I-75 Florida's Regional Advanced Mobility Elements (FRAME)

Advanced Transportation Congestion Management Technologies Deployment (ATCMTD), 2016 Application

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GRANT REQUEST: $11.89M
GRANT TYPE: Predominately Rural
SUBMITTAL DATE: 06/24/2016

PROJECT NAME: I-75 FLORIDA'S REGIONAL ADVANCED MOBILITY ELEMENTS (FRAME)	
Previously Incurred Project Cost (FY 2014/2015)	$16.55 M
Ongoing Project Cost (FY 2015/2016)	$14.34 M
Future Eligible Project Cost	$11.89 M
Total Project Cost	$42.78 M
ATCMTD Request	$11.89 M
Total Federal Funding (including ATCMTD)	$11.89 M
% ATCMTD Match Request	28%
Are matching funds restricted to a specific project component? If so, which one?	Road Side Units along I-75 and arterials; all other technology deployment will be along arterials and vehicle onboard units
State(s) in which the project is located	Florida
Is the project currently programmed in the: • Transportation Improvement Program (TIP) • Statewide Transportation Improvement Program (STIP)	• I-75 Freeway Management System (FMS) is programmed using state funds • Arterial corridors identified under MPO Long Range Transportation Plan • Future freeway expansion identified under State Long Range Transportation Plan

for Jim Boxold — June 21, 2016

Secretary — Date

Florida Department of Transportation

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ACRONYMS

AADT	Average Annual Daily Traffic
AAM	Active Arterial Management
AASHTO	American Association of State Highway and Transportation Officials
API	Application Program Interface
ASCT	Advanced Signal Control Technology
ATCMTD	Advanced Transportation Congestion Management Technology Deployment
ATMS	Advanced Traffic Management System
AVL	Automatic Vehicle Location
BSM	Basic Safety Messages
C2C	Center-to-Center
CAD/ AVL	Computer Aided Dispatch/ Automatic Vehicle Locater
CCTV	Closed Circuit Television
CTST	Community Traffic Safety Team
CV	Connected Vehicle
DIVAS	Data Integration and Video Aggregation System
DMS	Dynamic Message Sign
DSRC	Dedicated Short-Range Communication
DSS	Decision Support System
FAV	Florida Automated Vehicle
FDOT	Florida Department of Transportation
FHWA	Federal Highway Administration
FMS	Freeway Management System
FMVSS	Federal Motor Vehicle Safety Standards
FRATIS	Freight Advanced Traffic Information System
FSP	Freight Signal Priority
FTA	Florida Trucking Association
I-SIG	Intelligent Traffic Signal System
LOS	Level of Service
MMICM	Multimodal Integrated Corridor Management
MMITSS	Multimodal Intelligent Traffic Signal System
MPH	Miles per Hour
MPO	Metropolitan Planning Organization
MVDS	Microwave Vehicle Detection System
NOFO	Notice of Funding Opportunity
OBU	On-Board Unit
PED-SIG	Pedestrian Signal
PREEMPT	Emergency Vehicle Preemption
RACI	Responsibility, Accountability, Coordination, and Informed
RSU	Roadside Unit
RTMC	Regional Transportation Management Center
RTS	Regional Transit System
RWIS	Road Weather Information System
SHRP2	Strategic Highway Research Plan 2
SIS	Strategic Intermodal System
SM	Single Mode
SPaT	Signal Phasing and Timing
SPM	Signal Performance Measures
TERL	Traffic Engineering Research Laboratory
TMS	Traffic Management System
TSM&O	Transportation Systems Management and Operations
TSMCA	Traffic Signal Maintenance Compensation Agreement
TSP	Transit Signal Priority
USDOT	United States Department of Transportation
V2I	Vehicle-to-Infrastructure
V2V	Vehicle-to-Vehicle
WIM	Weigh in Motion

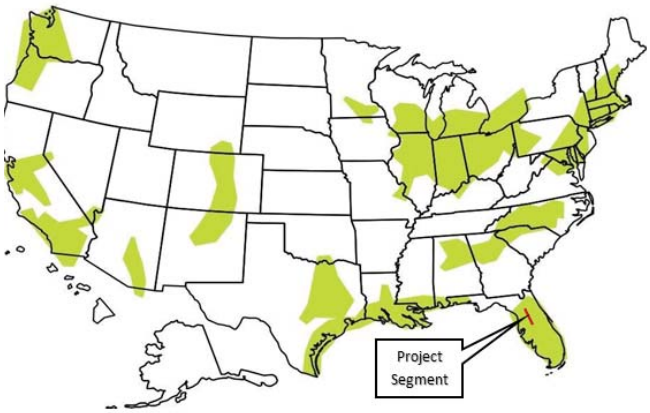
PROJECT SUMMARY CHECKLIST

	SELECTION CRITERIA	DESCRIPTION
1	Is there public-private partnership?	**Yes**. Florida Department of Transportation (FDOT) established a partnership with HERE and Waze for probe data information and with Florida Trucking Association. This application will promote the private, third-party application development by making public and HERE/Waze data available through FDOT's Data Integration and Video Aggregation System (DIVAS). Alachua County has an existing ridesharing partnership with private partners that can be extended to cover Sumter and Marion counties in future.
2	Is there local partnership?	**Yes.** Partnerships established with Metropolitan Organizations (MPOs), Alachua, Marion and Sumter counties, cities of Gainesville and Ocala, Law Enforcement and local transit agencies.
3	Degree that the proposed technology deployment aligns with program requirements and DOT goals, including safety, innovation, and opportunity.	**High**. The project will reduce secondary crashes where the primary incident is either a previous crash or crash-caused congestion thus improving both safety and efficiency. The project contains several innovations including connected signals and adaptive signal control.
4	Readiness of the proposed technology(ies) to be deployed, and the likelihood of success of the applicant to deploy and sustain the proposed technology(ies), including the proposed approaches to addressing any regulatory environment and other obstacles to deployment.	**High**. Florida is in a unique position of having already developed and tested central system software, SunGuide®, capable of communicating basic safety messages (BSMs) and traveler information from Regional Transportation Management Centers (RTMCs) to Road Side Units (RSUs) and vehicles equipped with On Board Units (OBUs) and driver interface technologies. Also, bringing in lessons learned from the Tampa Hillsborough Authority Expressway (THEA) connected vehicle project in Florida.
5	Scalability or portability of the proposed technology deployment to other jurisdictions.	**High**. There are multiple corridors throughout Florida and nationally than can benefit with this application. I-75 is a major north-south freeway that connects Florida to Georgia, Tennessee, Kentucky, Ohio and Michigan.
6	Commitment to evaluate the effectiveness (i.e. cost-benefit) of activities proposed.	**Yes**. FDOT is committed to do a thorough project evaluation and before and after analysis including benefit cost analysis as part of this project. Additional funding provision will be discussed with the FDOT Research office.
7	Degree that the Application includes a program/project management structure or organization that will successfully oversee the proposed technology deployment.	**High**. FDOT Central Office will oversee the I-75 Florida's Regional Advanced Mobility Elements (FRAME) project and has a program management structure to manage the program through operations. Within the past 15 years, FDOT has implemented fiber optic communication and freeway management systems on all Florida freeways. Florida has implemented 14 RTMCs. Several, including the one in Gainesville that will have a significant role in operations of I-75 FRAME, are combined freeway/arterial RTMC. Florida has implemented managed express lanes, adaptive signal control technologies, active arterial management and other technologies included in this application. The project team has been involved in many of these improvements and will bring their experience and lessons learned for the benefit of I-75 FRAME.
8	Expertise and qualifications of key personnel for managing or conducting appropriate aspects of the proposed technology deployment through the period of performance.	**High**. Key personnel qualification highlights are contained in the application and resumes are attached. All are highly qualified, experienced, and available to provide their designated roles. This team alone brings in a combined relevant experience of over 100 years in the field of Intelligent Transportation System (ITS), Connected Vehicles (CV), Arterial, and Freeway Management Systems.
9	Will the project better connect people to essential services such as employment centers, health care, schools and education facilities, healthy food, and recreation?	**Yes**. The I-75 corridor is a high-growth corridor containing jobs, health care facilities, recreational opportunities, and schools. The project will remove barriers caused by traffic impacts of road closures, incidents and events on I-75 by reducing both the duration and magnitude of congestion. Transit and pedestrian priority will be added to traffic signals. The grant application also includes enhancement of an "Aging Road User" mobility program to support transportation options for this growing and underserved population segment. This project serves three Hospitals, University of Florida (UF), several schools, several churches, parks, museums, and a major shopping mall.
10	Will the project remove physical barriers to access?	**Yes.** Intermodal connectivity will enable greater access to opportunities in the corridor.
11	Will the project strengthen communities through neighborhood redevelopment?	**Yes**. The project enhances redevelopment attractiveness by improving access and reducing barriers caused by traffic congestion.
12	Will the project mitigate the negative impacts of freight movement on communities?	**Yes**. Through use of freight priority at signals on diversion routes, fewer diverted trucks will be stopped at traffic signals improving traffic flow and reducing the duration and magnitude of congestion caused by trucks starting from stopped conditions.
13	Will the project support workforce development, particularly for disadvantaged groups, which include low-income groups, persons with visible and hidden disabilities, elderly individuals, and minority persons and populations?	**Yes**. The project will indirectly support workforce development by reducing congestion impacts, improved pedestrian and bicyclists safety, and improve transit operations, thus improving access to jobs and educational institutions, particularly within the cities of Gainesville and Ocala.
14	Will the project design likely to generate benefits for all users of the proposed project, including non-driving members of a community adjacent to or affected by the project?	**Yes**. The signal systems will be equipped with CV pedestrian and transit priority applications to reduce the impacts of congestion caused by diverting traffic. Diverted traffic traverses school zones and other areas with significant pedestrian traffic. Diverted traffic traverses business areas and transit routes.

1. PROJECT DESCRIPTION

FDOT's Advanced Transportation Congestion Management Technology Deployment (ATCMTD) grant application requests $11.89 million in grant support for I-75 Florida's Regional Advanced Mobility Elements (FRAME) to efficiently manage traffic during incidents and special/emergency events improve safety and connectivity for all types of road users. I-75 FRAME deploys a Multimodal Integrated Corridor Management (MMICM) plan on I-75 and US 301/441 using connectived vehicle (CV) technologies, advanced signal control, and multijurisdictional coordination within the Florida's megaregion (see link) (see Figure 1). This project covers 74 miles of I-75 and 82 miles of US 301/US 441; both extend from Wildwood on the south to Alachua on the north along with several east wet corridors connecting I-75 and US 301.

FIGURE 1. USDOT'S MEGAREGION



Source: USDOT – Beyond Traffic 2045

Based on the success, results, and lessons learned from I-75 FRAME, this concept will be scaled statewide.

1.1. PROBLEM STATEMENT

Following are the problems that require immediate attention:

- 105 million annual visitors, growing to 157 million by 2025: I-75 is a major route for visitors to Florida by car, bus, and motor homes
- 60 million tons of freight annually on 12,000 trucks per day. These numbers are projected to double by 2040 (see reference documents)
- Traffic crashes cause complete closure of I-75 every nine days on average with more than one lane closure incident per day.
- I-75 experiences cash rates typical of major urbanized areas
- I-75 serves as an important emergency evacuation route for Tampa and Miami areas
- I-75 serves two major conservation areas in Florida, Paynes Prairie State Park and Marjorie Harris Carr Cross Florida Greenway
- US 301/US 441 and other east-west corridors serves UF, schools, parks, and church traffic have high frequency of pedestrian and bicyclist crashes
- US 301/US 441 and other east-west corridors experiences congestion during incidents and special events
- US 301/US 441 and other east-west corridors have two rail-road crossings

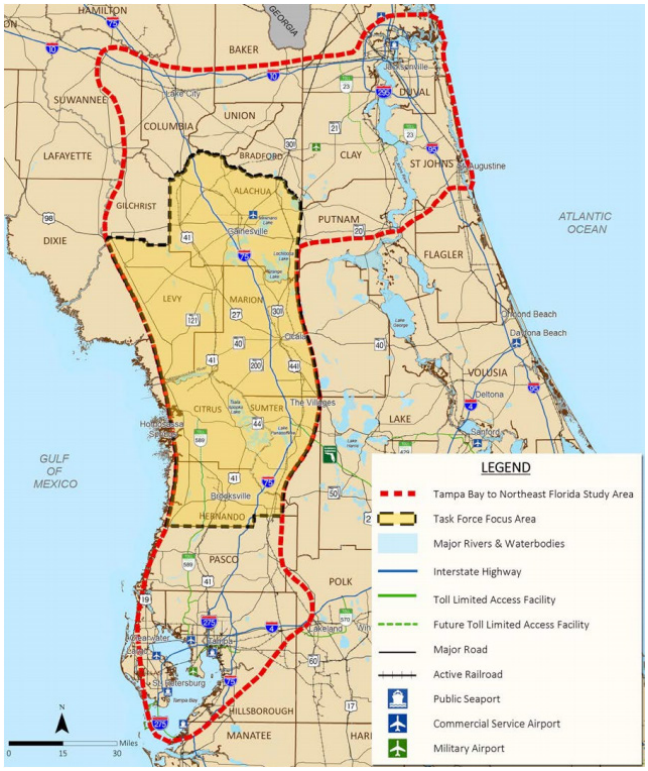
FDOT set up a special task force called I-75 Relief Task Force (see link) in 2011 to address the safety and congestion problems using emerging technologies, capacity building, Hard Shoulder Running (HSR), and multimodal transportation solutions. Figure 2 shows the I-75 Relief project area along with I-75 FRAME.

1.2. VISION, GOALS AND OBJECTIVES

The FDOT Transportation Systems Management and Operations (TSM&O) vision is, "Optimize the use of transportation infrastructure for improved safety and mobility moving from facility management to mobility management." I-75 FRAME will accelerate and solidify this vision via real world implementation to realize the benefits (see link) below:

- Increased safety for I-75 users
- Improved reliability for I-75 users
- Reduced delay for trips using I-75
- Accommodate population and economic growth and demand for moving people and freight
- Enhanced regional emergency evacuation and response

FIGURE 2. I-75 RELIEF STUDY AREA



Source: FDOT

FDOT's Future Corridors initiative (see link) envisions TSM&O solutions and emerging technologies to help optimize existing infrastructure and improve safety. I-75 FRAME aligns with that vision and collaborates with local partners to implement effective mobility solutions. A comprehensive approach to addressing the mobility challenges is described within this proposal.

We will leverage existing FDOT and partner-agency efforts to achieve the mobility and safety goals of I-75 FRAME.

The I-75 FRAME project has a high likelihood of success as it:

- **Supports USDOT goals for mobility, safety and addresses the mobility needs of vulnerable road users and aging travelers using advanced technologies**
- **Leverages existing ITS communications infrastructure, current partnerships, and extensive staff capabilities in emerging mobility solutions to mitigate project risks**
- **Contributes almost 72% of the full project implementation costs, and 100% of the operations and maintenance (O&M) costs for the proposed system**

1.3. ATCMTD AND I-75 FRAME

I-75 FRAME addresses the following focused areas identified in the ATCMTD's notice of funding opportunity (NOFO):

The ATCMTD grant award will expedite the deployment of emerging technologies envisioned by FDOT and articulated in the I-75 Relief Task Force to not only provide relief to the I-75 congestion and safety problems, but also to increase efficiency of the arterial and freeway systems when the long term capacity improvements are in place.

1. **Advanced traveler information system:** I-75 FRAME will disseminate road condition information via Florida 511 smartphone application and website (see link). In addition, FDOT's Data Integration and Video Aggregation System (DIVAS), City of Gainesville Smarttraffic center, OBUs, and third-party smartphone applications will be leveraged for traveler information dissemination.
2. **Advanced transportation management technologies:** With the use of the ITS deployment along I-75 and the proposed I-75 FRAME technologies, real-time transportation management will be enhanced significantly at the existing RTMCs. I-75 FRAME will deploy

Adaptive Signal Control Technology (ASCT); Multimodal Intelligent Traffic Signal System (MMITSS) with Intelligent Signal (I-SIG) to emit Signal Phasing and Timing (SPaT) data, Pedestrian Signal (PED-SIG) safety technology, Transit Signal Priority (TSP), Freight Signal Priority (FSP) and Emergency Vehicle Preemption (PREEMPT) on select corridors.

3. **Infrastructure, maintenance, monitoring, and conditions assessment**: FDOT has existing agreements with local agencies as well as O&M contracts within Districts 2 and 5 to actively assess, monitor, and maintain the infrastructure condition on both arterials and freeways. I-75 FRAME adds new arterial technologies to improve operations, actively monitor traffic and infrastructure conditions. I-75 FRAME adds data-driven Signal Performance Measures (SPM) along select corridors.
4. **Advanced public transportation systems:** Two transit agencies operate within the project area: the Regional Transit System (RTS) (see link) in Gainesville and the SunTran (see link) in Ocala. Both agencies equipped their vehicles with Automatic Vehicle Location (AVL) technology. Gainesville RTS proposed enhanced AVL in their 10-year plan. SunTran's website shows real-time bus locations on a live map (see link). Using the transit agency partnerships, some buses will be equipped with CV OBUs. The combination of OBU and TSP is expected to increase transit travel time reliability and on-time performance.
5. **Transportation system performance data collection, analysis, and dissemination systems:** The travel time and incident data collected from freeways and arterials will be made available through the FL511 website and smartphone application, and to third parties via DIVAS. The data is archived temporarily on FDOT servers to eventually transfer into the Regional Integrated Transportation Information System (RITIS) for analysis. The I-75 FRAME will use SPMs and ASCT data for active arterial management. FDOT also has existing contracts with HERE and Waze where FDOT shares incident and event information with the latter. Waze also shares crowd-sourced incident information that is currently used in the RTMCs.
6. **Advanced safety systems:** I-75 FRAME will deploy V2I technologies. Vehicle penetration is vital. Therefore, I-75 FRAME will deploy OBUs in cars, transit buses and emergency vehicles to transmit and receive BSMs. A high-level OBU deployment plan is provided in the supporting documentation. FDOT is leading a discussion with automotive industry via its Florida's Automated Vehicle (FAV) initiative (see link) to increase vehicle penetration for V2I. National Highway Traffic Safety Administration (NHTSA) rulemaking Federal Motor Vehicle Safety Standards (FMVSS) 150 require installation of CV components in all new vehicles will enhance vehicle penetration by the 2019/2020 timeframe. MMITSS will enhance vulnerable road user safety and includes funds for a private party app developer to develop an Application Program Interface (API) to relay BSM to the vulnerable road users using smartphones and to the vehicles using OBUs.
7. **Advanced mobility and access technologies:** FDOT has an "Aging Road User" initiative in partnership with UF to develop an online database (Find-A-Ride, see link) that enables road users to identify potential options to complete a trip individually or do ridesharing. With UF's support, FDOT is actively modifying the database to provide a simple way for older adults and people with disabilities access to their local health care and daily living transportation options. I-75 FRAME will leverage such efforts to provide more dynamic ridesharing opportunities to the aging road users and underserved population.

I-75 FRAME actively addresses six ATCMTD priority areas as shown in Table 1. The other two are addressed via local initiatives.

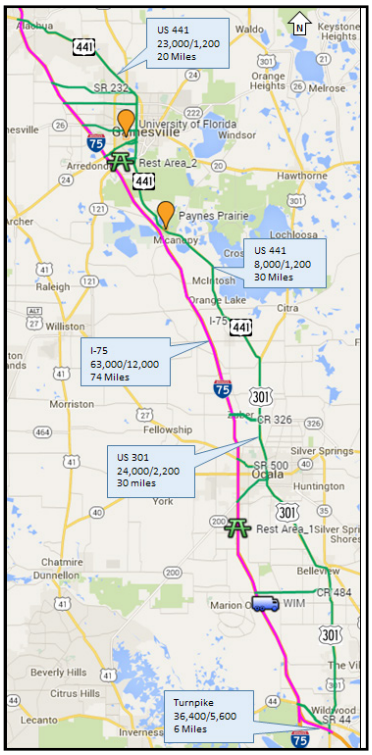
I-75 FRAME aligns with the vision of the USDOT Smart City Challenge and includes CV and AV technologies to address mobility needs in the corridor. The City of Gainesville and Alachua County have several ongoing smart city initiatives that are leveraged under I-75 FRAME. A quote from City of Gainesville Smarttraffic website (see link) states: "The City of Gainesville and Alachua County are dedicated to going green. Among the biggest threats to our environment are carbon emissions from automobile exhaust…. By reducing traffic congestion, area drivers will spend less time on the road, burning less fuel and releasing fewer emissions into the environment."

The Gainesville Parking (see link) infosytem provides information on parking locations and reserves parking spots. Cities of Ocala and Gainesville are designing and deploying a smart parking system for on-street parking as well. I-75 FRAME will collect parking information via DIVAS for dissemination through third party and CV applications.

1.4. PROJECT AREA

The project area is shown in Figure 3.

FIGURE 3. PROJECT AREA



Source: FDOT and Google Maps

1.4.1. I-75

The 74 miles I-75 project segment runs from Wildwood and Alachua. I-75 is a six-lane divided freeway with a speed limit of 70 MPH. It has closely spaced interchanges in the Ocala and Gainesville areas with longer interchange spacing in the rural

TABLE 1. I-75 FRAME ATCMTD PRIORITY AREAS

S. NO.	ATCMTD PRIORITY AREAS	ACTIVE VIA ATCMTD DEPLOYMENT	PASSIVE VIA LOCAL AGENCY INITIATIVES
1	Transportation elements associated with Smart Cities	X	
2	Systemic applied pedestrian crossing technology	X	
3	Multimodal Integrated Corridor Management (ICM)	X	
4	Traffic signal data acquisition, analysis, and management	X	
5	Unified fare collection and payment system across transportation modes and jurisdictions		X
6	Incorporation of connected vehicle (CV) technology in public sector and first responder fleets	X	
7	Weigh-in-Motion (WIM) facilities for advanced data collection	X	
8	Dynamic ridesharing		X

areas. Within the project limits are four Interstate rest areas and two truck weigh stations. The Average Annual Daily Traffic (AADT) is 63,000 with an average of 20% truck traffic.

1.4.2. US 301/US 441

The 82 miles of US 301/US 441 runs from Wildwood to Alachua. This corridor is four-lane divided arterial with speed limits of 65 miles per hour (MPH) in the rural areas and 35 MPH in the urban areas. Within Ocala and Gainesville, this route is six-lane with closely spaced signals, high pedestrian and bicyclist traffic, hospitals, schools, business access, and transit stops. This route has a total of 62 signals including two railroad crossings and three mid-block crossings.

1.4.3. EAST-WEST ROUTES CONNECTING I-75 AND US 301/441

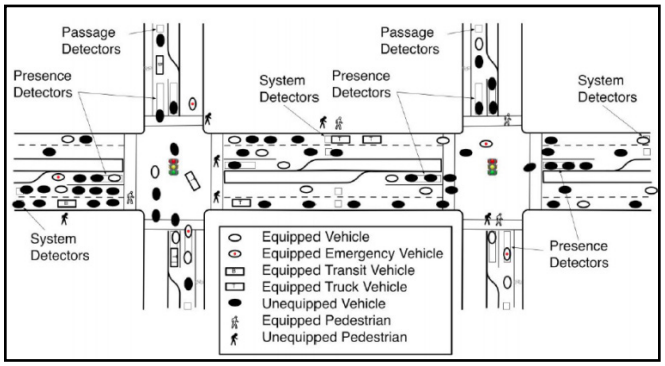
All east-west connecting routes are four or six lanes with left-turn lanes at major intersections. These routes are used by traffic by-passing incidents or congestion on I-75. Table 3 shows the East-West routes along with segment lengths, signals, railroad crossings, mid-block signals, technology deployment, and maintaining agencies.

1.5. PROPOSED TECHNOLOGY DEPLOYMENT

1.5.1. MMITSS

MMITSS suite will use CV applications to gather information about the vehicles, pedestrians and bicyclists at an intersection or group of intersections in order to improve traffic flow through the intersections. The system includes I-SIG to accommodate signal priority, preemption, and pedestrian movements; TSP and FSP to provide signal priority to transit and freight vehicles at intersections; PED-SIG to allow for automated call from pedestrians or bicyclists using the smartphone application; and PREEMPT to allow for multiple emergency requests. The SPaT read-only data information dissemination between RSUs and OBUs will provide information dissemination from these signal. MMITSS applications will be deployed along US 301/US 441 and on select east-west corridors within the cities of Ocala and Gainesville. Figure 4 shows the MMITSS concept.

FIGURE 4. MMITSS CONCEPT



Source: "MMITSS Final ConOps," University of Arizona et al.

The MMITSS study (see link) by USDOT Federal Highway Administration (FHWA) showed MMITSS applications effectively improved travel time and delay of the equipped vehicles. In particular, FSP reduced delay of connected trucks by up to 20% and I-SIG improved travel time reliability by up to 56%. The simulation study found that I-SIG achieved vehicle delay reductions up to 35% and TSP effectively saved travel time for both transit and passenger vehicles on the corridor where TSP was operated. Figure 5 shows MMITSS architecture that will be used for the I-75 FRAME.

1.5.2. RSU

The I-75 FRAME will deploy RSUs every two miles along I-75 at existing CCTV locations. RSUs will also be installed every two miles on the 50-mile rural segments of US 301/US 441 at proposed CCTV locations. The RSUs will also be installed at signal locations with MMITSS. The RSUs will send and receive messages to and from connected vehicles, transit, freight, and emergency vehicles, and other RSUs using the 5.9 GHz Dedicated Short Range Communication (DSRC).

TABLE 2. ARTERIAL CORRIDORS SUMMARY

FACILITIES	LENGTH (MILES)	SIGNALS	RAILROAD CROSSINGS	MID-BLOCK CROSSINGS	TOTAL SIGNALS	TECHNOLOGY DEPLOYMENT	MAINTAINING AGENCY
SR 222	7.0	11	0	0	11	SPM, MMITSS	City of Gainesville
SR 26	5.0	24	0	0	24	SPM, MMITSS	City of Gainesville
SR 24	4.0	13	0	0	13	SPM, MMITSS	City of Gainesville
SR 24A	1.0	3	0	0	3	SPM, MMITSS	City of Gainesville
SR 331	2.5	5	0	0	5	SPM, MMITSS	City of Gainesville
SR 326	3.0	3	1	0	4	SPM	Marion County
SR 500	3.0	5	0	0	5	SPM, MMITSS	Marion County
SR 40	3.0	4	0	0	4	SPM, MMITSS	Marion County
SR 200	4.0	11	0	0	11	SPM, MMITSS	Marion County
CR 484	7.0	7	0	0	7	ASCT	Marion County
SR 44	4.0	3	0	0	3	ASCT	Sumter County
US 301/ US 441	82.0	57	2	3	62	ASCT, SPM, MMITSS, CCTV, and RSU	City of Gainesville Marion County Sumter County
Total	**125.5**	**146**	**3**	**3**	**152**		

1.5.3. ASCT

ASCT will be deployed along specific corridors. ASCT adjusts signal timing to accommodate sudden surge in the traffic demand. The main benefits of this technology are dynamic distribution of green light time to all traffic movements, improved travel time reliability and reduced congestion, and optimized traffic signal timing. The corridors selected for ASCT deployment are US 301/US 441 and east-west corridors to support improved traffic progression of the detoured traffic from I-75.

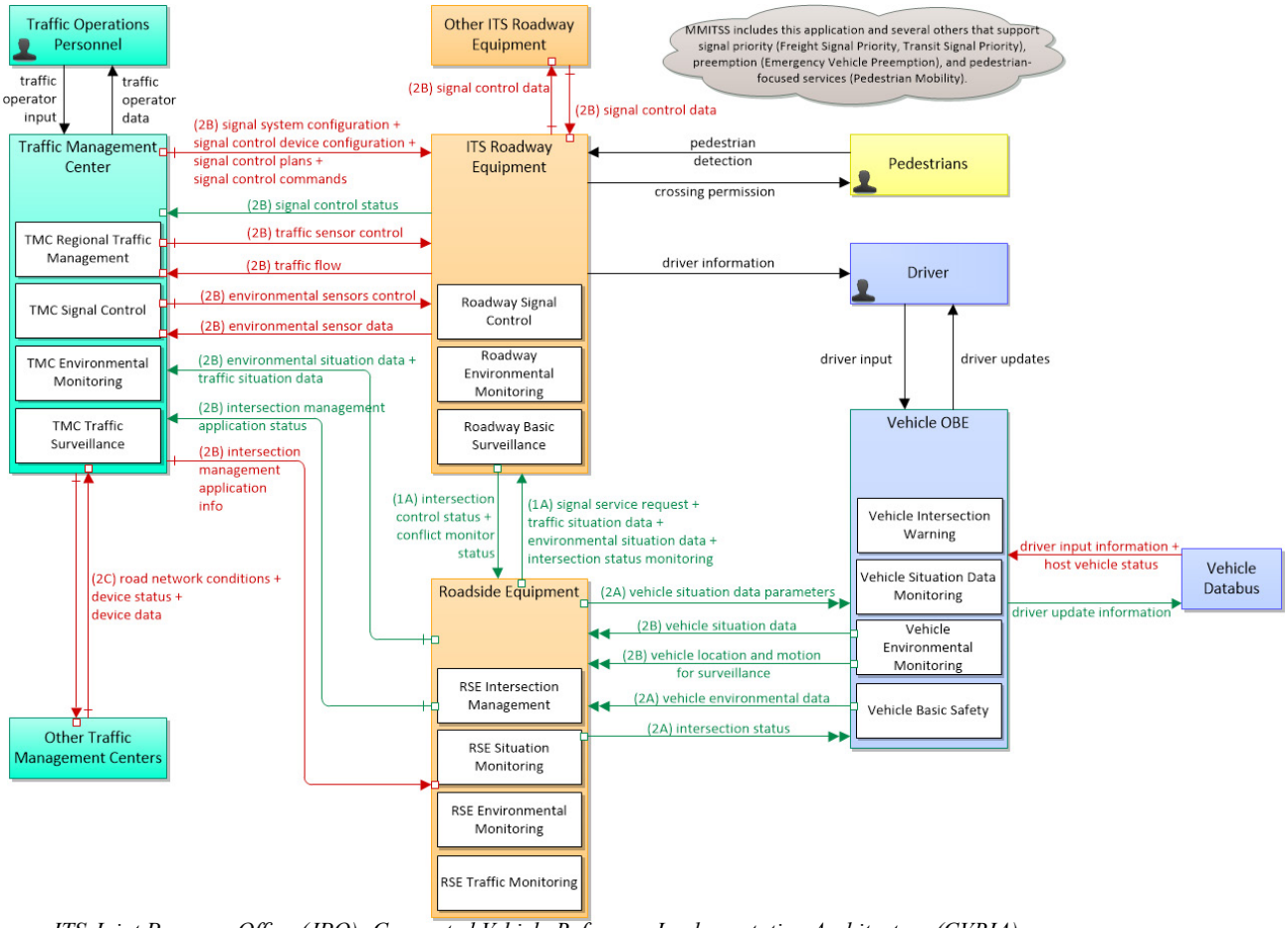
1.5.4 ARTERIAL CCTV

The I-75 FRAME will deploy arterial CCTVs along 50-mile stretch of US 301/US 441 segments at strategic locations to provide video coverage for real-time incident management. Major intersections within the cities of Ocala and Gainesville have existing CCTVs and traffic detections deployed.

1.5.5. OBU

I-75 FRAME will outfit cars, transit buses, and emergency vehicles to provide OBUs with vehicle-based processing, storage, and communications functions necessary to support CV operations. The OBUs will be third party units for vehicles older than 2017. The cars will be selected for deployment on a volunteer basis by surveying major trip generators such as University of Florida, schools, employment centers (hospitals), and shopping centers. The buses and emergency vehicles will be provided by local transit and law enforcement agencies, respectively. I-75 FRAME will not fund freight OBU deployment; however, a partnership with Florida Trucking Association (FTA) has been established to discuss the benefits of FSP and how OBUs can help with real-time traffic information and dynamic route choices. A high-level OBU deployment plan is provided in supporting documentation.

FIGURE 5. MMITSS ARCHITECTURE



Source: ITS Joint Program Office (JPO); Connected Vehicle Reference Implementation Architecture (CVRIA)

1.5.6. COMMUNICATION

The I-75 FRAME will deploy 50 miles of fiber optic cables along US 301/US 441 rural segments. There are existing communication infrastructure installed along all other I-75 FRAME routes. Wireless communications will be explored on some rural segments as a cost effective solution.

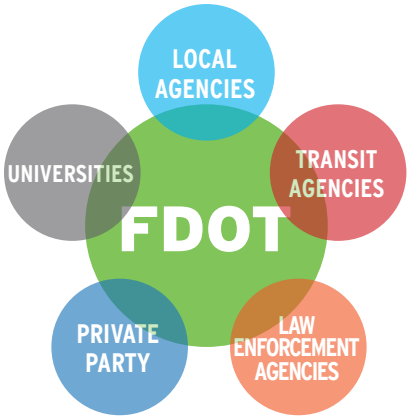
1.5.7. SOFTWARE DEVELOPMENT

The following list identifies the software development for I-75 FRAME success:

1. **ICM Decision Support System (DSS):** I-75 FRAME will develop an MMICM decision support modules for engaging and disengaging the MMICM. This DSS will optimize the use of both existing and new systems.
2. **API:** The I-75 FRAME will develop an API for pedestrian, bicyclists, transit, freight, and in-vehicle communication using a smartphone application. The API will collect and transmit real-time data to and from users to establish real-time traffic and safety information system.
3. **Emergency Vehicle Integration:** The I-75 FRAME will fund the interface development between PREEMPT, RSUs, and OBUs.

1.6. PROJECT PARTNERS

FIGURE 6. PROJECT PARTNERS



FDOT will actively partner with FHWA to carry out the I-75 FRAME technology deployments as described above. FDOT has ongoing partnerships with the local agencies, MPOs, and law enforcement agencies specific to I-75 FRAME with the following agencies:

- Gainesville Metropolitan Transportation Planning Organization (TPO), Ocala-Marion County TPO, and Lake Sumter MPO
- Alachua, Marion, and Sumter Counties
- Cities of Gainesville and Ocala
- Gainesville RTS and Ocala SunTran transits
- Local and State Law Enforcement Agencies
- University and private partnerships include:
  - University of Florida
  - Local ridesharing initiatives
  - HERE and Waze via existing FDOT contracts
  - Florida Trucking Association

FDOT will lead the group, develop the Concept of Operations, systems engineering management plan, project requirements and procure a design-build firm to design, deploy, integrate and test the technologies identified in I-75 FRAME using this award. FDOT will establish a memorandum of understanding with the local agencies and multi-jurisdictional partners to help operate and maintain the arterial system technology deployment as well as RSUs and OBUs. Letters of support from these agencies are provided in supporting documentation.

The following is a high-level responsibility, matrix developed for the agency level coordination.

1.7. REAL WORLD ISSUES, CHALLENGES AND SOLUTIONS

1.7.1. REAL WORLD ISSUES AND CHALLENGES

Traffic Crashes

Crash data for the project area corridor segments shown in Table 4 covers a total of four years from 2011 to 2014. I-75 experienced approximately 35 fatal crashes and 1185 injury crashes.

Portions of US 441/US 301 also have very high crash rates. Crash data information by segment is provided in supporting documentation.

> The crash rates along I-75 near Gainesville and between Ocala and Wildwood are as high as those along Interstates in the state's largest urban areas, reflecting the mix of cars and trucks and local and long-distance traffic.

Figure 7 shows the 2014 crash rate map on I-75.

Vulnerable Road User Crashes

The project area experienced a total of 226 vulnerable road user (90 pedestrians and 136 bicyclists) crashes between 2011 and 2014 with 169 crashes along US 301/US 441 concentrated within the cities of Gainesville and Ocala (see Figure 8). Vulnerable road users' safety is of prime concern and the project will address these issues using technology deployment.

Weather Related Crashes

The corridors within the project area experienced a total of 1,518 rain and 70 fog related crashes. I-75 experienced seven fatalities in a single fog related

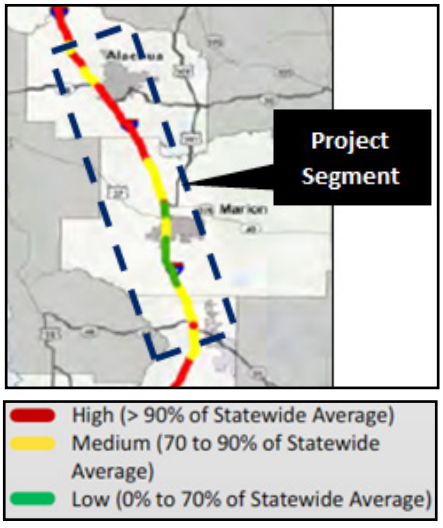
TABLE 3. AGENCY LEVEL RACI MATRIX

HIGH LEVEL TASKS	RESPONSIBILITY	ACCOUNTABILITY	COORDINATION	INFORMED
Develop Concept Plans, Concept of Operations (ConOps) and Project Systems Engineering and Management Plan (PSEMP)	FDOT	FDOT	LA	FHWA
Request for Proposal and Technical Requirements and Specifications Development	FDOT	FDOT	LA	FHWA
Procurement services for design-build firm	FDOT	FDOT	LA	FHWA
Final design, field device deployment, integration and testing	DBF	FDOT	LA	FHWA
Construction engineering inspection	CEI	FDOT	DBF, LA	FHWA
Vehicle OBU for cars	DBF	FDOT	LA	FHWA, LE
Emergency Vehicle Fleet OBU	DBF	FDOT, LE	FDOT	FHWA, LA
Transit Agency Fleet OBU	DBF	FDOT, TA	FDOT	FHWA, LA
Decision support system for MMICM	DBF	FDOT	LA	FHWA, LE, TA
Before and after analysis, Project Evaluation and Benefit Cost Analysis	UF	FDOT	FDOT, LA	FHWA, TA, LE, LA
Field device O&M	FDOT, LA	FDOT, LA	LE	FHWA

Note: LA = local agencies (city, county, or MPOs); LE = law enforcement agencies; TA = transit agencies; DBF = design build firm; CEI = construction engineering and inspection firm; UF = University of Florida

crash in 2012 and five fatalities in a single rain related crash in 2013 (see Figure 9)

FIGURE 7. 2014 I-75 CRASH RATE



Traffic Congestion

I-75 is a critical evacuation route for Florida's west coast, especially the Tampa Bay Region. The I-75 and Turnpike interchange at the south end of the project limit is identified as an evacuation bottleneck.

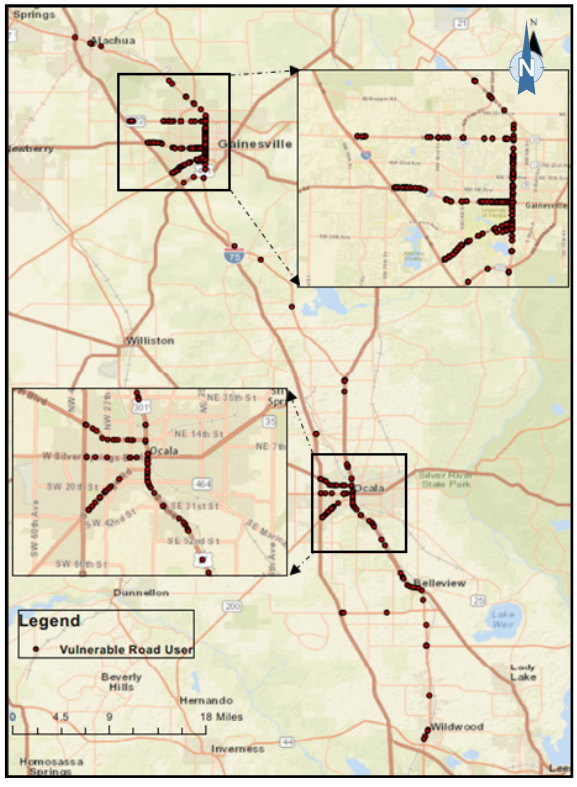
Photos in Figure 10 show typical condition during I-75 during closure and lane-blocking incidents.

According to the FDOT SunGuide® incident reports, this segment of I-75 experiences an average of one all-lane closure crash per direction every nine days.

TABLE 4. CRASH DATA SUMMARY

ROAD	FATAL	INJURY	PDO	TOTAL
SR 222	0	350	535	885
SR 26	1	709	1,163	1,873
SR 24	1	584	832	1,417
SR 331	0	92	142	234
SR 326	2	63	59	124
SR 500	0	116	88	204
SR 40	1	171	165	337
SR 200	3	315	242	560
CR 484	1	75	64	140
SR 44	3	27	40	70
Turnpike	1	39	61	101
I-75	35	1,185	2,181	3,401
US 441/US 301	29	1,766	3,072	4,867
Total	**77**	**5,492**	**8,644**	**14,213**

FIGURE 8. PEDESTRIAN AND BICYCLIST CRASHES



Source: FDOT Traffic Engineering and Operations Office

FIGURE 9. FOG AND RAIN RELATED CRASHES

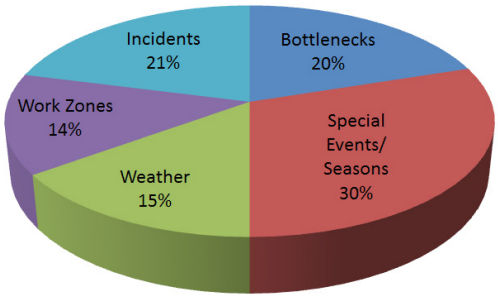
Source: FDOT Traffic Engineering and Operations Office

FIGURE 10. I-75 TYPICAL CONGESTION AND CONGESTION DURING CRASHES

Source: FDOT

The typical causes of congestion on I-75 were special events, bottlenecks, incidents, work zones, and weather. Figure 11 shows the typical causes of congestion in percentages along I-75.

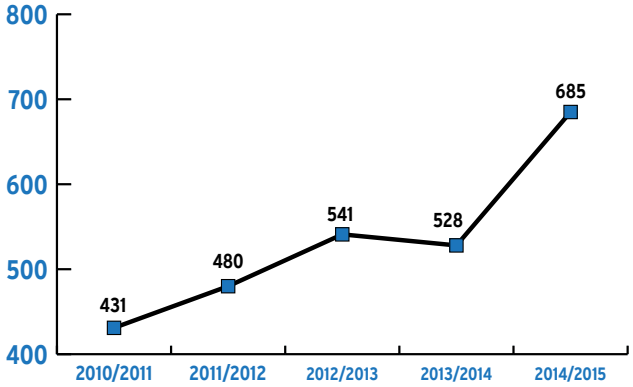
FIGURE 11. CAUSE OF I-75 CONGESTION



Source: FDOT

Over the last five years, incidents have caused at least one I-75 lane or ramp to be closed 2,665 times in the study area as shown in Figure 12 below. In 2014/2015, there were one incident every other day that involved lane closure.

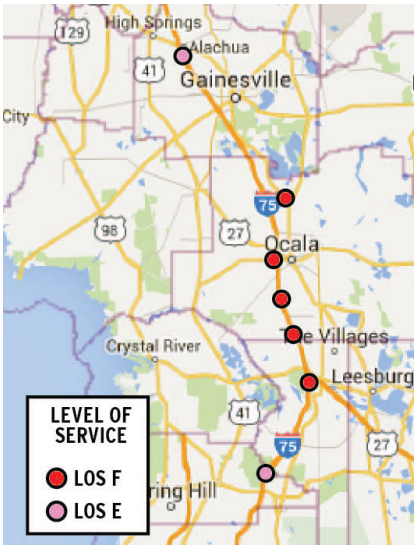
FIGURE 12. NUMBER OF INCIDENTS RESULTING IN LANE CLOSURES



Arterial Congestion

Portions of US 301/US 441 traffic operate at Level of Service (LOS) D or worse. The situation worsens when the traffic diverts to the arterial system. This operation can be improved with the use of emerging technologies, such as ASCT, SPM, MMITSS, RSUs and OBUs. Figure 13 shows the corridor LOS in 2040 for both arterial corridors and I-75.

FIGURE 13. 2040 LOS ALONG ARTERIAL



Source; FDOT

Potential Risks

Table 5 provides the potential risks and mitigations to the project.

1.7.2. REAL WORLD SOLUTIONS

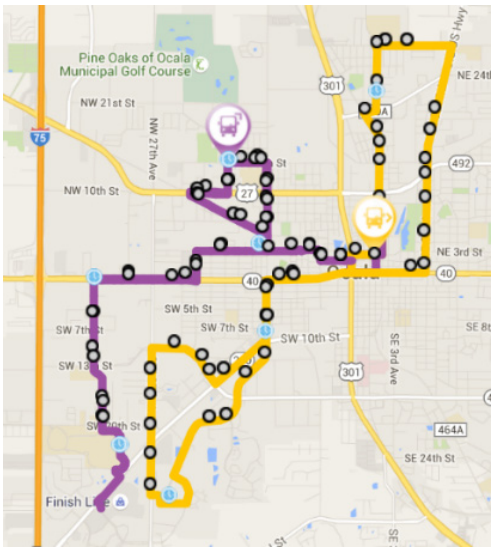
FDOT has invested extensively on research projects ranging from adaptive signal control technologies to connected vehicle technologies planned for the I-75 FRAME.

FDOT's team has real world experience with one of the very first connected pilots in the nation deployed in central Florida. Plus, FDOT has deployed a test bed at their TERL in Tallahassee to support application testing and workforce development. Also, FDOT has established in-house capabilities in their TSM&O office with experience in deployment and operation of CV technologies and test environments. Finally, as a partner on the THEA CV Pilot, lessons learned on that program will be applied on the I-75 FRAME.

1.8. TRANSPORTATION SYSTEMS AND SERVICES

1.8.1. TRANSIT SERVICES

FIGURE 14. OCALA SUNTRAN ROUTES WITH REAL-TIME BUS LOCATER



Source: Ocala SunTran Website

TABLE 5. PROJECT RISK AND MITIGATION

POTENTIAL RISK	RISK MITIGATION
Schedule: The key milestone is the advertisement date for the design/build request for proposals. If the ad date is delayed, date for on-going operations will be delayed.	The proposed schedule is for on-going operations to begin 42 months after notice of award. The NOFO allow 48 months, providing a 6-month cushion.
On-board units: Benefits will not be fully achieved without significant OBU for V2I communication.	The project budget includes equipping of private, transit and emergency vehicles with OBUs in the Ocala and Gainesville area. A high-level OBU deployment plan is prepared for I-75 FRAME.
DSRC licensing: Lack of DSRC licensing would prevent real-time V2I communication.	FDOT has a statewide 5.9 GHz license and is working through Federal Communications Commission (FCC) DSRC site registration requirements for the THEA pilot project and this experience will be leveraged for I-75 FRAME.
Equipment performance: Equipment does not perform as expected or required for the project.	Florida statutes require certification of all traffic control equipment used on Florida public highways. The Florida Traffic Engineering Research Laboratory (TERL) is staffed and equipped to test and certify roadside CV equipment. This process is beginning with the THEA pilot project. Part of the testing process is to ensure the technology functions as intended.
Expertise of staffing: Experienced staffing is required to ensure project is developed and delivered on schedule.	Key technical staff are provided through FDOT contract #C913. Key technical staff are identified and available from HNTB, Iteris, GSP, and the University of Florida. These persons have expertise in development and delivery of every aspect of the project scope.

POTENTIAL RISK	RISK MITIGATION
Institutional Collaboration: The project requires extensive collaboration with specific local agencies to achieve maximum benefit.	The proposed project scope aligns with local agency goals and objectives. Coordination is underway and will continue after application submittal. Local agency letters of support highlights their commitment to the success of I-75 FRAME.
Long term O&M: The system will not continue to perform without long-term operations and maintenance funding and personnel.	FDOT provides an annual budget for ITS O&M with each district procuring contractors for O&M activities. Additional costs for O&M will be added to the FDOT FY 19/20 budget. FDOT supports traffic signal O&M from Traffic Signal Maintenance Compensation Agreement (TSMCAs). These agreements were updated in 2015 with additional funding and performance requirements. They will updated again in FY 19/20 for agencies entering into I-75 FRAME implementations.
Cost overruns: Cost overruns will limit the numbers of and locations where technologies that can be implemented.	Project budget was developed using FDOT historical costs and AASHTO budget numbers for roadside and on-vehicle units. The budget was adjusted to reflect FDOT's existing ITS and communication infrastructure. The budget also includes a contingency amount since final design is not yet complete.
Railroad coordination: Conduit for fiber optic cabling will require railroad company approvals.	The project team has extensive successful experience working with CSX and Florida's East Cost (FEC) railroads for underground communication crossings and understands the necessity of protecting the integrity of the track infrastructure.

TABLE 6. REAL PROBLEM AND REAL WORLD SOLUTIONS

ISSUES		SOLUTIONS	REASON	STATUS
Congestion	Freeway	RSUs	For real-time V2I connectivity	To be deployed in I-75 FRAME
		OBUs	For real-time CV connectivity	To be deployed in I-75 FRAME
		ITS	For real-time monitoring and incident management	Existing
	Arterials	RSU for V2I	For real-time V2I connectivity	To be deployed in I-75 FRAME
		OBU for V2V	For real-time CV connectivity	To be deployed in I-75 FRAME
		ITS	For real-time monitoring and incident management	Existing
		MMITSS	For intelligent signal with real-time V2I capability	To be deployed in I-75 FRAME
		TSP	For transit management and operation	To be deployed in I-75 FRAME
		FSP	For freight management and operation	Future deployment in coordination with FTA
		PREEMPT	For traffic management and operation	To be deployed in I-75 FRAME
		ASCT	For arterial operation of traffic signals in real-time	To be deployed in I-75 FRAME
		SPM	For arterial operation of traffic signals in real-time	To be deployed in I-75 FRAME

ISSUES		SOLUTIONS	REASON	STATUS
	Combined	MMICM DSS	For active traffic demand and incident management	To be deployed in I-75 FRAME
		Probe Data	For active traffic demand and incident management	Existing - Waze, HERE
Safety	Fog	Fog sensors	For fog detection and predictive analysis	Existing
	Rain	Pavement sensors	For wet pavement and flood warnings	Future deployment
	Pedestrian/ Bicyclist	Smartphone Applications	For in-vehicle warning and pedestrian smartphone warning; for active tracking at the intersection using MMITSS	To be deployed in I-75 FRAME
Coordination	Arterials and Freeways	Center to Center Communication	Multi-jurisdictional stakeholder coordination during traffic incident management and emergency management	Existing
Scalability	Systemwide	Interoperability	For scaling FRAME in other parts of Florida's megaregion and nationally	Future deployment
Expertise/ Experience	Systemwide	Experience with CV pilots	For successful deployment of I-75 FRAME	Previous experience with the 2011 ITS world congress pilot deployment and ongoing THEA CV grant experience and lessons learned

SunTran Bus System

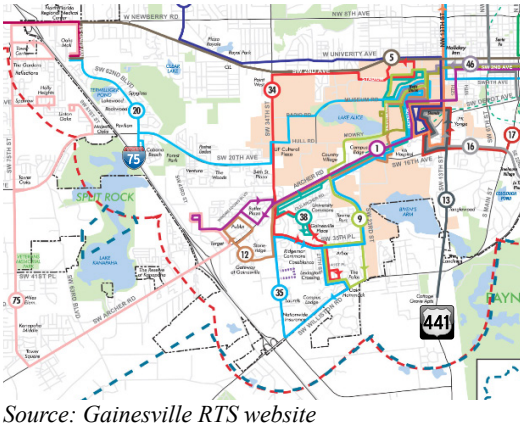
SunTran provides transit services for the City of Ocala. SunTran is cooperatively supported by the Ocala/Marion County TPO, Marion County, the City of Ocala, FDOT and Federal Transit Administration. Their website (see link) provides route information as well as a live bus tracker map. Their website allows passengers to receive alerts when their bus is within their selected time from their stop. Figure 14 shows two of the SunTran routes that are highly impacted when I-75 traffic detours through Ocala.

Gainesville RTS

Gainesville RTS serves Gainesville metropolitan area. The RTS website (see link) provides route information and a trip planning tool. RTS served 10,293,434 passengers in 2015. Figure 15 shows RTS routes that are impacted when I-75 traffic detours through Gainesville.

The RTS 10-Year Transit Development Plan, Technical Memorandum # 6/7 – Short / Long Range Service Plan Recommendations, October 10, 2014, recommends implementation of a Computer Aided Dispatch/Automatic Vehicle Locator (CAD/AVL) System which would help RTS efficiently manage vehicle operations and vehicle location identification.

FIGURE 15. GAINESVILLE RTS ROUTE MAP



Source: Gainesville RTS website

1.8.2. TRAFFIC MANAGEMENT AND OPERATIONS

City of Gainesville Traffic Management System (Smarttraffic)

The Gainesville Smarttraffic is a partnership

between the City of Gainesville (see link) Alachua County, FDOT, and the University of Florida that optimizes driving efficiency by monitoring and coordinating traffic signals. Figure 16 shows the Gainesville Smarttraffic interior.

The Gainesville Smarttraffic includes:

- Operation and maintenance of all traffic signals
- Fiber-optic communications network
- Traffic monitoring cameras
- Enhanced system-wide signal timing
- On-the-fly signal timing changes
- Emergency vehicle control (signal priority)
- Real-time motorist information
- Effective incident management
- Traffic data collection
- Dynamic message signs
- Arterial travel time systems
- Traffic Management Center Control Room

FIGURE 16. GAINESVILLE SMARTTRAFFIC

Source: Gainesville Smarttraffic

City of Ocala Traffic Systems

Within the city limits, the Traffic Division operates and maintains 124 signalized intersections on both city and state roads. The City has a small traffic signal operations center where they manage traffic signal operations and maintenance. The Ocala/Marion County MPO has allocated funds for traffic signal improvements, including ASCT. Implementation of ASCT within Ocala will occur simultaneously with the I-75 FRAME project.

FDOT District 2, District 5 and Florida's Turnpike RTMC

The FDOT District 2 RTMC located in Jacksonville, Florida, works closely with Gainesville Smarttraffic to manage traffic along I-75 corridor from Marion County line to Georgia state line.

The FDOT District 5 RTMC located in Orlando, Florida, works closely with the City of Ocala and the Turnpike RTMC to manage traffic along I-75 in Sumter and Marion counties.

Florida's Turnpike RTMC is located in Ocoee, FL and manages traffic on all Florida toll roads and Florida's Turnpike (SR 91).

All these RTMCs operates 24 hours a day and seven days a week.

1.9. PROVISION FOR LONG-TERM O&M

O&M for I-75 FRAME will occur within the framework of FDOT's existing freeway management and traffic signal system as well as within the framework of Florida Statutes of providing O&M for the infrastructure deployment:

- FDOT Districts 2 and 5: The Districts use the services of a district-wide maintenance contractors. The maintenance contractors provide routine preventive and responsive maintenance of all field devices and communication infrastructure.
- O&M for new I-75 FRAME features will be added to the existing operations and maintenance contracts through the Department's 10-year budgeting process.
- Districts use TSMCA to provide funding for local agency maintenance of traffic signal systems.

1.10. REGULATORY, LEGISLATIVE, AND INSTITUTIONAL ISSUES

1.10.1 REGULATORY AND LEGISLATIVE CHANGES

Florida statutes and regulations empower FDOT to utilize ITS and other technologies to improve management and operation of Strategic Intermodal System (SIS) facilities with state funds. Florida statutes and regulations also allow using Federal funds to benefit state and local transportation systems.

1.10.2. INSTITUTIONAL CHALLENGES

FDOT has a long history of working with local agencies to provide transportation system management and operations improvements. FDOT provides funding to local agencies for traffic signal operations and maintenance. FDOT has worked with local agencies to develop multi-agency traffic management centers and in some cases supports operation and maintenance of these facilities.

1.10.3. TECHNOLOGY CHALLENGES

FDOT has a statewide license to deploy 5.9 GHz DSRC for V2I communication and has tested earlier versions of RSUs. FDOT has successfully implemented BSMs communication with V2I. For new technologies, TERL is equipped and prepared to test equipment compatibility with SunGuide®. FDOT also developed DIVAS that collects and shares data with a wide range of data and agency partners. The one component that needs further is OBU and driver interface to increase vehicle penetration for the deployment. FDOT is closely monitoring the THEA pilot project and will leverage lessons learned and results in this area for I-75 FRAME. Also, assuming the new NHTSA rulemaking and well and USDOT CAMP partnerships will create even more vehicle penetration by 2019/2020.

1.11. QUANTIFIABLE SYSTEMS PERFORMANCE IMPROVEMENTS

The ATCMTD project includes the quantifiable performance improvements as listed in Table 7.

1.12. QUANTIFIABLE SAFETY, MOBILITY AND ENVIRONMENTAL BENEFITS

The I-75 FRAME includes quantifiable safety, mobility and environmental benefits, as show in Table 8.

1.12.1. BEFORE AND AFTER EVALUATION

UF will perform the project evaluation and collect the before and after data and analyze the actual project impacts to the individual corridors as well as to the entire system. As part of this evaluation, performance measures will be defined in coordination with FHWA as well as benefit-cost ratio will be developed based on benefits obtained from operations, safety and environmental emission reduction. Based on the success and lessons learned from this pilot, the use of similar systems within Florida and nationwide can be defined. If additional funding is needed for the evaluation, FDOT Research Office will identify additional funds.

1.13. PARTNERSHIP WITH PRIVATE SECTOR AND PUBLIC AGENCIES

1.13.1. Waze

FDOT has an existing agreement with Waze, signed March 2014, to allow Waze to tap into FDOT databases for advanced traveler information dissemination. Waze, in return, agreed to enhance FDOT's information dissemination capabilities and provide crowd-sourced information for minor incidents and debris. Waze alerts are received in FDOT RTMCs and are often the first notification of potential hazardous conditions. Both parties recognize each other as the source of information that is being posted. With the advent of DIVAS, other third parties can access and share the traffic information with each other. I-75 FRAME will leverage this partnership and the new/existing technologies to efficiently operate the freeway and arterial systems.

TABLE 7. QUANTIFIABLE SYSTEMS PERFORMANCE IMPROVEMENTS

TECHNOLOGY	PERFORMANCE MEASURES	MEASURABLE PERFORMANCE IMPROVEMENTS/IMPACTS
US 301/441 CV Roadside Units	Higher quality, real-time data collection and traveler information	Reduced primary crashes Reduced secondary crashes Reduced incident congestion Improved incident clearance
ASCT	Improved signal response to incident traffic	Improved travel time reliability Reduced delay
SPM	Improved signal response to incident traffic	Improved travel time reliability Reduced delay
MMITSS	Improved signal response to incident traffic	Improved travel time reliability Reduced delay
SPaT	Improved signal response to incident traffic	Improved travel time reliability Reduced delay
I-SIG	Better signal V2I data processing	Improved travel time reliability Reduced delay
TSP	Improved signal response for transit	Better transit travel time reliability
FSP	Improved signal response for freight	Better truck travel time reliability Fewer trucks stopped at signals
PED-SIG	Improved signal response for pedestrians	Less delay for pedestrians during congested conditions Less delay for traffic when pedestrians not present
PREEMPT	Improved signal response for emergency vehicles	Less delay for emergency vehicles
CV Vehicle OBUs	Higher quality, real-time data collection and traveler information	Less delay for equipped vehicles Better travel time reliability for equipped vehicles
Fiber optic communication infrastructure on US 301/441	Improved real-time high band width communication	No direct measureable impacts Enables impacts of other improvements
Wireless communication	Cost effective solution to cover 10 mile gap north of Belleview and Ocala	No direct measureable impacts Enables impacts of other improvements
CCTV on US 301/441	Ability to confirm incidents, congestion and support incident response and management	Improved incident clearance times
Arterial Dynamic Message Sign (ADMS) integration	Integrate existing ADMS in vicinity of Ocala to support traffic incident management	Reduced primary crashes Reduced secondary crashes Reduced incident congestion Improved incident clearance

TABLE 8. QUANTIFIABLE SAFETY, MOBILITY AND ENVIRONMENTAL BENEFITS

QUANTIFIABLE BENEFITS	ESTIMATED IMPACT	COMMENTS
Reduced fatalities and severe injuries on I-75	Down by 20%	High speeds and high truck volumes contribute to high crash severity in the project corridor
Reduced fatalities and severe injuries on US 301/441	Down by 20%	High speeds and traffic signals in rural areas contribute to crash severity
Reduced secondary crashes on I-75	Down by 25%	Florida's SunGuide® software tracks secondary crashes
Reduced intersection crashes within urban limits of Ocala and Gainesville	Down by 30%	ASCT, SPM, ISIG and SPaT will contribute to intersection safety
Reduced total crashes on project area	Down by 25%	The planned six-month after study period should be adequate to collect enough crash data for valid comparison with before data
Hours of delay General traffic Freight Transit Pedestrians Emergency vehicles	 Down by 20% Down by 20% Down by 10% Down by 20% N/A	Reducing non-recurring congestion will additional reduce undesirable vehicle emissions and increased travel time reliability.
Travel-time reliability General traffic Freight Transit Emergency vehicles	 Up by 15% Up by 10% Up by 10% Up by 10%	Direct result of fewer crashes and improved traffic signal performance. Travel time reliability will compare both non-congested conditions to congested conditions and before/after congested conditions. See link.
Transit on-schedule performance	Up by 20%	Due both to TSP and congestion reductions
Toxic emissions and fuel consumption	Down by 10%	Secondary crash and congestion reductions, reduced trips
Benefit Cost Ratio	10 to 1 up to 20 to 1	Cumulative benefits versus implementation, O&M costs over 20-year horizon. See link.

1.13.2. HERE

FDOT has an existing contract with HERE to provide a unified base map and manage roadway data, collision statistics, emergency response, and monitor traffic performance in real-time. The contract provides data to support real-time traveler information dissemination through the Florida 511 system in coordination with District RTMCs. The I-75 FRAME will leverage this partnership and the new/existing technologies to efficiently operate the freeway and arterial systems.

1.13.3. RIDESHARING PARTNERS

Alachua County, City of Gainesville, and University of Florida provides last mile connectivity options to senior citizens and students using existing private partnerships. A new program called Freedom-In-Motion was announced in 2015 in collaboration with the City of Gainesville, Alachua County (ElderCare), and the Gainesville Chamber of Commerce. I-75 FRAME will leverage this partnership as well as transit agency partnerships to enhance ridesharing options and on-demand transportation solutions.

1.14. LEVERAGE AND OPTIMIZE EXISTING TECHNOLOGIES

1.14.1. FREEWAY MANAGEMENT SYSTEM

The I-75 FMS deployment is ongoing and scheduled for completion in December 2016. The I-75 FMS includes CCTV and Microwave Vehicle Detection System (MVDS) every mile, Dynamic Message Signs (DMS) at major interchanges, fog and visibility sensors, and fiber connections to all major cross streets. The current gap in the fiber optic system is along I-10 between Tallahassee and Jacksonville. FDOT District 2 is currently designing the I-10 FMS with construction work programmed for FY 2017, to be completed by FY 2019. To cover this fiber gap, the information to/from I-75 and Gainesville will be carried over private party fibers to the District 2 RTMC under an existing agreement. A redundant communication path is also established with the state microwave system. The I-75 information south of Alachua County rides on I-75 fibers and Florida's Turnpike fibers (SR 91) that eventually connect to I-4 (District 5) to connect to District 5 RTMC. Figure 17 shows the fiber paths and microwave tower locations.

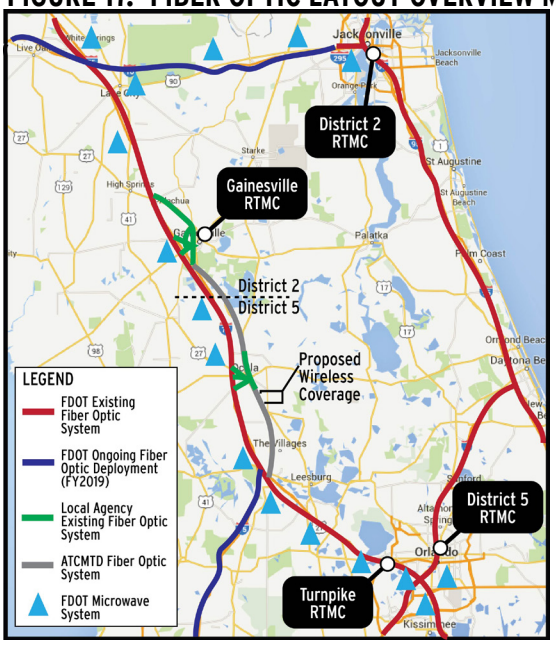
1.14.2. ARTERIAL MANAGEMENT SYSTEM

Gainesville has fiber optic cables on all major arterials within the city limits (see Figure 20). The city also has an extensive system of arterial CCTVs. Gainesville also upgraded traffic signal controllers compatible with SPM, ASCT and MMITSS and has Arterial DMS signs on select corridors.

Ocala has fiber optic cables on all major corridors within the city limits. Ocala also has upgraded traffic signal controllers compatible with SPM, ASCT and MMITSS, ADMS signs on select corridors, and CCTVs on all major roads.

Figure 17 shows the fiber optic cable gap of approximately 45 miles along US 301/US 441. The grant award will cover this gap (shown in purple).

FIGURE 17. FIBER OPTIC LAYOUT OVERVIEW MAP



Source: FDOT

1.14.3 FDOT SUNGUIDE® INTEGRATION

SunGuide® Software is an advanced traffic management system software system to control and monitor roadside equipment and vehicle resources to facilitate traffic and incident management; disseminate traveler information to the motoring public; exchange critical information among agencies, and collect and report data regarding the operation of Florida's transportation system. SunGuide® has capability to transmit and receive BSMs via V2I communication and is based on an open architecture and enables users to manage multiple subsystems. I-75 FRAME will leverage SunGuide® capabilities and the center to center (C2C) communication between RTMCs and V2I technologies.

1.14.4. FLORIDA 511 INTEGRATION

FL511 is an integral part of Florida's TSM&O program, enhancing the safety and mobility of people and goods, economic competitiveness, and the quality of our environment and communities by serving commuters, tourists, commercial vehicle operators, and evacuees. FL511 disseminates information via phone, text, e-mail, and the FL511.com

website. I-75 FRAME will use FL511 to disseminate real-time traffic information in addition to the sharing traffic information with private third-party information service providers.

1.14.5. FDOT DIVAS INTEGRATION

FDOT DIVAS database repository/server will be housed in district 5 RTMC. It streamlines data processing and video aggregation to improve FDOT's ability to share data with third parties. DIVAS will also supply data to the FL 511 system as well as develop a third party data feed to obtain data and video to and from the FDOT districts. I-75 FRAME will use DIVAS to provide real-time traffic information to and from RSUs and OBUs.

1.14.6. Waze AND HERE DATA INTEGRATION

The Waze and HERE traffic data will be available via DIVAS and open for private developers to innovate and develop third party applications centered. The FDOT ITS data will also be accessible via DIVAS.

1.14.7. WIM STATION DATA INTEGRATION

The I-75 FRAME has two WIM stations within the project limits that are connected to the FDOT wide area network. The I-75 FRAME will integrate this data for real-time freight operation and weight information collection and dissemination.

1.15. SCHEDULE FOR CONDUCTING DEPLOYMENT AND COMPLETION OF ALL PROPOSED ACTIVITIES

A schedule for conducting the technology deployment and for completion of all proposed activities is provided in Table 9. A detailed schedule is provided in supporting documentation.

1.16. LEVERAGING OTHER FDOT INITIATIVES

1.16.1. FDOT HSR

FDOT has a draft HSR guidelines to use shoulder lanes for emergency and congestion management. I-75 FRAME is consistent with FDOT's initiative to employ HSR along this corridor.

1.16.2.I-75 MOBILITY STAKEHOLDERS GROUP – DISTRICT 5

Due to the ever increasing freight demand through this I-75 project segment, as identified in the Freight Mobility and Trade Plan (see link), the I-75 Mobility Stakeholders Working Group was formed by FDOT and other regional partners and stakeholder. Due to the pace of activities affecting I-75, the group meets biannually, a web portal was developed (see link). I-75 FRAME is consistent with the goals of the I-75 Mobility Stakeholders Working Group.

1.16.3. UF CV TEST BED

In anticipation of the advent of connected vehicle technology use and renewed interest by software developers and vehicle manufacturers, FDOT is collaborating with the UF to designate and equip a roadway network in the Gainesville area to test CV technologies. I-75 FRAME acted as a catalyst for defining and equipping the road network and defining testing goals and milestones.

1.16.4. FDOT'S FAV INITIATIVE

FDOT's FAV initiative is helping to educate stakeholders, developing research and pilot projects, and creating awareness of the technologies and how they support FDOT vision of "serving the people of Florida by delivering a transportation system that is fatality and congestion free." I-75 FRAME is consistent with the FAV goals.

1.16.5. FDOT COMPLETE STREETS INITIATIVE

FDOT's Complete Streets initiative promotes safety, quality of life, and economic development in Florida. While maintaining safety and mobility, Complete Streets serves the transportation needs of transportation system users of all ages and abilities, including but not limited to cyclists, motorists, transit riders, freight riders, and pedestrians. I-75 FRAME will enhance management and operation of Complete Streets initiatives.

TABLE 9. PROJECT SCHEDULE

ACTIVITY	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14
PROJECT BEGINS														
KICKOFF MEETING														
CONOPS, SYSTEMS ENGINEERING														
BEFORE STUDY														
ENVIRONMENTAL CLEARANCES														
DESIGN/BUILD PROCUREMENT														
DESIGN														
IMPLEMENTATION/CEI														
INTEGRATION AND TESTING														
AFTER STUDY														
ON-GOING O&M														

1.16.6. FDOT AGING ROAD USERS INITIATIVE

From 2007 to 2009, adults age 65 and older made up an increasing percentage of all fatalities from crashes over the three years – 18.3 percent, 18.7 percent and 20.6 percent. I-75 FRAME will provide technology solutions to the safety problems faced by this age group using MMITSS and dynamic ridesharing initiatives by local agencies.

1.16.7. FDOT FOG VISIBILITY SYSTEM DEPLOYMENT

The segment of I-75 experienced 70 fog related crashes in four years and most of these crashes are severe. The FDOT fog visibility study was done 2014 and the system is deployed in District 2 portion of I-75. I-75 FRAME will collect and disseminate the information from these sensors.

1.16.8. FDOT DISTRICT 5 ACTIVE ARTERIAL MANAGEMENT (AAM)

FDOT District 5 has an AAM contract to actively operate and manage arterial operations. I-75 FRAME will provide AAM for Ocala and Wildwood during incidents.

1.16.9. COMMUNITY TRAFFIC SAFETY TEAM (CTST) AND TRAFFIC INCIDENT MANAGEMENT (TIM) TEAMS

FDOT and local local agencies in this area have very active CTST of traffic engineers, planners and designers that meet on a quarterly basis to promote safe and accountable traffic signal system design. FDOT also has active TIM teams (Districts 2 and 5) that meet quarterly to better the TIM practice in this Area. I-75 FRAME leverage these efforts.

2. STAFFING DESCRIPTION

2.1. DESCRIPTION OF THE ORGANIZATION OF STAFF

The organization of staff and staff description is shown in Table 10. Detailed resumes of the key staffs are provided in supporting documentation.

Figure 18 shows the project organization chart.

2.2. PRIMARY POINT OF CONTACT

The primary point of contact for the project is Fred Heery in FDOT TEOO office in Tallahassee Florida. His contact information is:

Fred H. Heery, Sr., P.E.
State TSM&O Program Engineer
Traffic Engineering & Operations Office
Florida Department of Transportation
605 Suwannee Street, MS 36
Tallahassee, FL 32399
Phone: 850-410-5606
Email: Fred.Heery@dot.state.fl.us

3. FUNDING DESCRIPTION

3.1. BREAKDOWN OF ESTIMATED COSTS

The list of technology deployment was described in Section 1.2. The project cost breakdown is provided in Table 11.

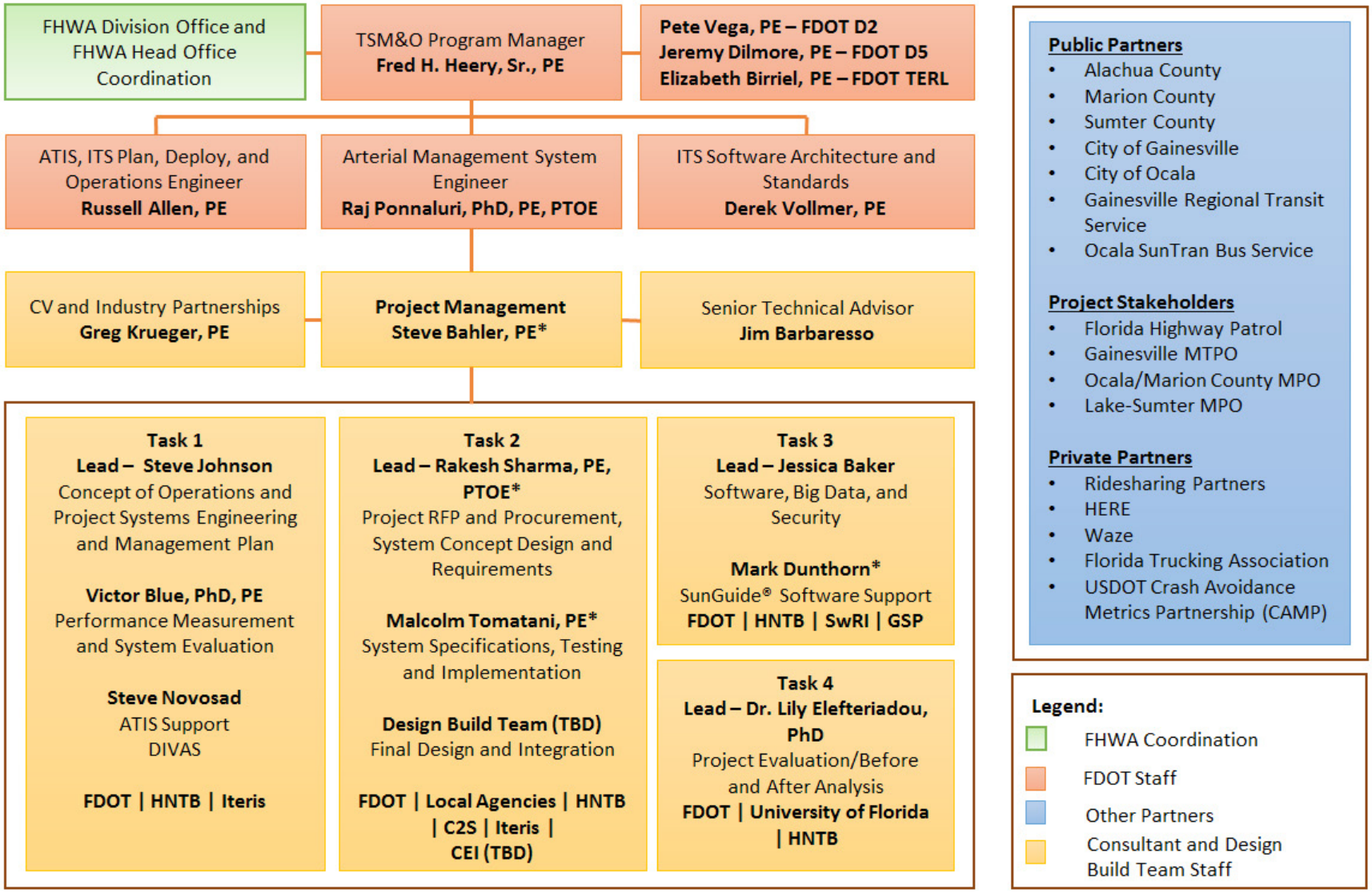
Note the quantities shown in the estimates may vary during system engineering management plan, concept of operation, final design, and local agency coordination, while keeping the overall cost of deployment the same. A value engineering process will be followed during PSEMP development to optimize the use of technology to obtain maximum benefits and coverage from the system.

As shown in Table 11 FDOT is requesting $11.888 million dollars via the 2016 ATCMTD grant

TABLE 10. STAFF DESCRIPTION

STAFF NAME AND POSITION	POSITION DESCRIPTION	YEARS OF EXPERIENCE
Fred D. Heery Sr., PE	TSM&O Program Manager	30
Elizabeth Birriel, PE	TERL device testing and verification	21
Raj Ponnaluri, PhD, PE, PTOE	Arterial management system engineer	21
Russell Allen, PE	511, ITS Plan, Deploy, and Operations	17
Derek Vollmer, PE	SunGuide® Software and Integration	7
Pete Vega, PE	District and local agency coordinator in District 2	26
Jeremy Dilmore, PE	District and local agency coordinator in District 5	11
Jim Barbaresso	Senior Technical Advisor	37
Greg Krueger, PE	CV design and Industry Partnerships	22
Steve Bahler, PE	Project Manager	25
Rakesh Sharma, PE, PTOE	Request for Proposal (RFP), Procurement, Concept Design and Requirements	13
Malcolm Tomatani , PE	CV testing and integration	19
Steve Johnson	ConOps, PSEMP, and CV design	30
Jessica Baker	Software, Big Data and Security	18
Dr. Lily Elefteriadou	Project Evaluation, Before and After and Benefit Cost Analyses	27

FIGURE 18. PROJECT ORGANIZATION CHART



*In House FDOT TSM&O General Engineering Consultant Staff

application to deploy the I-75 FRAME system. This cost estimate does not include any operations and maintenance costs. Operations and maintenance costs will be covered by FDOT.

FDOT has identified some funding sources and avenues to fund operations and maintenance cost of the system through state and local agency support as discussed in Section 1.6.

3.2. FUNDING SOURCES AND AMOUNTS

Table 12 shows the relevant breakdown of FDOT matching funds identified for this application.

The FDOT match is all state funds with no federal fund dollars built in them. The FDOT match is 72% of the total deployment cost as detailed.

FDOT Match (million): $30.89

ATCMTD Cost of Deployment (million): $11.89

Total Cost of Deployment (million): $42.78

Total % FDOT Match: 72%

Total % ATCMTD Request: 28%

The central office TSM&O GEC consultant support staff use cost reflects the cost without the preliminary engineering design cost of $1.0M paid under this grant award. The detailed cost breakdown is provided in the supporting documentation. **All recently completed (in last two years) and ongo-ing I-75 FMS projects, are considered as a match to this grant application. These FMS projects are critical to the success of the I-75 FRAME and providing C2C communications.**

TABLE 11. PROJECT COST SUMMARY

ITEMS	UNIT COST	QUANTITY	UNIT	TOTAL COST
Freeway RSU	$20,000.00	37	EA	$740,000.00
Arterial RSU	$20,000.00	25	EA	$500,000.00
Arterial CCTV	$35,000.00	25	EA	$875,000.00
Ocala MMITSS	$25,000.00	35	EA	$875,000.00
Gainesville MMITSS	$25,000.00	77	EA	$1,925,000.00
ASCT	$35,000.00	23	EA	$805,000.00
SPM	$100,000.00	1	EA	$100,000.00
Arterial Fiber (Ocala to Gainesville)	$40,000.00	26	Miles	$1,040,000.00
Arterial Fiber (Wildwood to Belleview)	$40,000.00	14	Miles	$560,000.00
Wireless (Belleview to Ocala)	$10,000.00	5	EA	$50,000.00
Transit CV Transceivers (OBU)	$10,000.00	10	EA	$100,000.00
Emergency Vehicle CV Transceivers (OBU)	$5,000.00	30	EA	$150,000.00
Commuter CV Transceivers (OBU)	$2,000.00	200	EA	$400,000.00
SUBTOTAL				$8,120,000.00
Preliminary Design - PSEMP, ConOps, CV Architecture, NEPA				$1,000,000.00
CEI				$700,000.00
MOT				$150,000.00

ITEMS	UNIT COST	QUANTITY	UNIT	TOTAL COST
Public Outreach				$150,000.00
Before and After Evaluation				$200,000.00
Emergency Vehicle Integration for CV				$200,000.00
API for Ped/Bike/Transit/Vehicle/Freight				$50,000.00
Integrated Corridor Management DSS				$100,000.00
Contingency		15%		$1,218,000.00
GRANT TOTAL				$11,888,000.00

TABLE 12. FDOT MATCH AND FUNDING SOURCE

AGENCY	PROJECT NAME	FY	FDOT FINANCIAL PROJECT IDENTIFICATION (FPID)	FUND SOURCE	STATUS	MATCH (MILLION $)
District 2	I-75 FMS from Marion Co/L to SR-24/Archer Road	2014	4335101-1	State Funds	Ongoing	$1.66
District 2	I-75 FMS US 441 from SW 104th Ave. to SW 66th Place	2014	433765-1	State Funds	Complete	$0.47
District 5	I-75 FMS from SR 44 to N of US 27	2014	428213-1	State Funds	Ongoing	$5.00
District 2	Marion County Countywide ITS Communication System	2014	430252-1	State Funds	Complete	$4.00
District 5	I-75 FMS from N of US 27 to Alachua County Line	2015	428213-2	State Funds	Ongoing	$4.05
District 2	I-75 FMS from SR 24 in Alachua County to GA Stateline	2016	427474-2	State Funds	Ongoing	$12.00
Central Office	Fog Visibility Study - Paynes Prairie	2016	190258-1	State Funds	Ongoing	$0.22
Central Office	DIVAS Deployment	2017	418195-1	State Funds	Ongoing	$2.00
Central Office	TSM&O General Engineering Consultant (GEC) Support	2016-2020	190258-1	State Funds	Ongoing	$1.50
TOTAL MATCH						$30.89


FDOT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Managing and Operating for an Efficient Transportation System