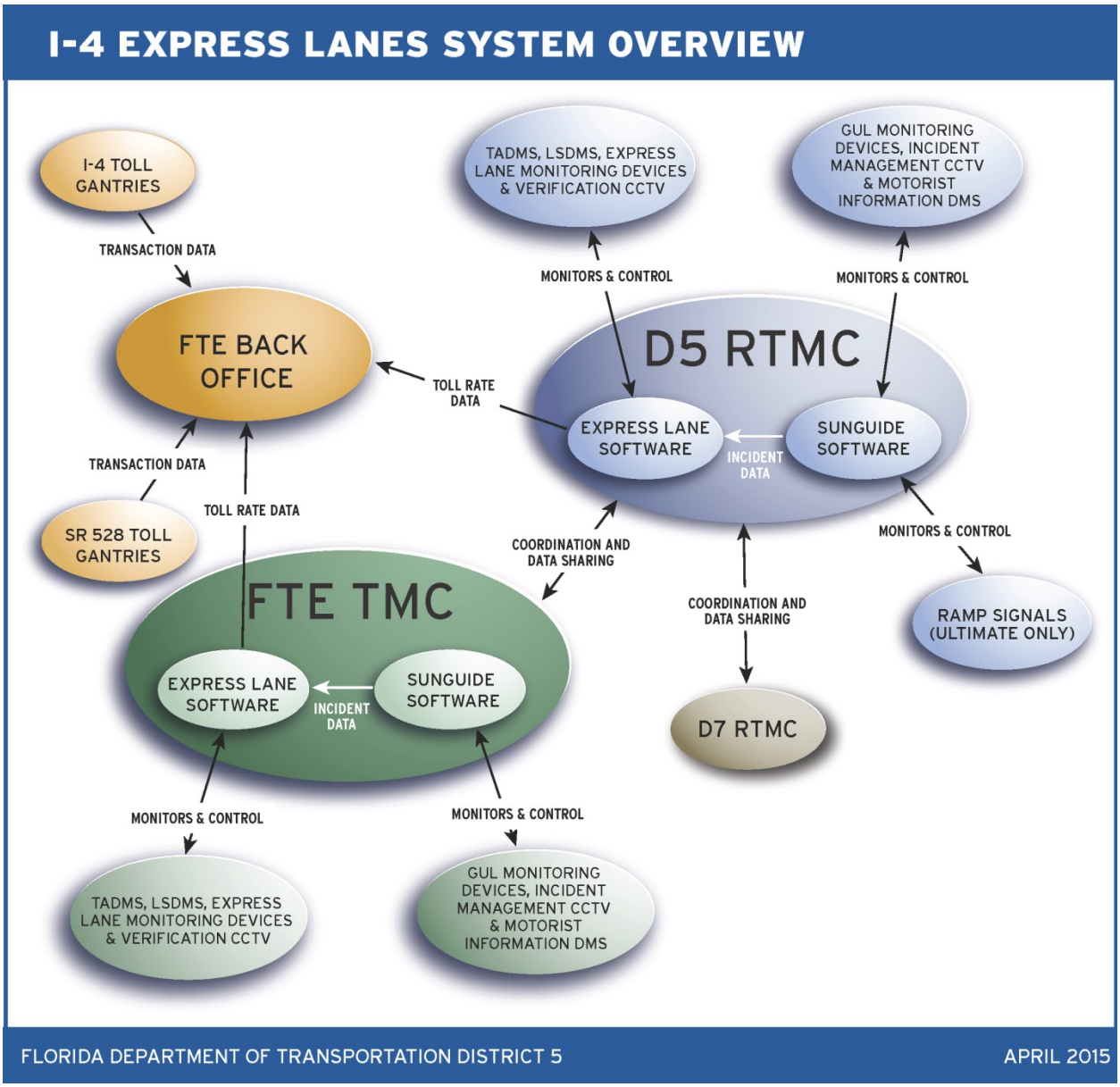
Toll information will be collected by FTE at new toll and data gantries utilizing the existing network that will be installed to collect tolls for I-4 Ultimate. The ELS will send the final toll amount information by segment and trip to FTE for processing. The ELS will provide a web service to allow FTE customer service representatives access to toll operation data, incident information, and TADMS/LSDMS messages regarding the Express Lanes operations.

The proposed ITS system for I-4 will consist of two separate software programs located at the D5 RTMC, ELS and SunGuide®. SunGuide® will be used to monitor and control the ITS devices for the general use lanes and control the ramp signals for the I-4 Ultimate project. ELS will be used to monitor and control the ITS devices for the express lanes. The D5 RTMC will need to coordinate and share data with the District 7 RTMC for incident management purposes near the Polk County border. The D5 RTMC will also need to coordinate with the FTE TMC for incident management at system borders. Toll rate data will be sent from the D5 ELS to the FTE back office for processing. Transaction data will be sent to the FTE back office directly from the toll and data gantries. A flow chart outlining these connections can be seen in Figure 4-1.

4.4.2 District 5 Regional Traffic Management Center

The District 5 Regional Traffic Management Center (D5 RTMC) will be responsible for operating the I-4 Express Lanes within the Beyond the Ultimate corridor. D5 RTMC Operators will monitor traffic conditions in the I-4 Express Lanes and post toll amounts via the FDOT Toll Setting Software. The vehicle detectors within the Beyond the Ultimate corridor will be on the D5 RTMC network and will be used to monitor traffic conditions for toll setting and reporting by the D5 RTMC. The dedicated CCTV for the D5 RTMC controlled Toll Amount DMS will be on the D5 RTMC network and will be used by D5 RTMC staff to confirm the messages posted. The CCTV and Motorist Information DMS, which pertain to the I-4 Express Lanes, and are located along other adjacent networks such as the Florida Turnpike and other local agencies, will also be controlled by the D5 RTMC. The D5 RTMC will be responsible for the maintenance of ITS devices on their network, regardless of the jurisdictional location of the devices. Additional staffing will be required to operate the express lanes. An estimated four additional operators

Figure 4-1: ITS Connections.



will be required for the new express lanes. The details of the additional staffing can be found in Section 8.4.

The D5 RTMC will also be responsible for incident management within the Express lanes and General Purpose Lanes along I-4 within the project limits. This includes incident detection, dispatching Road Rangers, agency notifications, and posting messages on Motorists Information DMS. Coordination for incident management resources will occur for incidents near the I-4 Ultimate/I-4 Beyond the Ultimate project boundaries.

4.4.3 Florida Turnpike Enterprise

Florida Turnpike Enterprise (FTE) will handle account management of the SunPass® accounts, which includes all back office functions. Back office functions include developing and maintaining the trip reconstruction software and any interface software developed to receive the tolls set by the D5 RTMC. FTE will also share data required to support reporting requirements. FTE Customer Service Representatives will handle all initial account inquiries and will be supported by the D5 RTMC to address any toll disputes. FTE will also be responsible for the installation and maintenance of electronic toll collection (ETC) equipment on the toll and data gantries and the equipment inside the gantry buildings.

ITS information will be shared by FTE and District 5 for the purposes of operating the express and general use lanes. The express lane connection at SR 528 will require that FTE express lane signs be placed along District 5 operated roadways and District 5 express lanes signs will be required along FTE operated roadways. Additional VDS devices will also be needed along the SR 528 express lanes to operate the I-4 express lanes and FTE will require additional VDS devices along the I-4 express lanes to operate the SR 528 express lanes. For these signs and ITS equipment a new ITS maintenance agreement will be required between the two jurisdictions allowing ITS maintenance to take place along each other's roadways.

4.4.4 Central Florida Expressway Authority

The D5 RTMC is currently monitoring and controlling the ITS devices along CFX roadways and is expected to continue monitoring them after the Beyond the Ultimate project is completed. ITS information will continue to be shared by FDOT and CFX.

4.4.5 I-4 Mobility Partners

I-4 Mobility Partners will be responsible for the maintenance of the I-4 Express Lanes from west of SR 435 (Kirkman Road) to east of SR 434. In addition to roadway maintenance, they are also responsible for the maintenance of all ITS devices from east of SR 528 to east of Lake Mary Boulevard and incident management from SR 528 to Lake Mary Boulevard. FDOT will coordinate with I-4 mobility partners by sharing ITS information needed to operate the general use lanes and the express lanes near the operating limits of the projects.

4.4.6 Florida Highway Patrol

FHP will be responsible for providing field enforcement of the Express Lanes as well as incident management support. FHP Troop D and Troop K will coordinate enforcement and incident response responsibilities at jurisdictional boundaries. Additional staff will be needed for enforcement of the express lanes. The details of the staffing requirements can be found in section 9.1.

4.4.7 Local Fire and Rescue

The fire rescue agencies will continue to provide emergency services for incidents along the project corridor. These agencies will revisit their existing mutual aid agreements for responding to incidents near their respective jurisdictional boundaries because access to the express lanes will be limited. Access to the Express Lanes will be restricted to the entrance ramps, exit ramps, and where emergency access gates are located.

4.4.8 FDOT District 1

FDOT District 1 will continue to maintain the general use lanes within Polk County. The District 7 RTMC will continue to dispatch FHP and Road Rangers for the general use lanes within Polk County. The D5 RTMC will coordinate with the D7 RTMC through existing communication channels in order to operate and maintain the express lanes within and around Polk County. ITS devices will be needed within District 1 in order to operate the express lanes. The concessionaire chosen will be required to coordinate express lanes operations, ITS maintenance, incident management, traffic enforcement, and roadway maintenance within Polk County.

4.5 Maintenance

Maintenance responsibilities for the Beyond the Ultimate segments will be determined based upon the procurement method used to construct the projects. Maintenance of the toll equipment will be the responsibility of FTE. Two options for maintenance responsibilities are shown in Table 4-1. Additional maintenance costs for the express lanes are estimated to be $8 Million per year. This includes roadway maintenance, ITS operations and maintenance, and incident management costs.

Table 4-1: Maintenance Responsibilities.

Public-Private Partnership		**Design-Build-Finance, Design-Build, or Design-Bid-Build**	
Description	**Responsibility**	**Description**	**Responsibility**
Roadway Maintenance	Concessionaire	Roadway Maintenance	Contractor (Asset Maintenance)
ITS Maintenance	Concessionaire	ITS Maintenance	Contractor (ITS Maintenance)
Road Ranger Patrols	Concessionaire	Road Ranger Patrols	Contractor (LYNX)
Road Ranger Dispatch	Concessionaire	Road Ranger Dispatch	FDOT
Sign Posting	FDOT	Sign Posting	FDOT
FLATIS Interface	FDOT	FLATIS Interface	FDOT
Regional Coordination	FDOT	Regional Coordination	FDOT
Incident Response	Concessionaire	Incident Response	FDOT

4.6 Public Information

The express lanes in FDOT District 6 have been a success in part due to the proper dissemination of information to the public. District 6 utilizes one Public Information Officer (PIO) and one Assistant PIO. The I-4 Express Lanes will also need at least one PIO and one Assistant PIO in order to be successful. The PIOs will be responsible for all of the ITS operations within District 5 and will cost an estimated $225,000 per year. The cost of these additional PIOs would be covered by the FDOT.

5 Traffic and Roadway Characteristics

Intersection and interchange improvements are included in the I-4 Beyond the Ultimate project in locations where modeling of the future traffic projection volumes has indicated that the existing infrastructure will create significant delay. Project traffic for I-4 and surrounding arterials within the study limits was provided in the *I-4 SAMR Update: Traffic Technical Report (May, 2015)* prepared for this project. The *I-4 SAMR Update: Traffic Technical Report* updates the previously approved *I-4 SAMR Update: Design Traffic Technical Memorandum (January 2013).* The *Preliminary Engineering Report* that was prepared under the Project Development and Environment Study contains detailed information on the traffic projections and interchange concepts that were developed for the project.

6 Tolling

The express lanes will be a tolled facility with trip based tolling. Trip based tolling consists of combining toll segments together in order to lock in the price paid for travelling beyond more than one segment. Trip based tolling promotes longer vehicle trips inside the express lanes because customers know that they will not have to pay more than the price they saw for any segment within the trip. The tolling strategy has been defined based on the tolling concepts that are currently being implemented throughout the state.

6.1 Tolling Concepts

The tolling concept will be based on trip based tolling with each trip consisting of three or fewer exits, or segments, per trip. One segment is defined as being from the earliest entry point to the next succeeding exit point. After each exit point the following segment begins. For example, the first segment in the westbound direction begins at the beginning slip ramp just west of SR 472. There are two additional entrances within the first segment at Rhode Island Avenue and the westbound Dirksen Drive slip ramp entrance. The first segment ends at the first exit, which is the SR 417/ SR 429 exit. The next segment begins after the SR 417/ SR 429 exit. Due to the nature of the exits along I-4 and the length of the system, the trips are not the same in the eastbound and westbound directions. For example, in the westbound direction, one segment begins after the Lake Mary Boulevard eastbound slip ramp exit and ends at the Lee Road slip ramp exit. The same segment in the eastbound direction begins after the Central Parkway exit and ends at the Lake Mary Boulevard westbound slip ramp exit. The eastbound and westbound segments and trips can be found in Figure 6-1 and Figure 6-2 respectively.

6.2 Rate Structure

The tolling rate will be dynamic and vary based on the traffic density of the express lanes. The Florida Administrative Code addressing toll rate structure, which is currently written for 95 Express, is undergoing revisions to support multiple express lanes projects throughout the state. In accordance with current FDOT policy High Occupancy Vehicles (HOV) will not be exempt from the tolls.

The toll rate will be calculated for each segment based on the traffic density in that segment. The trip tolls will be a summation of the segment tolls traveled within that trip. The toll assessment will function similar to 95 Express Phase 2 and 75 Express/ Palmetto Express in that a trip toll benefit will be provided to the customers by locking in the price for the trip when the customer enters that trip.

6.3 Payment Methods

Tolls will be collected electronically using the current SunPass system. Toll-by-plate will not be used to collect tolls in the express lanes. The Florida Turnpike Enterprise (FTE) will be responsible for ensuring that the tolls are being collected properly and that any violations are being enforced in accordance with the Florida Statutes. Roadside equipment will be provided and maintained by the Florida Turnpike Enterprise for all toll and data gantries.

Figure 6-1: 4 Express Eastbound Segments

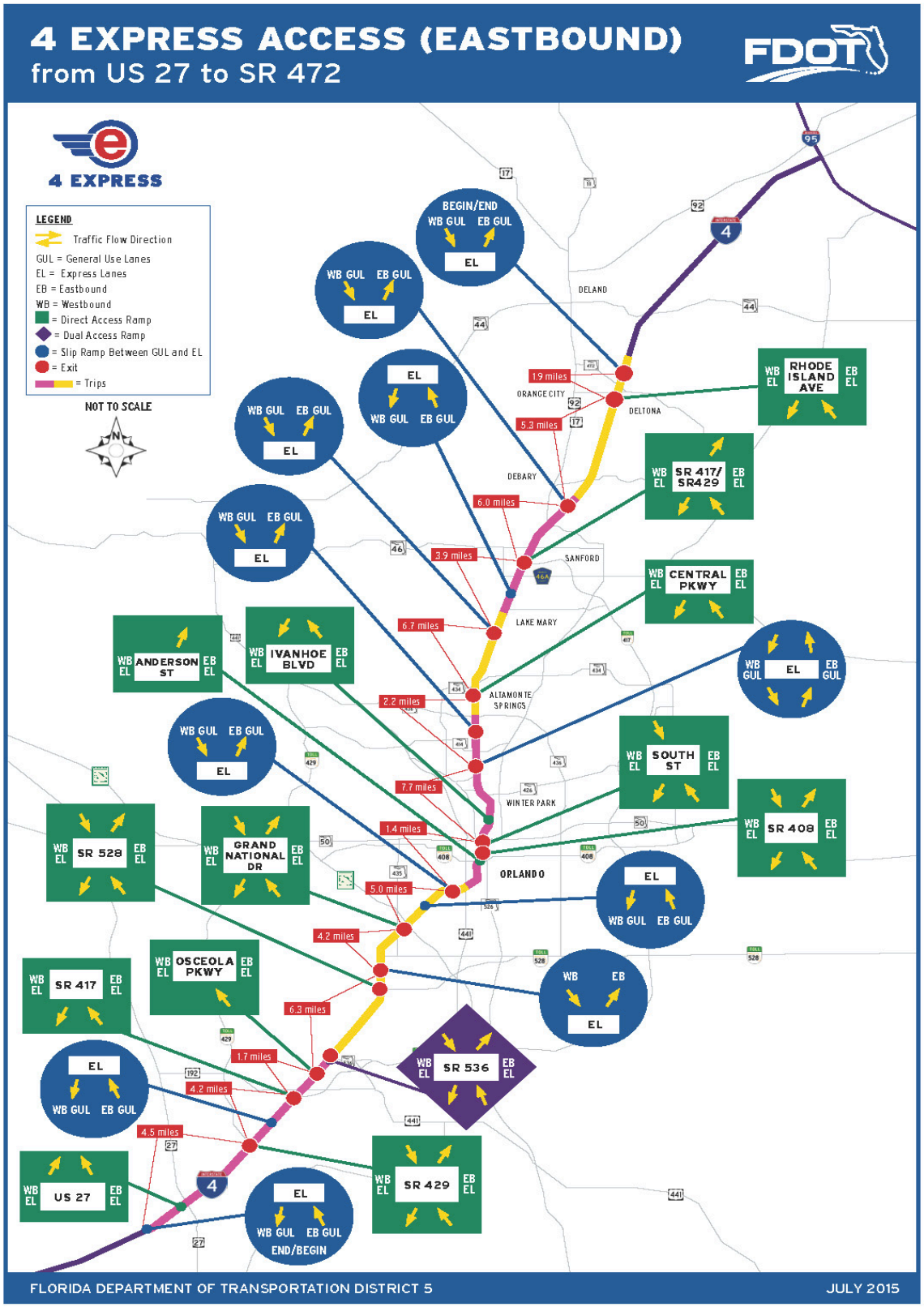
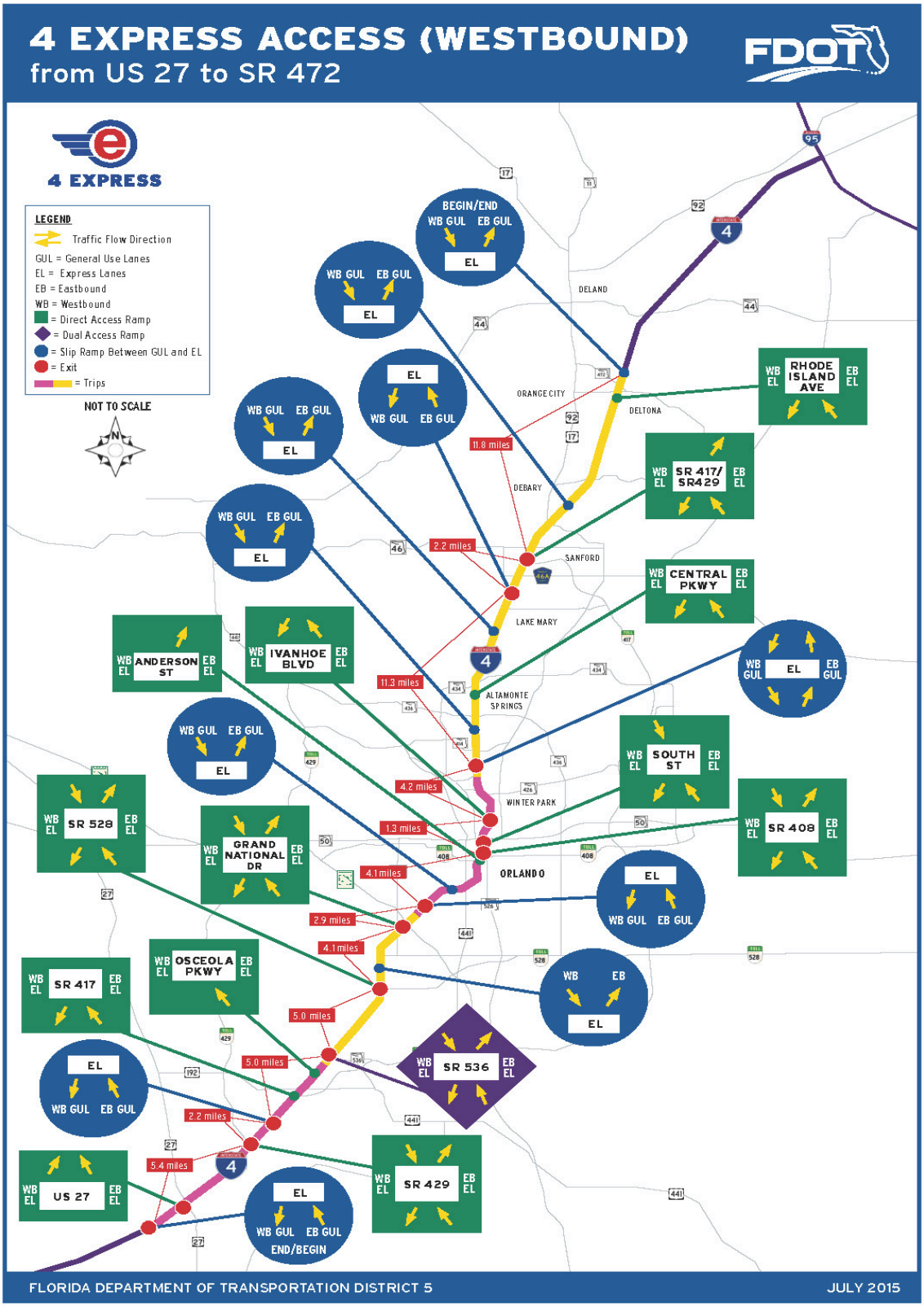


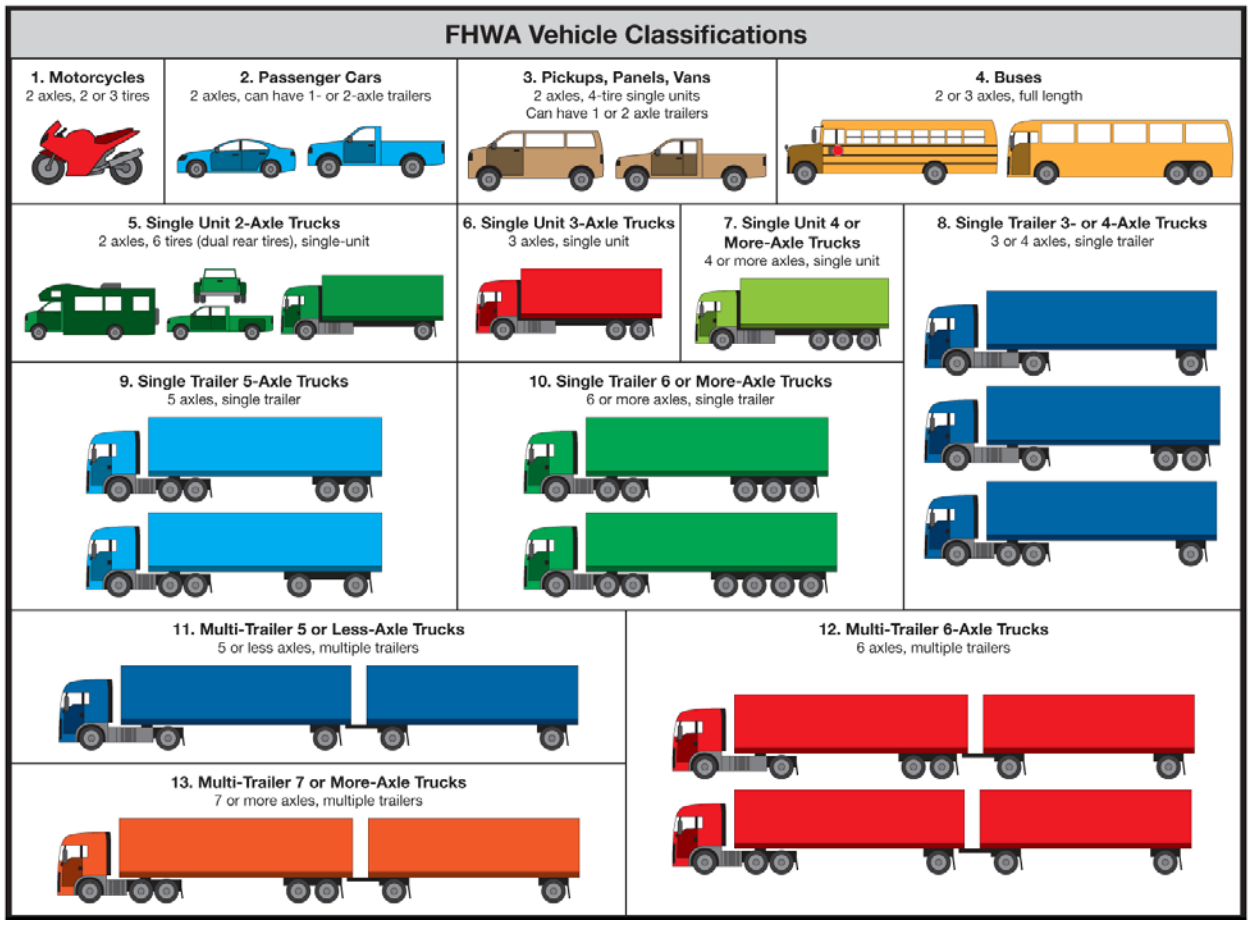
Figure 6-2: 4 Express Westbound Segments



6.4 Allowable Vehicles

In accordance with statewide policy, only two axle vehicles will be allowed to use the express lanes with the exception of buses that have three axles (vehicles in FHWA categories 1 through 5). In accordance with FDOT statewide policy, registered school buses and public transit buses will be exempt from the express lane tolls. Figure 6-3 Shows the FHWA Vehicle Classifications.

Figure 6-3: Vehicle Classification.



Source: *http://onlinemanuals.txdot.gov/txdotmanuals/tri/images/FHWA_Classification_Chart_FINAL.png*

6.5 Operating Modes

Consistent with other express lanes within the state that are under construction or already implemented, the express lanes will have five different operating modes. The modes will be used for different operational situations.

- **Dynamic:** Dynamic mode will be used under normal day-to-day operating conditions. The toll is based on real-time traffic data that will be fed into the dynamic pricing algorithm and the tolls will be updated based on a predetermined time interval.

- **Time of Day:** Time of Day (TOD) mode will be used when insufficient real-time traffic data is available from the field. Historical data will be used to establish the TOD tolls and will be updated periodically. The operating rules will establish the initial TOD tolls as well as periodic updates to the TOD tolls.
- **Closed:** Closed mode will be used when an event causes any travel lane in the express lanes to be blocked. When Closed mode is implemented an indicator will be sent to FTE so that FTE does not charge a toll amount for that specific segment. Operating rules will be established to determine the operation of the express lanes under the Closed mode. Since motorists should not be entering the express lanes during Closed mode additional legislative action may be appropriate in order to limit access by motorists while the system is in Closed mode. Additionally, any trip toll benefits will not be provided for motorists traveling within the segment during Closed mode.
- **Zero:** Zero mode will be used when the Express Lanes are open, but a $0.00 toll is charged. This may be applied when traffic is diverted from the General Purpose Lanes to the Express Lanes because of an incident in the general use lanes. The decision to divert traffic into the express lanes will be made at the D5 RTMC using preapproved operating rules. This mode will also be used for evacuations, when tolls have been lifted on other FTE facilities.
- **Manual:** Manual mode is used when the Operator has to make a manual adjustment to tolls. This can happen when a Toll Amount DMS has malfunctioned. For example, if a Toll Amount DMS message is stuck on a certain toll amount, which is different from the desired toll amount, the Express Lanes may be put into Manual mode to ensure the tolls posted are consistent with the tolls charged. This will follow the approved operating rules.

6.6 Dynamic Pricing Algorithm

The dynamic pricing algorithm developed for the Express Lane Software will be used to calculate the toll amounts for each segment of the I-4 Express Lanes. The dynamic pricing algorithm changes the toll amounts in the express lanes based on the traffic demand. The minimum and maximum tolls will be set for the I-4 express lanes based on Administrative Codes and the length of each segment.

The dynamic pricing algorithm calculates toll amounts based on traffic density. Traffic density is calculated by dividing the traffic volume by the traffic speed. The traffic volume and speed are collected by the vehicle detection system (VDS). The traffic data is processed every fifteen minutes and the current traffic density is calculated for each segment to the nearest whole number.

The dynamic pricing algorithm will use two tables to determine the toll amount to be charged. The two tables are a level of service (LOS) table and a Delta Settings table. The LOS table defines a range of prices that can be charged based on the current LOS in the express lanes. The LOS in the express lanes is defined by the Highway Capacity Manual (HCM) and is based on the calculated traffic density. A sample LOS table is shown in Table 6-1.

Table 6-1: Level of Service Table.

Level of Service	Traffic Density (pc/mi/ln)	Toll Amount	
		Min	Max
A	0 – 11	$0.50	$0.50
B	>11 – 18	$0.50	$1.50
C	>18 – 26	$1.50	$4.00
D	>26 – 35	$3.00	$7.00
E	>35 – 45	$5.00	$7.00
F	>45	$6.00	$7.00

The Delta Settings table relates the change in traffic density to a change in price. The change in traffic density is measured from the previous time period to the current time period. The change in toll rate is determined by change in traffic density and the previous toll amount. The current toll is then compared to the maximum and minimum toll amounts for the current LOS. If the current toll amount falls outside of the maximum or minimum toll amount for the current LOS then the respective maximum or minimum toll will be charged. A sample Delta Settings table can be found in Table 6-2.

Table 6-2: Delta Settings Table.

Level Of Service	Traffic Density (pc/mi/ln)	Δ Traffic Density						
		0	1	2	3	4	5	6
D	27	$0.00	$0.25	$0.75	$1.00	$1.25	$1.50	$2.00
	28	$0.00	$0.25	$0.75	$1.00	$1.25	$1.50	$2.00
	29	$0.00	$0.25	$0.75	$1.00	$1.25	$1.50	$2.00
	30	$0.00	$0.25	$0.75	$1.00	$1.25	$1.50	$2.00
	31	$0.00	$0.25	$0.75	$1.00	$1.25	$1.50	$2.00
	32	$0.00	$0.25	$0.75	$1.00	$1.25	$1.50	$2.00
	33	$0.00	$0.25	$0.75	$1.00	$1.25	$1.50	$2.00
	34	$0.00	$0.25	$0.75	$1.00	$1.25	$1.50	$2.00
	35	$0.00	$0.25	$0.75	$1.00	$1.25	$1.50	$2.00

The Express Lane Software (ELS) uses the dynamic pricing algorithm to set the toll rate based on the traffic density. Before the toll amount is changed, the express lanes operator must verify that the price displayed on the TADMS matches the price shown as being charged by ELS and that the price is within the allowable rage for the current LOS.

6.7 Roadside Toll Equipment Types

Two types of roadside toll equipment installations will be utilized on the express lanes:

- Non-accessible type toll gantries
- Non-accessible type data gantries

Non-accessible toll gantries will be utilized for toll collection and enforcement purposes within each segment of the express lanes. Gantries with AVI equipment (data gantries) will be used in locations where there is more than one entrance to the express lanes to record the time when vehicles enter the express lanes. Using the AVI equipment in this way will ensure that the correct tolls will be assessed for vehicles within the express lanes by reducing the amount of time between when a vehicle sees a specified price and when the vehicle is identified as having entered each segment. Each data gantry will be designed to support all of the normal equipment used at a toll gantry but will only be equipped with the vehicle identification equipment that is required to identify when a vehicle enters a segment.

7 Design Concepts

7.1 Roadway Design

The design speed of the new construction will be 70 miles per hour and the typical section of the general use lanes will be 12 foot outside shoulders with 12 foot lanes and 10 foot inside shoulders. The design speed of the express lanes will also be 70 miles per hour and the typical section of the express lanes will be 10 foot outside shoulders with 12 foot wide lanes and 6 foot inside shoulders. A rail corridor will be preserved in the median of I-4 from west of US 27 to SR 528 (Polk, Osceola, and Orange Counties)and a transit corridor will be preserved in the median from the St. Johns River bridge to east of SR 472(Volusia County). The proposed typical section of the express lanes can be seen in Figure 7-1.

7.1.1 Dry Standpipes

Dry standpipes will be provided on all third and fourth level bridges, any location with a retaining wall higher than four feet, and connector ramps over 0.5 miles in length. Access for fire hoses will also be added through all existing sound walls where none or inadequate access currently exists. The layout of the dry-line risers should be dependent on the location of the existing fire hydrants. The lower ends of the riser pipes all have to be within 500-feet of a fire hydrant and the upper ends have to be spaced at a maximum distance of 1000-feet apart to facilitate the length of a fire hose.

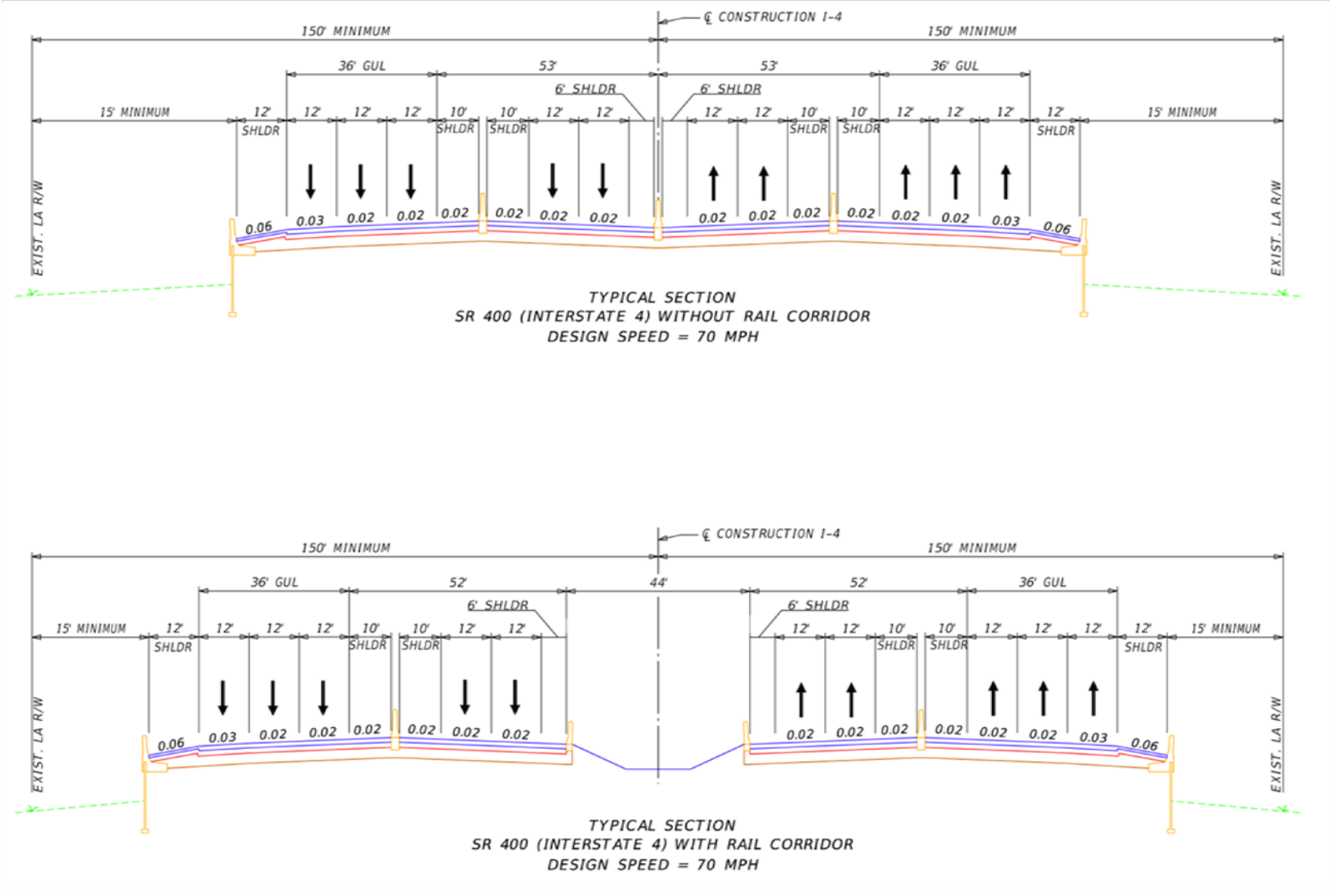
High Intensity signage will be used to identify dry standpipe locations throughout the project limits. The signage will contain information about the location of the nearest fire hydrant and an identifier that will correspond to the other end of the dry standpipes. The signage will be mounted at both ends of the standpipes to assist emergency responders in locating and identifying the correct standpipes that may be needed for emergency situations.

7.1.2 Ramp Metering and Wrong Way Detection

Ramp metering is currently being implemented along I-4 under the I-4 Ultimate project. It is currently not within the scope of work of the Beyond the Ultimate project based on existing FDOT guidance. However, the hardware features that are needed to support ramp metering will be installed at on-ramp reconstructions under the Beyond the Ultimate project in order to support possible future ramp metering. Updates to FDOT guidance are underway and changes may result in a need to reevaluate the use of ramp metering for the BtU project at a future date. Ramp metering will not be implemented on system to system ramps; therefore, ramp metering hardware will not need to be installed on these ramps.

Wrong way driving detection devices shall be evaluated and implemented at interchange ramps following release of detailed criteria, which is expected in late 2016. Both ramp metering and wrong way driving detection devices should be re-evaluated for compliance with FDOT guidance or policy upon the release of new guidance or policy and upon final design.

Figure 7-1: I-4 Proposed Typical Sections



7.2 Signing Concepts

The signing for the express lanes is based on the tolling strategy type. Trip based tolling will be used for the express lane tolling and the signs will be based on the tolling strategy and other constraints. A signing concept plan for the express lanes has been developed with respect to the following constraints:

- No more than three destinations listed per sign.
- Pricing for all exits will be displayed on the signing.
- Trips must have at least one slip ramp so users can choose to exit before continuing.
- Exits within a mile of each other will be treated as the same exit and will be charged identically.

The signing concept plan for the I-4 Express Lanes can be seen in Figure 7-2.

Three additional signage concepts are proposed to be included in the Beyond the Ultimate project. The additional concepts are enhanced reference location signs, ramp location signs, and emergency access gate restriction signs.

Enhanced reference location signs are signs that are spaced at close intervals that allow disabled motorists to easily identify their location to emergency responders. The additional signs are proposed to be placed every one half mile on the barrier wall that separates the general use lanes and the express lanes. The enhanced reference location signs will comply with current MUTCD standards and will be mounted back to back on the barrier wall.

Additional ramp signage will be implemented along longer ramps that exceed one mile and connector ramps that may be confusing to motorists. The purpose of the additional signs is to allow disabled motorists to identify their location to emergency personnel. The spacing of the signs will be similar to that of the enhanced reference location signs at one half mile spacing. The signs will also be dual sided to allow motorists to never be more than one quarter mile away from a location sign. The signs will contain information that includes the direction and roadway of where the ramp originated and terminates. The signs will also be numbered sequentially to allow emergency responders to identify the disabled motorist's location along the ramp.

Where the emergency access gates are provided in the barrier wall separating the express lanes and the general use lanes, signs will be required that identify the emergency access gate and restrict access to official use only.

7.3 Toll Gantry Locations and Type

Non-accessible type gantries will be used for gantries located in the express lanes and along ramps. For operational purposes, gantries will be located as close as possible to the entry location of vehicles entering the express lanes or at the beginning of tolling segments. The proposed gantry locations can be found in Figure 7-2.

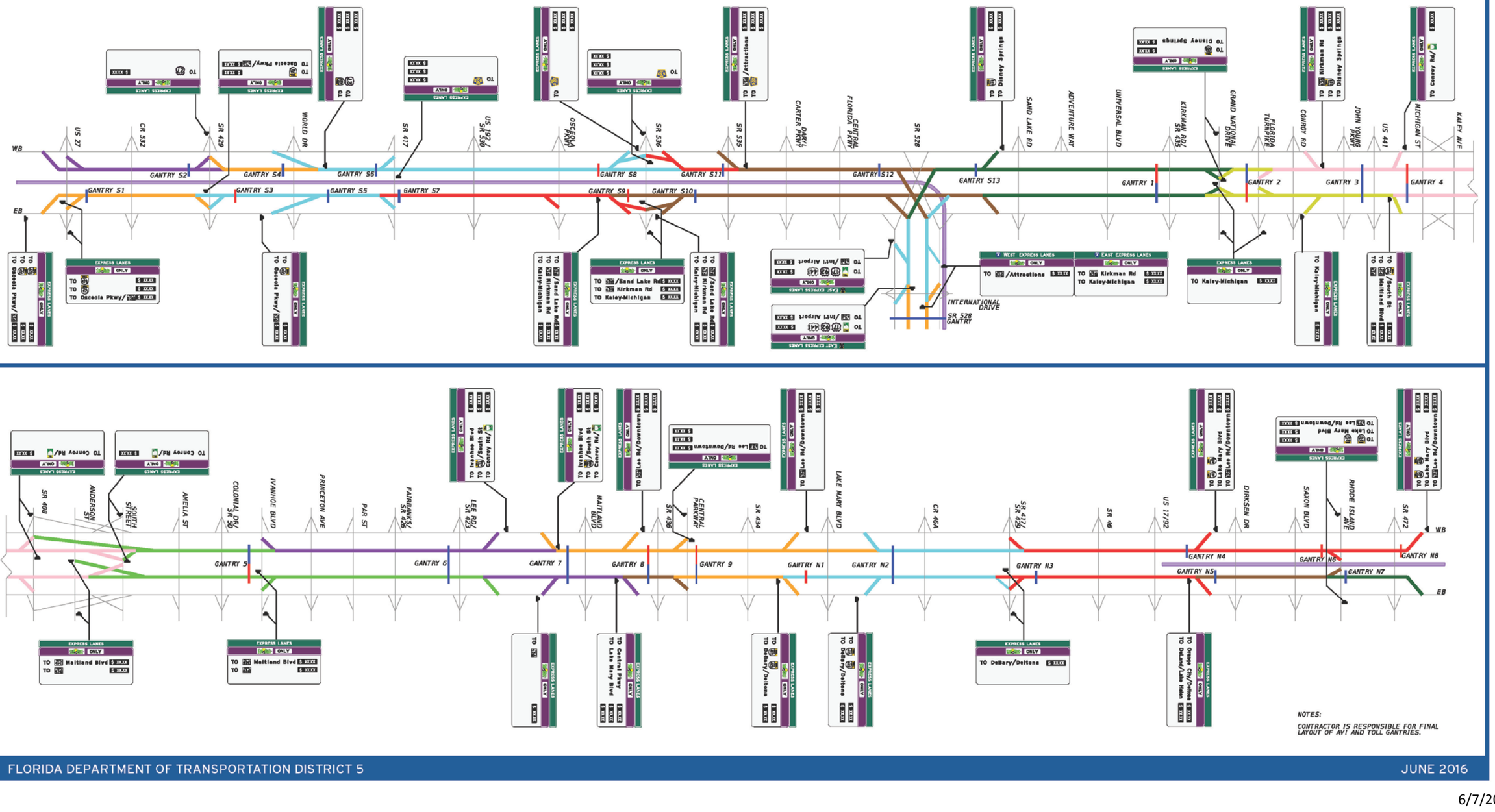
Figure 7-2: Proposed Tolling Plan

4 EXPRESS TOLLING
Signing Concept Plan

FDOT

4 EXPRESS

LEGEND
= General Use Lanes (Grey)
= Toll Gantry with Tolling Equipment
= Rail/ Transit Corridor In Median
= Express Lanes (Colors)
= Toll Gantry with AVI Equipment Only



FLORIDA DEPARTMENT OF TRANSPORTATION DISTRICT 5

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7.4 Emergency Access Gates

The barrier wall, which separates the express lanes from the general use lanes, provides a safe barrier between the facilities and ensures compliance with the tolls; however, the barrier wall also prevents emergency responders from accessing the express lanes at locations other than the entrance slip ramps. In order to provide better emergency response, electronically operated access gates will be provided approximately every two miles when the distance between successive entrances exceeds four miles. Further information on the operation of the access gates can be found in section 8.3.

8 Operations

8.1 User Oriented Operational Description

The following sections describe how the operations of the express lanes will work under normal operating conditions, when there is a crash in the general use lanes, and when there is a crash in the express lanes.

8.1.1 Typical Operations

It is Monday morning and Jose is on his way into work at 8:35 AM for an important business meeting at 9:00 AM. Jose lives on SR 46 in Seminole County and works at Lee Road and his commute normally takes him 15 minutes in travel time. Jose is travelling in the general use lanes and when he passes the DMS at Lake Mary Boulevard he notices that it says "To Lee Rd, 11 Miles, 30 Minutes". Jose thinks about his possible options: either staying in the general use lanes or taking the express lanes. If he stays in the general use lanes, it will be a 30 minute travel time to Lee Rd and he will arrive at his office at 9:05 AM. However, if he gets in the Express Lanes he will be able to make it to his meeting on time.

Jose is a SunPass account holder and has heard from co-workers how the Express Lanes have been a reliable travel option. As he approaches the westbound entrance to the Express Lanes, he sees the Toll Amount DMS displaying a toll amount of $2.00 to Lee Rd at 8:40 AM. He sees the traffic in the general use lanes begin to slow down and decides to get on the Express Lanes. Jose feels it would be worth paying the $2.00 to make sure he makes it to his meeting on time. By taking the Express Lanes, he is able to arrive at the meeting safely and on time.

At the D5 RTMC, the operators are actively monitoring the congestion along I-4 westbound. They verify that there is no incident along I-4 in the area of congestion and they verify the travel times are posting properly via the CCTVs. The Express Lane Operators are monitoring the SunGuide® Software speed graphs based on the data collected in real-time from the Vehicle Detection System, as well as, checking the CCTV along the I-4 Express Lanes. The Express Lanes Operators see demand increasing in the Express Lanes, but the speeds are remaining consistent with free flow speeds. The FDOT Toll Setting Software notifies them that the tolls have adjusted in response to increasing demand for the Express Lanes. The SunGuide® Software presents a video snapshot of the Toll Amount DMS and the toll amounts that should be displayed. The Express Lanes Operator confirms that everything is working properly and that the appropriate price is being displayed.

The travel time from the Toll Amount DMS to the Automatic Vehicle Identification (AVI) on Gantry 9 is calculated by FDOT Toll Setting Software from the Vehicle Detector System. The travel time is three (3) minutes at 8:35 AM, which means the $2.00 toll displayed at 8:35 AM would be charged to those detected between 8:38 AM and the next toll update. Jose's SunPass® is detected by the AVI at Gantry 9 at 8:38 AM, Gantry 8 at 8:39 AM, and Gantry 7 at 8:41 AM. The FTE back office software processes the data collected from the gantries and rebuilds Jose's trip to be entering the express lanes at the Lake Mary Westbound slip ramp entrance with a destination of Lee Road slip ramp exit. The FTE back office

software receives the toll data from the FDOT Toll Setting Software, which has Jose's trip set to $2.00 from 8:38 AM to 8:41 AM. The FTE back office software applies a charge of $2.00 to Jose's SunPass® account.

8.1.2 Crash in the General Purpose Lanes

It is Thursday night at 7:15 PM and the D5 RTMC operators are actively monitoring the General Use Lanes with CCTV and speeds graphs. The D5 RTMC Operator observes speeds have dropped below a threshold of 30 MPH on I-4 westbound just east of SR 535. The D5 RTMC Operator controls the CCTV near SR 535 and sees a multi-vehicle crash blocking the two (2) right travel lanes. The D5 RTMC Operator enters the event into SunGuide® Software and reviews the SunGuide® Software map that depicts the location of the Road Rangers via the automatic vehicle location (AVL) system. The D5 RTMC Operator identifies and dispatches the closest Road Ranger to the incident. The D5 RTMC Operator utilizes the SunGuide® Software to generate a plan for disseminating information about the crash to Motorists Information DMSs and 511. At the same time, the D5 RTMC Operator notifies the D5 RTMC Shift Supervisor of the crash. The D5 RTMC Shift Supervisor notifies FHP Dispatch of the event, while observing Fire Rescue arriving on-scene via the CCTV. FHP Dispatch notifies the closest FHP Trooper, who arrives shortly after being dispatched. The Road Ranger arrives at the incident site and positions their vehicle according to the training that they received. The D5 RTMC Operators continue to monitor the crash and update the event in SunGuide® Software. The D5 RTMC manages according to the established procedures until the crash is completely cleared from the highway.

At 7:30 PM, Alex is on her way to the Disney area from downtown Orlando to attend a concert with some of her friends at 8:00 PM. Because it is late in the evening, Alex plans to stay in the I-4 general use lanes and exit at the SR 536 exit. As Alex passes the Florida Turnpike exit she notices that the DMS in the General Use Lanes displays the message "Two right lanes blocked at SR 535". To meet her friends on time for the concert, Alex will have to find an alternate route to the Disney area . At the Express Lane entrance ramp at Sand Lake Rd the Toll Amount DMS is indicating a toll of $2.00 to get to SR 536. Alex decides that paying the $2.00 to use the Express Lanes is worth making it to the concert on time.

8.1.3 Crash in the Express Lanes

It is Saturday morning at 10:15 AM and the Express Lanes Operator is actively monitoring the Express Lanes with CCTV and speeds graphs. The Express Lanes Operator observes that speeds have dropped below a threshold of 45 MPH on I-4 Express Lanes eastbound near the Central Florida Parkway Interchange. The Express Lanes Operator turns the CCTV near Central Florida Parkway and confirms there is a multi-vehicle crash in the left express lane. A multi-vehicle incident is expected to require more than 30 minutes to completely clear so once the incident has been confirmed and entered into the SunGuide® Software, the Express Lane Operator changes the Express Lanes operating mode for the segment between SR 536 and Sand Lake Road from "Dynamic" to "Closed" in the FDOT Toll Setting Software. The Express Lanes Operator also associates the event with the closure and sets the tolls to zero ($0.00) retroactively ten (10) minutes before the event was created to ensure any motorists who entered the segment between SR 536 and Sand Lake Road are not charged for that Segment. The

SunGuide® Software posts "CLOSED" on the Toll Amount DMS/Lane Status DMS at the SR 536 entrance to the Express Lanes and the Toll Amount DMS inside the Express Lanes approaching the SR 536 Express Lanes exit.

At the same time, the Express Lanes Operator enters the event into SunGuide® Software and reviews the SunGuide® Software map, which depicts the location of the Road Rangers via the GPS system. The D5 RTMC Operator identifies and dispatches the closest Road Ranger. The staged Flatbed Tow Truck is also dispatched to help clear the Express Lanes quickly. The Express Lanes Operator utilizes the SunGuide® Software to generate a plan for disseminating information about the crash to Motorists Information DMSs and 511. This includes posting "Express Lanes Closed at SR 536" on the Motorists Information DMS located in the Express Lanes approaching the SR 536 Lanes exit, as well as, the Motorists Information DMS located in the General Purpose Lanes west of the SR 536 entrance to the Express Lanes. The Express Lanes Shift Manager notifies FHP Dispatch of the event, while observing Fire Rescue arriving on scene using the CCTV. FHP Dispatch notifies the closest FHP Trooper, who arrives shortly after being notified. The Road Ranger and Flatbed Truck arrive at the crash and position their vehicles according to the maintenance of traffic (MOT) training that they have received. Additional FHP troopers arrive at the SR 536 Express Lanes exit ramp and position their vehicles to divert all traffic out of the Express Lanes at this location. Another trooper positions his vehicle to block the Express Lanes entrance ramp at the SR 536 Express Lanes entrance ramp. Since the crash is west of the SR 528 Express Lanes entrance ramp, the traffic coming from SR 528 is not impacted and there are no changes to the Toll Amount DMS and Lane Status DMS located on SR 528 for the I-4 Express Lanes. Road Rangers and FHP troopers on scene discuss and identify a location to relocate the damaged vehicles and complete the investigation once the fire has been extinguished. The Express Lanes Operators continue to monitor the crash and update the event in SunGuide® Software as well as update other agencies per the established procedures. The D5 RTMC manages according to the established operating procedures until the incident is completely cleared from the highway.

Harold lives in the Ridgewood Lakes subdivision on US 27 and is on his way to the airport. Harold is planning on parking in an off-site long term parking lot near the airport. He leaves for the airport on Saturday at 11:00 AM. Harold knows that heavy traffic is likely to occur on Saturday around the attractions area and decides to take the I-4 Express Lanes so that he will have a reliable travel time to the airport. When Harold gets to SR 536 he sees a DMS indicating that the Express Lanes are closed ahead due to a crash in the express lanes at Central Florida Parkway. As he approaches SR 536 he sees police officers directing everyone off the Express Lanes and into the General Use Lanes. Harold exits the Express Lanes safely and continues along I-4 in the General Use Lanes until he exits I-4 at SR 528.

8.2 Operating Rules

The operating rules for the I-4 Express Lanes will be developed as part of the I-4 Ultimate project and will be adjusted as necessary when the Beyond the Ultimate project becomes operational.

In general, the express lanes will be operational 24 hours per day, 7 days per week unless there is an incident in the express lanes blocking at least one lane and is anticipated to last more than 30 minutes

or there is maintenance work that requires the express lanes to be closed. When this occurs the express lanes will be put in the "CLOSED" operating mode and no toll will be charged for vehicles that are in the express lanes. If an incident is expected to block all the lanes of the express lanes and last longer than 30 minutes then the express lanes will be put in the "CLOSED" operating mode and FHP troopers will be dispatched. The FHP troopers will block the entrance ramps upstream of the incident and guide vehicles back into the general use lanes at the nearest upstream slip ramp.

8.3 Incident management

Incident management will play a critical role in ensuring that the I-4 Express Lanes provide a reliable trip option to customers. A comprehensive incident management plan will be developed prior to the opening of the express lanes that will establish quick clearance policies, investigation areas, staging of response vehicles, and additional resources needed. The incident management plan should utilize the existing procedures established for the 95 Express lanes where applicable. Additional project specific incident management procedures will need to be developed for I-4. The incident management plan should be developed to achieve the same incident management targets as 95 Express which are:

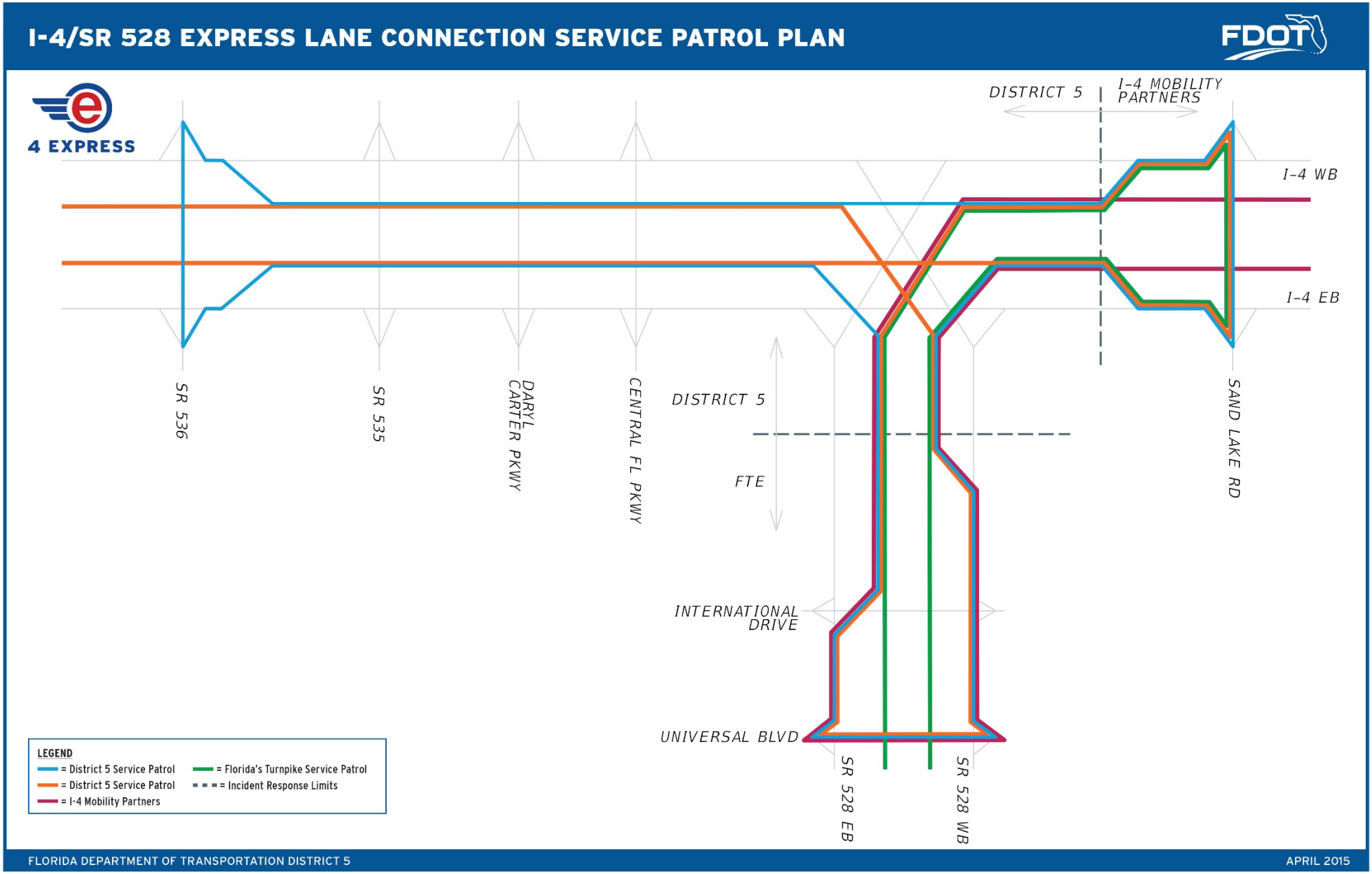
- Incident Verification (Event Creation to Event Confirmation) < one (1) minute
- Incident Response (Road Rangers/SIRV/IRV Notification to Road Rangers/SIRV/IRV Arrival) < five (5) minutes
- Travel Lane Blocking Duration (First Travel Blockage to All Travel Lanes Open) < twenty (20) minutes
- Facility Closed due to Non-Recurring Events < three (3) percent of the time

In order to meet these goals quick clearance of disabled vehicles will be required. FDOT will establish a contract with one or more local companies to ensure timely vehicle clearance within the express lanes. An estimated six additional Road Rangers will be needed in order to meet the goals listed. This will cost an estimated $2,470,000 per year to operate. Three of the six new Road Rangers will be needed by the concessionaire for incident management purposes. The cost to operate these Road Rangers is included in the estimate.

Incident management coordination procedures will be needed for coordination with the I-4 Ultimate portion of I-4 as well as with the SR 528 express lanes project. Road Ranger patrols and incident response limits can be seen in Figure 8-1. Additional incident management coordination procedures will be needed with the District 7 RTMC for incidents occurring in Polk County. The concessionaire will be responsible for coordinating incident management within Polk County.

The emergency access gates will be remotely operated from the District 5 Regional Traffic Management Center (D5 RTMC) and by local fire rescue departments from a controller in their vehicle that will be provided to them from FDOT. Additionally, a keypad will be available adjacent to the gate in the event of a loss of communication to the access gates. Battery backup power will be provided at each gate in the event of a loss in power to the gate. Manual operation will be possible if there is a battery failure. Additional training will be needed to ensure that the responding fire rescue departments will be able to

Figure 8-1: Service Patrol Limits



manually operate the emergency access gates in the event of a power or communications failure. FDOT will draft a Memorandum of Understanding (MOU) with the local fire departments that will govern emergency access gate operations. The safe operation of the emergency access gates will be the responsibility of both FDOT and the local fire rescue agencies.

Designated incident investigation areas will be provided. The incident investigation areas will be 16 feet wide and 1300 feet long. The incident investigation areas can serve as a temporary place for vehicles to be towed to in order to open both express lanes to traffic or for use by law enforcement personnel for staging and enforcement. The incident investigation areas will be located throughout the Beyond the Ultimate corridor spaced an average of two miles apart. The incident investigation areas and emergency access gate locations are shown in Figure 8-2 and Figure 8-3.

8.4 Space and Staffing Requirements

The current staffing requirements for operating the D5 RTMC for day-to-day operations, from 6 AM until 10 PM, including incident management and Road Ranger dispatching are:

- Three operators for I-4
- One operator for I-95
- One operator for I-75 and FDOT operated arterials
- Two operators for Central Florida Expressway Authority (CFX) roadways
- One shift supervisor

This equates to a total of seven operators and one shift supervisor for day-to-day operations from 6 AM until 10 PM. When the I-4 Ultimate portion of the express lanes is opened an additional four operators will be required to operate the express lanes. Express lane operation includes toll amount verification, traffic monitoring, incident management, and Road Ranger coordination. An additional four operators will be required to manage the express lanes once the Beyond the Ultimate project is completed requiring a total of fifteen operators and one shift supervisor to conduct day-to-day operations.

8.5 Security

Redundancy will be incorporated into the design of critical components and equipment and data will be backed up routinely to minimize revenue loss in the event of equipment failures, communication losses, theft, or destruction. An Uninterruptable Power Supply (UPS) will be installed at equipment locations to ensure battery backup in the case of a power failure. Lockable cabinets and pullboxes will be used to prevent theft. The system network will be designed to protect against hacking and to keep personal identifiable information secure. The reliability of the revenue stream is critical in maintaining the financial integrity of the express lanes to cover operations and maintenance costs.

Figure 8-2: Proposed Incident Management Facilities for the Western Section

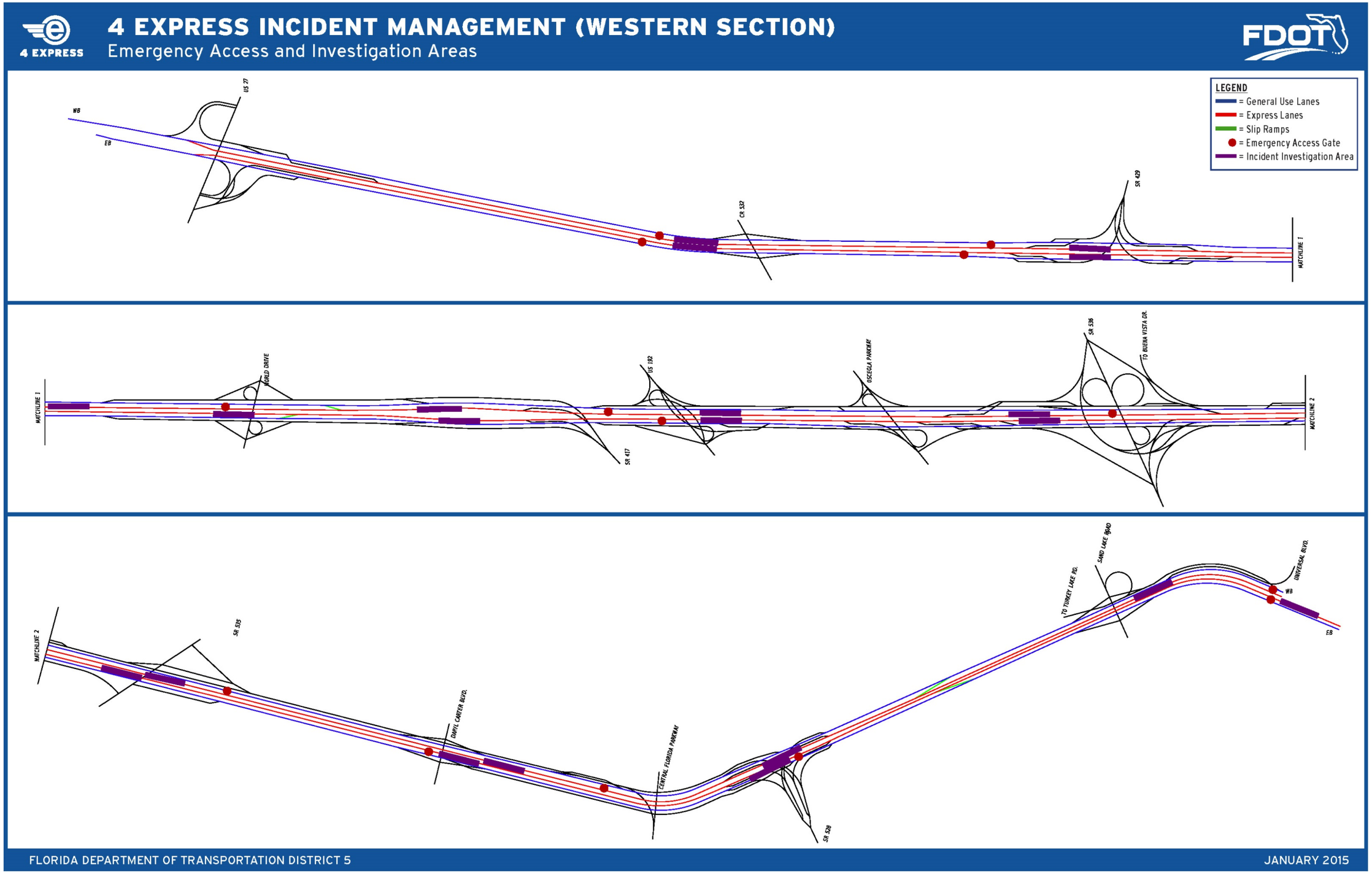
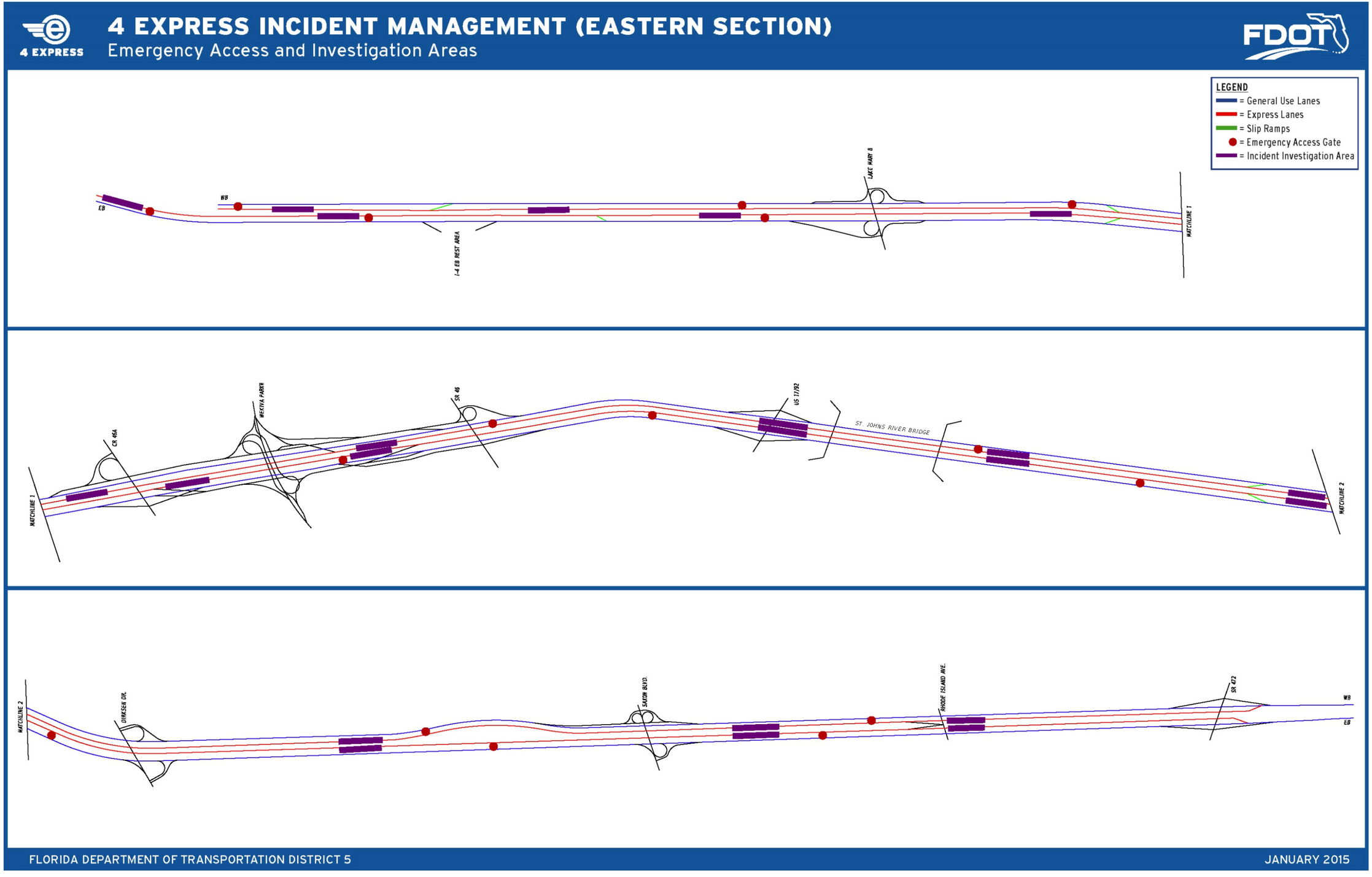


Figure 8-3: Proposed Incident Management Facilities for the Eastern Section



8.6 Software Integration Plan

The current version of SunGuide® software that is being used by the D5 RTMC will need to be updated to accommodate the new functionality and requirements of the express lanes. The SunGuide® software will need to interface with the toll setting software, control the proposed ramp signals, and operate the new emergency access gates. Additional PTZ CCTV cameras and highway DMS will need to be integrated into SunGuide® appropriately.

The toll setting software will be the Express Lane Software (ELS) and will be installed at the D5 RTMC as a stand-alone system to allow for separate patching and upgrades. ELS will control the TADMS and LSDMS needed for express lane operations. The static CCTV that monitors the TADMS will be viewed and controlled by ELS. Traffic data collected by the VDS for the express lanes will be input into ELS directly for the toll price calculation.

8.7 Change Management

A change management process will be implemented to manage changes to the approved operating rules after they are developed. This process will incorporate input from the impacted stakeholders with approval from District 5.

9 Enforcement

The I-4 Express Lanes will introduce a new operational characteristic to the project corridor that will require additional enforcement to ensure the project's success. The Florida Highway Patrol (FHP) will be responsible for enforcement of the entire express lanes corridor. A final enforcement plan will be developed and subsequent training for FHP Troopers should be provided by FDOT.

9.1 Enforcement Responsibilities

Enforcement of the tolls will be provided at the toll gantries utilizing the existing FTE methods for identifying toll violators as they pass through the toll gantries. All vehicles will be required to have a registered SunPass® transponder to use the express lanes. FTE's Violation Enforcement System will electronically monitor traffic and any drivers without a transponder will have their license plate photographed and receive an Unpaid Toll Notice (UTN) for failing to pay the toll. Failure to resolve the UTN will result in a Uniform Traffic Citation (UTC).

There are currently 18 troopers and 3 supervisors assigned to enforcement within the project limits along I-4. FHP estimates that it will require an additional nine troopers and one supervisor to provide adequate coverage for the express lanes costing an additional $750,000 per year.

Enforcement coordination will occur between FHP's Troop D and Troop K at the express lane connection at the I-4/ SR 528 interchange. In order to provide complete coverage of the express lane connections in this area, the limits of enforcement will have to be coordinated similar to the limits of the Road Ranger patrols. Incident response and enforcement responsibility limits for Troop D will include the ramps between the I-4 express lanes and the SR 528 express lanes and will end at the gores for the ramps and SR 528. Incident response and enforcement responsibility limits for Troop K will cover the SR 528 mainline express lanes. The current enforcement limits for the general use lanes will remain the same.

Enforcement coordination will also be necessary between FHP's Troop D and Troop C within Polk County. This coordination will be the responsibility of the concessionaire.

10 Summary of Impacts and Analysis of Proposed System

As previously described in chapter 4, the operational impacts of the proposed system will increase the workload of the existing RTMC Operations, Incident Responders, ITS Maintenance, and Roadway Maintenance resources. This additional workload will require additional funding for the operation and maintenance of the proposed system. Subsequently, this will require additional training for the system operators. The new operational procedures and rules will be developed at least six (6) months prior to opening the I-4 Express lanes to allow enough time to properly train the system operators. This includes training for express lanes operational procedures/strategies, incident coordination/response, maintenance of traffic procedures, and enforcement operations.

The proposed I-4 Express Lanes will provide additional capacity and operational improvements that are expected to provide the following benefits:

- Reduced travel times and vehicle delays
- Improved trip reliability
- Improved safety
- Increase in total volume throughput

The I-4 Express Lanes will be continuously monitored and analyzed to ensure the proposed system is operating such that these benefits are realized to the public. Based on the FDOT's experience, the demand for the Express lanes will change over time resulting in adjustments to the dynamic pricing algorithm parameters and operational strategies. In addition, there will be a need to feed data from the proposed system into toll and revenue updates, improve the accuracy of projections, and ensure the proposed system is sustainable.

FDOT will establish a comprehensive performance measurement program that will provide the data and tools to perform periodic analysis of the proposed system. These data will be available for any user defined time period and will support general data requests from other agencies/consultants for future toll and revenue studies as well as future analysis of express lanes operations. The performance measurement program will include the following elements:

- Performance Reporting/General Data Requests:
  - Total Trips
  - Tolls
    - Monthly Revenue
    - Total Revenue
    - Minimum and Maximum Range
    - Average Weekday
    - Average Peak Period
    - Average Weekend
    - Average Off Peak
    - 85th Percentile Weekday

  - Volume (Express lanes and General Purpose Lanes)
    - Average Weekday
    - Average Weekend
    - Average Peak Periods
  - Speed (Express Lanes and General Purpose Lanes)
    - Average Overall
    - Average Peak Periods
    - Percentage of Time Above 45 MPH
  - Facility Availability
    - Percentage of Time Closed due to Planned Events
    - Percentage of Time Closed due to Non-recurring Events
- Conduct periodic analysis when system approaches undesirable performance.
  - Speeds drop below 45 MPH in the Express lanes during peak periods
  - Extended or frequent closures that impact availability of the Express lanes

Appendix 1: Reversible Express Lanes Evaluation