Escambia/Santa Rosa Regional Advanced Traffic Management System Feasibility Study and Implementation Plan

Implementation Plan

Technical Memorandum

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Version 3.0

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List of Acronyms and Abbreviations

AADT .... Annual Average Daily Traffic
AID .... Accelerated Innovation Deployment
ATC .... Advanced Transportation Controller
ATMS .... Advanced Traffic Management System
AVI .... Automatic Vehicle Identification
CCTV .... Closed-Circuit Television
DMS .... Dynamic Message Sign
DSRC .... Dedicated Short Range Communications
FDOT .... Florida Department of Transportation
FHWA .... Federal Highway Administration
ITS .... Intelligent Transportation Systems
MFES .... Managed Field Ethernet Switch
RTMC .... Regional Transportation Management Center
RWIS .... Road Weather Information System
SPM .... Signal Performance Measures
TIGER .... Transportation Investment Generating Economic Recovery
TMC .... Transportation Management Center
TPO .... Transportation Planning Organization
TSM&O .... Transportation Systems Management and Operations
TSOC .... Traffic Signal Operations Center
USDOT .... United States Department of Transportation
WAN .... Wide Area Network

1 EXECUTIVE SUMMARY

This implementation plan provides information concerning the future design and utilization of a state-of-the-art advanced traffic management system (ATMS) and regional transportation management center (RTMC) in the Florida panhandle region. Multiple transportation agencies in the Escambia/Santa Rosa Counties area, including Escambia County, City of Pensacola, Santa Rosa County, City of Gulf Breeze, and City of Milton, are interested in upgrading existing traffic control systems in the area and establishing an integrated ATMS that will serve the region. This project has served as a catalyst for stakeholder agencies to adopt resolutions committing their support for the construction and operation of a unified ATMS and RTMC. These resolutions recognize the benefits of ATMS and intelligent transportation systems (ITS), and resolve to establish interagency cooperation and coordination for the joint development, operation, and maintenance of the ATMS and RTMC through a Regional Transportation Management Team.

The implementation plan recommended for the regional system involves a three-phased approach. Phase I, completed in 2015, included an upgrade of 18 existing controller cabinets; installation of cameras and fiber optic cable along portions of SR-296 (Brent Ln./Bayou Blvd.), US-29 (SR-95/N Palafox Rd.), and SR-295 (Fairfield Dr.); and installation of central management software within both the City of Pensacola and Escambia County Traffic Signal Operations Center (TSOC). Phase II will establish a regionwide communications network and upgrade intersections throughout the region with new controller cabinets and cameras. Phase III will complete the build-out of the system by constructing the RTMC for collocated operations and adding additional ITS devices along system corridors.

In total, the proposed work for Phase II has an estimated project total cost of approximately $25 million. The completion of Phase II will provide the region with the communications infrastructure necessary for the Phase III system as well as providing immediate upgrades to obsolete traffic signal systems that are currently in use throughout the region. Phase II signal system upgrades and the addition of cameras along regional corridors will enhance the capability of existing TSOCs and allow them to perform active arterial management functions for improved corridor operations.

Phase II will provide an active communication link from all devices within the region back to existing TSOCs. New controller cabinet assemblies will replace all existing controllers at signalized intersections throughout the region. In total, 321 signalized intersections will be retrofitted with improved controller assemblies, new electrical service components, and fiber optic hardware and communication components necessary for network connection. Phase II will also provide camera installations in strategic locations at the majority of signalized intersections throughout the region for corridor monitoring and incident management. Both existing TSOCs will receive equipment upgrades to enable video monitoring and active arterial management.

Phase II will include the deployment of 144-count single-mode fiber optic cable along key highways and arterials. The plan and budget estimates are based on the installation of approximately 150 miles of fiber-optic cable using underground conduit and existing aerial spans, creating a direct link between all devices and the existing TSOC. It also considers use of wireless where appropriate, such as connecting isolated signals or remote corridors in the interest of cost savings. Establishing contracts for the design and construction of Phase II is estimated to take approximately 9 months and construction of the system itself approximately 24 months.

Phase III will add additional field devices to the system, including arterial dynamic message signs (DMS), road weather information systems (RWIS), and vehicle detection systems for traffic data collection, and construct the RTMC desired for agency co-location and cooperative system operation. The implementation plan identifies six candidate site locations suitable for the RTMC. The Regional Transportation Management Team will make the final site selection. Due to the estimated timeframe for design and construction of Phase II, the project team recommends that final site selection for the RTMC be part of the design stage of Phase III. The estimated project cost for Phase III is also approximately $25 million with a timeframe for design and construction similar to Phase II.

This project has been developed following systems engineering guidelines established by the United States Department of Transportation (USDOT) Federal Highway Administration (FHWA) and adopted by the Florida Department of Transportation (FDOT). It involved seeking input from stakeholders across the region, establishing project goals and objectives, identifying and documenting current conditions, researching traffic control technologies and strategies, and proposing actionable steps to establish a unified ATMS and RTMC that will serve the region.

Currently, traffic signals throughout the region are operated independently by various local agencies. Many of these controllers and their supporting infrastructure have been in place for decades and are approaching, or have reached, obsolescence. Regional strategic plans have recognized the value of cooperative signal system operation and recommended regional traffic system upgrades, including the Pensacola Urban Area ITS Master Plan from 2003 and Regional ITS Plan adopted in 2010. This plan moves the vision provided in those documents forward towards reality.

The project team has worked with regional stakeholders to establish a ranking of corridors as part of this project. Corridors were ranked using criteria, such as functional classification, annual average daily traffic (AADT), and use as an evacuation route. This ranking helps establish an order for future project build-out and staged implementation. Based upon the levels of funding available, it may be necessary to deploy the ATMS in phases. These rankings can serve to set the order of construction for a full deployment or partial build-outs in the event that Phase II funding is limited.

This plan also reflects the desires of stakeholders to continue the operation and maintenance of their respective systems within their jurisdiction once the ATMS is completed. Repairs, upgrades, preventive maintenance, and other activities will ultimately become the responsibility of a joint operations team comprised of staff from each participating agency. This plan includes recommendations on future staffing levels based on industry best practices and describes existing partnership agreements, coverage areas, hours of operation, staff training, and other aspects to consider as systems move from current to future conditions.

ATMS projects are frequently funded using federal grants; several current opportunities are described in this plan and the grant resources noted herein should continue to be tracked for future funding opportunities.

2 INTRODUCTION

This implementation plan builds upon and complements previous technical memoranda developed for this project that serve to capture project considerations and work to date, including interagency coordination, stakeholder identification and meetings, alignment of a proposed project framework with the regional ITS architecture, user needs documentation, review of existing conditions, and technology review.

The primary project stakeholders in the region are members of the Florida-Alabama Transportation Planning Organization (TPO) Technical ITS Working Group. Therefore, this project has leveraged the membership, organization, and meetings of the TPO for coordination, outreach, stakeholder identification, and other aspects of this effort. The definition of the "region" as it relates to this project is the boundaries of the TPO, but it is also understood that multiple roads traversing the region influence travel and operations beyond the strict boundaries of the TPO. Therefore, outreach and solicitation of stakeholder input has expanded to include other areas within FDOT District Three. This plan also considers the input and direction District Three staff has provided for this project from their broader regional perspective.

Future design and construction undertaken because of this planning phase is expected to provide upgraded technology and equipment, connectivity of systems, integrated traffic monitoring and control, and enhanced regional traffic operations and data collection. The communications network and devices described in this plan will significantly increase the capabilities of local agencies to operate and maintain their transportation systems and also establish the infrastructure necessary for the region to apply active arterial management and integrated corridor management strategies that leverage technology and represent current best practices in transportation systems management and operations (TSM&O). A fully functional regional ATMS will also support the development of additional future systems to disseminate information to the public, such as a website that includes traffic data, incident information, and video from traffic cameras throughout the region.

2.1 Project Overview

The traffic control system operators in the Escambia/Santa Rosa Counties area determined that it was necessary to review and assess existing conditions, and plan, design, and implement a new regional ATMS that will allow them to improve the safety, efficiency, and effectiveness of their respective programs. This project has been undertaken following the USDOT's systems engineering guidance. Additional information on the systems engineering process and its application on this project may be found in the Escambia/Santa Rosa Regional Advanced Traffic Management System Feasibility Study and Implementation Plan ATMS Frame Technical Memorandum referenced in section 2.

2.2 Project Goals and Objectives

This plan, and its supporting documents generated during the overall course of this project, identifies existing traffic signal and signal system technologies currently deployed across the region, existing operating strategies, and documents input from regional stakeholders. This information serves as the foundation of the planning topics and recommendations contained in this report and serves as the basis for a roadmap and technical framework for the deployment and operation of future traffic management systems from both a local (agency) and regional perspective.

The following outlines the general goals and objectives identified at the onset of this project:

- Improved safety,
- Improved air quality mitigation,
- Improved congestion mitigation,
- Improved emergency response,
- Improved regional growth adaptability,
- Improved evacuations,
- Improved system communications,
- Improved cross-jurisdictional traffic flow,
- Improved integration of transportation systems,
- Improved regional security,
- Improved transportation agency operations, and
- Reduced operations and maintenance costs.

These goals and objectives were used to establish a starting point for gathering specific user needs from identified stakeholders, refining those user needs, and mapping them to services and service packages associated with the national and local ITS architecture. Details on user needs identified can be found in the Escambia/Santa Rosa Regional Advanced Traffic Management

System Feasibility Study and Implementation Plan User Needs Technical Memorandum referenced in section 2.

Additional information on mapping user needs to associated user services and service packages can be found in the Escambia/Santa Rosa Regional Advanced Traffic Management System Feasibility Study and Implementation Plan ATMS Framework Technical Memorandum referenced in section 2.

This document is a summary of research, analysis, and other considerations given to the City of Pensacola project, titled "Escambia/Santa Rosa Regional Advanced Traffic Management System Feasibility Study and Implementation Plan," in order to provide a basis for future designs, estimates, plans, specifications, funding, procurement, construction, staffing, operations, and maintenance phases of the project.

3 REFERENCED DOCUMENTS

Materials previously generated as part of this project and referenced herein include:

- Escambia/Santa Rosa Regional Advanced Traffic Management System Feasibility Study and Implementation Plan, User Needs Technical Memorandum, v.1.0, October 26, 2015.
- Escambia/Santa Rosa Regional Advanced Traffic Management System Feasibility Study and Implementation Plan, ATMS Framework Technical Memorandum, v.1.0, August 18, 2015.
- Escambia/Santa Rosa Regional Advanced Traffic Management System Feasibility Study and Implementation Plan, Technology Review Technical Memorandum, v.1.0, September 4, 2015.
- Escambia/Santa Rosa Regional Advanced Traffic Management System Feasibility Study and Implementation Plan, Technical Data Collection Report, v.2.0, January 27, 2016.
- Escambia/Santa Rosa Regional Advanced Traffic Management System Feasibility Study and Implementation Plan, Traffic Management Center Design Concept Technical Memorandum, v.1.0, May 23, 2016.

Reports, guidelines, and other materials used for guidance and reference in the course of this project, include:

- Regional Intelligent Transportation Systems (ITS) Plan, Florida-Alabama TPO, Okaloosa-Walton TPO and Bay County TPO, Final Report, Adopted September 2010
- 2035 Florida-Alabama Long Range Transportation Plan Final Report, Adopted November 2010
- Pensacola Urban Area ITS Master Plan, FDOT District 3 Traffic Operations, 2003
- FHWA Systems Engineering Management Plan Template (California Division)
- FHWA 23 Code of Federal Regulations Rule 940 – ITS Architecture and Standards

- USDOT Moving Ahead for Progress in the 21st Century Act (also known as Public Law 112-141)
- National Electrical Manufacturers Association Standards Publication TS-2-2003 (R2008), dated November 1, 2012
- California Department of Transportation, Transportation Electrical Equipment Specifications, dated March 12, 2009.
- Advanced Transportation Controller (ATC) Joint Committee – ATC 5201 v06.10
- National ITS Architecture (FHWA) 2010
- National Transportation Communications for ITS Protocol 9001 V004
- Transmission Control Protocol/Internet Protocol, Internet Protocol Suite
- FDOT Statewide ITS Architecture
- FDOT District Three Regional ITS Architecture
- FDOT Standard Specifications for Road and Bridge Construction
- FDOT Design Standards for Construction and Maintenance Operations on the State Highway System

4 CURRENT SITUATION

There are three municipalities and two county agencies operating and maintaining signal systems within the Escambia/Santa Rosa Counties area. In total, there are 362 operational traffic signals within the two-county region not including pedestrian signals or flashing beacons such as school zone flashers. Intersection traffic controllers and signals are located within the following jurisdictions:

- Escambia County
- Santa Rosa County
- City of Pensacola
- City of Milton
- City of Gulf Breeze

These agencies currently operate independent local traffic control systems within their jurisdictions. In addition, the City of Pensacola and Escambia County operate small TSOCs for limited monitoring and control or roadside traffic signal controllers. Future construction and implementation of a full regional ATMS deployment or smaller projects affecting regional corridors must ensure that TSOCs are kept fully functional during the course of improvements and upgraded accordingly until such point that a fully functional RTMC is built.

4.1 Description

The region has seen significant growth and development since the original design and deployment of the traffic control systems that are operational in the area. The region’s roadways include rural and metropolitan sections of Interstate-10, Interstate-110, multiple state highways, and dozens of arterial roadways.

The majority of traffic controllers, communications systems, and central control software used by local jurisdictions within the region have been in place for decades. Many of the signal controllers and their associated communications devices are obsolete and no longer manufactured. Stocking sufficient spares and maintaining these devices is becoming increasingly difficult. In addition, reliance on these legacy systems limits the ability of agencies to deal with growing traffic demands and improve the performance of their roadway networks. Agencies are simply not able to take advantage of the technological improvements made to signal controllers, communications equipment, and other fundamental traffic control devices in the last 15 to 20 years.

4.2 Current Regional ITS Plans and Programs

The Regional ITS Plan for the Florida-Alabama TPO, Okaloosa-Walton TPO, and Bay County TPO was developed in 2010. The plan identified and evaluated existing ITS networks in the region at that time, evaluated future ITS improvement needs for each TPO, and studied staffing needs for operations and maintenance of future ITS improvements. It concluded that every county in the region could benefit from ITS installation or expansion. Further, it recommended that major corridors throughout the region be improved with ITS first, followed by others in a prioritized approach to relieve traffic congestion. Since its writing, several projects have implemented ITS and other improvements for interstate operations and local intersection control throughout the region. This implementation plan further documents the needs and specific requirements of the Florida-Alabama TPO and identifies specific actions that will move forward remaining implementations identified and recommended in the 2010 ITS Regional Plan Final Report, in addition to those from the Pensacola Urban Area ITS Master Plan (2003), particularly those in Escambia and Santa Rosa Counties.

Figure 4-1 is an excerpt from that report that identified ITS priorities for the region, including recommendations for developing and expanding systems in the specific jurisdictions covered by this plan.

1	Expansion or additions on major corridors
2	Connecting fiber optic cable to create ring throughout region
3	Expansion or additions in Bay County
4	Expansion or additions in Escambia County
5	Expansion or additions in City of Pensacola
6	Expansion or additions in Okaloosa County
7	Installation in City of Milton
8	Installation in City of Defuniak Springs
9	Installation in City of Gulf Breeze
10	Installation in Santa Rosa County
11	Installation in Walton County

Figure 4-1: Priority List from Regional ITS Plan

The Regional ITS Plan also specifically identified numerous signalized intersections and roadway corridors at that time within Escambia County, the City of Pensacola, Santa Rosa County, the City of Milton, and the City of Gulf Breeze as well as the benefits gained from future ITS expansion. It noted that the City of Pensacola and Escambia County both require a transportation management center (TMC) to monitor and operate existing and future ITS components. It also put forth the vision of installing closed-circuit television (CCTV) cameras and additional buried fiber cable for coordination of signals and control by local TSOCs and, ultimately, a new RTMC. Past plans have also stressed that co-location of operations and multiple agencies would serve as a cost-effective approach to making maximum use of a future RTMC. In addition, co-location also allows for efficient communications, coordination, and cooperation between not only existing agencies, but other stakeholder partners as well. Collocation is a common component in operational and design philosophies applied throughout Florida and the country for effective and efficient TSM&O.

4.3 Stakeholders

The principle stakeholders identified and engaged during the course of this project to date include members of the Florida-Alabama TPO Technical ITS Working Group, whose membership includes the following local and regional government organizations that are also specifically named in the scope of the Escambia/Santa Rosa Regional Advanced Traffic Management System Feasibility Study and Implementation Plan project:

- FDOT
- Escambia County
- Santa Rosa County
- City of Gulf Breeze
- City of Milton
- City of Pensacola

Outreach conducted during this project also solicited input and participation from additional local and regional government organizations, including:

- West Florida Regional Planning Council
- Escambia Public Safety Office
- Escambia County Emergency Management
- Escambia County Fire Rescue
- Pensacola Fire Department
- Naval Air Station Pensacola
- Port of Pensacola
- Florida Highway Patrol

4.4 Critical Corridors

The project team identified and analyzed communication zones and regional corridors for potential future improvements. This effort included analyzing existing communication zones used by current closed-loop signal systems, developing preliminary designs and estimates for upgrading the existing interconnect to fiber, and prioritizing corridors in the region.

Agencies responsible for local signal systems and traffic operations within the region were asked to prioritize critical corridors (or segments within) as part of this project. Corridors were also ranked using criteria that included their functional classification (e.g., Other Principal Arterial, Minor Arterial, Major Collector, Minor Collector, Local), AADT, and use within designated evacuation routes. This information will help determine the order of future project build-out and staged implementation as needed. For example, a principal arterial with consistently high AADT ranks higher in priority than a minor arterial with a lower AADT. Corridor prioritization in this report used the latest geographical information system shapefiles and geodatabases published online by the FDOT Transportation Statistics Office as of May 2, 2016.

Figure 4-2 is a regional map illustrating multiple corridors that matched basic selection and ranking criteria elements as described above.

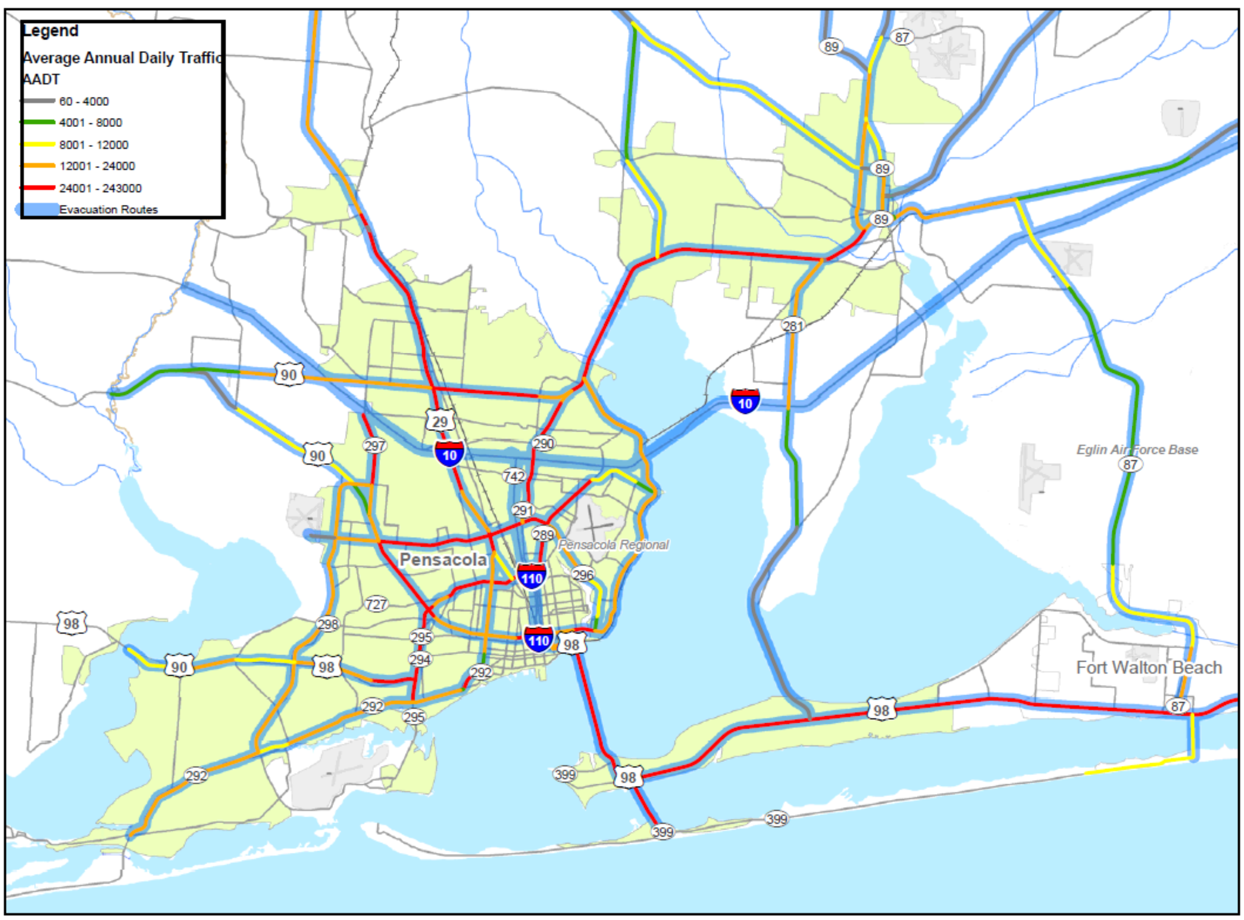

Figure 4-2: Regional Map showing Evacuation Routes and AADT

The beginning and ending points of prioritized corridors are signalized locations and were chosen so that the overall corridor includes all segments that exhibit relatively high AADT along the route. ATMS improvements applied along these routes should allow operators to effectively move and manage traffic under normal conditions as well during emergencies. If a full-region build-out is not possible, deployment of full ATMS functionality along one or more of these corridors can also serve as a representative example of what is possible and help generate support for future expansion and build-out of the regional system.

Table 4-1 provides the assigned priority of the corridors based on stakeholder input and the data analysis described above.

Table 4-1: Corridor Prioritization

Rank	Corridor	From	To	Length (Mi)	AADT
1	Gregory Street/Pensacola Bay Bridge(US 98)/Gulf Breeze Pkwy(US 98)(SR30)/Navarre Pkwy (US 98)	Palafox Street (US 29)	Orion Parker Boulevard	28.0	37656
	Pensacola Beach Boulevard(SR 399) /Bob Sikes Bridge	Gulf Breeze Parkway (US 98)	Fort Pickens Road/Via Deluna Drive	2.2	25500
	Stewart Street (SR 87)	Navarre Parkway (US 98)	East Bay Boulevard(CR 399)/Turkey Bluff Road	2.1	9882
2	Davis Highway (SR 291)	Brent Lane (SR 296)	9 Mile Road (US 90) /SR 10A	4.5	32184
	9 Mile Road/Davis Highway (Alt US 90)	Davis Highway (SR 291)	Scenic Highway (US 90)	0.4	22447
3	North Palafox Street/Pensacola Boulevard (US 29) (SR 95)	East Fairfield Drive (SR 295)	Morris Avenue/ (CR 95A)	13.2	29733
4	US 90	Alt US 90 (SR 10A)	SR 87	17.1	27140
	SR 87	Caroline Street (US 90)	Nichols Lake Road/Hickory Hammock Road	3.3	11609
5	Palafox Street/US 29 (SR 95)	Main Street	Texar Drive (SR 752)	2.7	9381
6	Navy Boulevard/New Warrington Boulevard/Fairfield Drive (SR 295)	Sunset Avenue	Texar Drive (SR 752)	6.3	25914
	9th Avenue (SR 289)/Creighton Road (SR 742)	Bayou Boulevard (SR 296)	Scenic Highway (US 90)	4.4	25000

Rank	Corridor	From	To	Length (Mi)	AADT
	Jackson Street (CR 298A)	New Warrington Boulevard (SR 295)	Old Corry Field Road (CR 295A)	0.2	8478
7	Cervantes Street/Mobile Highway (US 90) (SR 10A)	Perry Avenue	Blue Angel Parkway (SR 173)	10.3	23357
	New Warrington Road (SR 295)	Lillian Highway (SR 298)	Cervantes Street (US 90)	0.4	--
8	Pine Forest Road (SR 297)	Mobile Highway (US 90)	Interstate 10	3.3	26190
	Longleaf Drive	Pine Forest Road (SR 297)	Community Drive	0.5	18453
9	9 Mile Road (US 90 Alt)	Beulah Road (CR 99)	Scenic Highway (US 90)	11.3	22447
10	Saufley Field Drive (SR 296)/Michigan Avenue/ Beverly Parkway/Brent Lane	Blue Angel Parkway (SR 173)	N Palafox Road (US 29)	5.0	22285
11	Lillian Highway (US 98)	Bauer Road (CR 293)	Navy Boulevard (SR 295)	7.5	18928
	Bauer Road (CR 293)	West Escambia County Sports Complex	Lillian Highway (US 98)	1.0	7700
12	Sorrento Road/Gulf Beach Highway/ Barrancas Avenue/Pace Blvd (SR 292)	Gulf Beach Highway (CR 292A)	Herman Street	16.1	17161
	Blue Angel Parkway (SR 173)	Gulf Beach Highway (CR 292A)	Dog Track Road (CR 297)	3.2	10900
13	Cervantes Street/Scenic Highway (US 90)	Summit Boulevard	Olive Road (SR 290)	5.2	15654
	Langley Avenue	Spanish Trail Road	Scenic Highway (US 90)	0.5	12085
	Summit Boulevard	Spanish Trail Road	Scenic Highway (US 90)	0.8	5300
14	Dogwood Drive (SR 89)	Caroline Street (US 90)	Stewart Street (SR 87)	3.6	15446
15	Stewart Street (SR 87)	Caroline Street (US 90)	Dogwood Drive (SR 89)	3.4	11609
	Munson Highway (SR191)	Stewart Street (SR 87)	Alabama St (CR 87A)	0.2	4400
16	Chumuckla Highway (CR 197)	(US 90)	Woodbine Road (CR 197A)	3.4	10900
	Norris Rd (CR 197B)	Chumuckla Highway (CR 197 Spur)	Spencer Field Rd	0.7	--
17	Avalon Boulevard (SR 281)	(US 90)	Interstate 10	5.0	8894
18	9th Avenue (SR 289)	Creighton Road (SR 742)	Olive Road (SR 290)	1.2	25000
	Creighton Road (SR 742)	Tippin Avenue	9th Avenue (SR 289)	0.4	13937

Rank	Corridor	From	To	Length (Mi)	AADT
19	Airport Boulevard (SR 750)	Hancock Lane	9th Avenue (SR 289)	1.6	22384
20	University Parkway	Davis Highway (SR 291)	Campus Drive	2.3	21454
	Campus Drive	University Parkway	Campus Drive	0.7	--
21	Navy Boulevard/Garden Street	Navy Boulevard/New Warrington Drive (SR 295)	Wright Street	4.5	20052
	Old Corry Field Road (CR 295A)	Navy Boulevard	Chiefs Way	0.1	--
22	9th Avenue (SR 289)	Cervantes Street (US 90)	Fairfield Drive (SR 295)	2.2	17677
	Blount Street	Dr Martin Luther King Jr Blvd (SR 291)	9th Avenue (SR 289)	0.3	--
	Jordan Street	Dr Martin Luther King Jr Blvd (SR 291)	9th Avenue (SR 289)	0.3	--
	Texar Dr (SR 752)	Dr Martin Luther King Jr Blvd (SR 291)	12th Avenue	0.5	--
23	W Street (CR 453)	Jackson Street (CR 298A)	Fairfield Drive (SR 295)	1.8	17588
24	W Street (CR 453)	Massachusetts Avenue	Marcus Pointe Boulevard	1.9	17588
	Marcus Pointe Boulevard	Enterprise Drive	W Street (CR 453)	0.5	
25	Fairfield Drive (SR 727)	Jackson Street (CR 298A)	New Warrington Road (SR 295)	4.0	17575
26	Olive Road (SR 290)	Cody Lane	Davis Highway (SR 291)	1.0	15900
27	Main Street	Barrancas Avenue (SR 292)	Palafox Street	1.4	14757
	Barrancas Avenue	Pace Boulevard (SR 292)	Government Street	0.5	18300
	Spring Street	Main Street	Government Street	0.1	4400
	Government Street	Spring Street	Baylen Street	0.1	--
28	Chemstrand Road (CR 749)	Ten Mile Road	Kingsfield Road (CR 186)	1.5	13800
	Ten Mile Road	Pensacola Boulevard (US 29)	Chemstrand Road (CR 749)	1.2	--
29	Palafox Street (CR 95A)	Pensacola Boulevard (US 29)	9 Mile Road (US 90 Alt)	4.8	12283
30	Chase Street	Baylen Street	Bayfront Parkway (SR 196)	1.1	--
31	Berryhill Road (CR 184A)	Chumuckla Highway (CR 197)	Dogwood Drive (SR 89)	7.9	11000
32	Lillian Highway (SR 298)	Blue Angel Parkway (SR 173)	N 57th Avenue	2.3	9041
	Blue Angel Parkway (SR 173)	Lillian Highway (SR 298)	Muldoon Road	1.0	--

Rank	Corridor	From	To	Length (Mi)	AADT
	N 57th Avenue	Jackson Street (CR 298A)	Lillian Highway (SR 298)	0.6	--
	Jackson Street (CR 298A)	N 65th Avenue	N 57th Avenue	0.5	8478
33	E Street (CR 443)	Cervantes Street (Business US 98)	Texar Drive (SR 752)	1.7	7709
34	Creighton Street (SR 742)	Hilburn Road	Davis Highway (SR 291)	0.7	--
35	N 12th Avenue/Tippin Avenue	Bayou Boulevard (SR 296)	College Boulevard	0.9	6300

Figure 4-3 is a regional map illustrating corridors by their ranking identified in table 4-1.

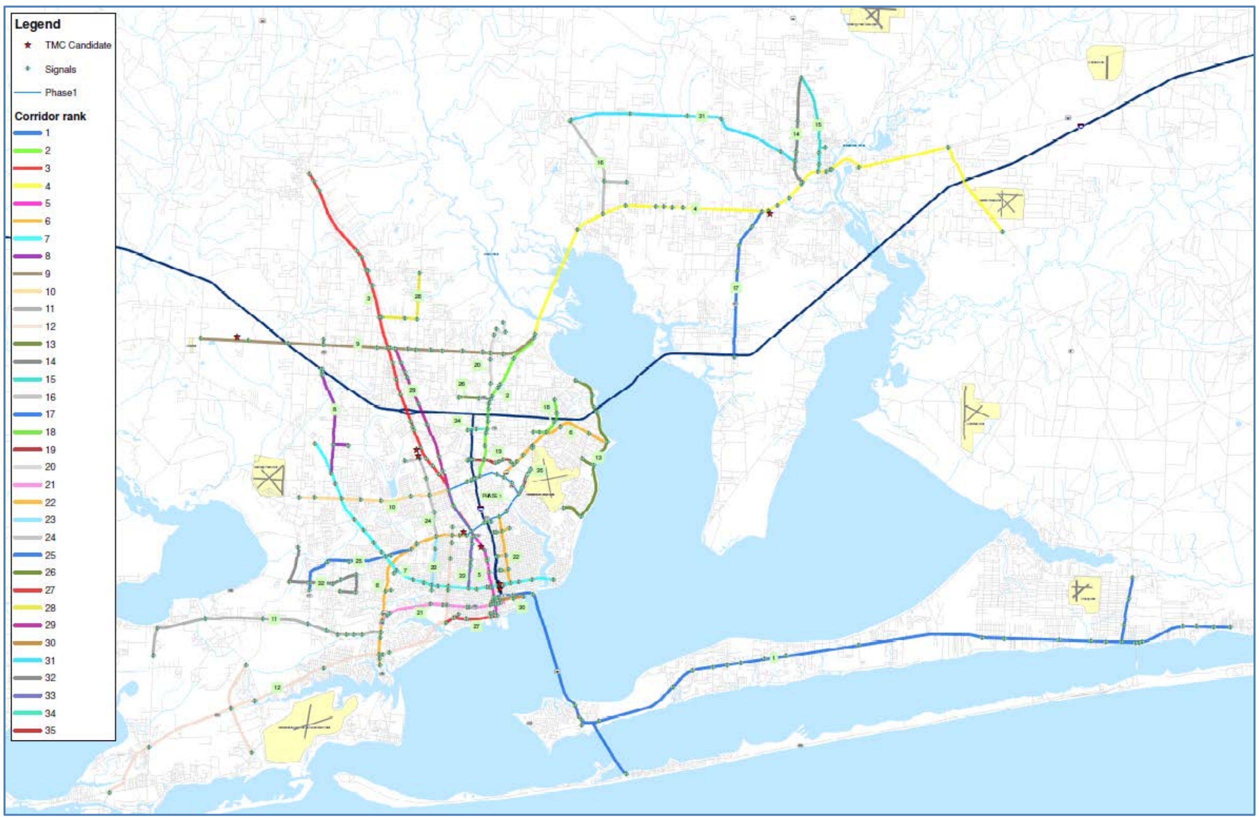

Figure 4-3: Regional Map Showing Routes by Rank

5 ISSUES AND OBJECTIVES

Transportation managers and public officials in the region face a multitude of competing pressures and demands. Population is growing and the demand placed on the regional transportation infrastructure continues to increase. General congestion, reductions in travel time reliability, crashes, and other causes of travel delays result from increased demand.

Officials in the area have recognized the need to make the best use of existing transportation facilities by implementing measures that actively manage and integrate systems to improve traffic operations, safety, and efficiency. Capacity projects alone will not alleviate these issues, so agencies throughout Florida and the nation use TSM&O strategies that rely upon roadside technology and agency coordination to maximize the day-to-day performance of the transportation system. It has been repeatedly demonstrated that the cost-benefit of applying ITS and related traffic control technologies far exceeds that of traditional concrete and asphalt improvements.

The issue in the Florida-Alabama TPO region is that transportation demand has increased significantly in the last 20 years, yet the technology infrastructure used for traffic operations, traffic control, and management of area roads has not been significantly upgraded during that period. In particular, the traffic management systems in Escambia and Santa Rosa Counties continue to rely heavily upon the traffic control technology that was state-of-the-art in the 1980s.

Not only does the local region exhibit common challenges stemming from typical metropolitan development and traffic, it is also impacted by seasonal traffic associated with tourism to area beaches and multiple recurring special events, such as large airshows, food festivals, fishing tournaments, and Mardi Gras celebrations. Coastal areas and ports receive and generate significant traffic and the local system must be prepared to effectively manage traffic during hurricane evacuations, storms, and other events. The local system also includes a number of bridges that will benefit from the management and operations capabilities provided through a fully functional regional ATMS. Ultimately, the regional ATMS will also support additional integration of arterial operations with operation of local interstate facilities through center-to-center (C2C) communications and a cooperative operations and staffing strategy whereby RTMC operators can monitor and respond to conditions and events on interstate facilities as well as local roads.

While these systems and the staff who operate them have served the region well, and extended their operational use of these tools through creative means, the existing infrastructure is obsolete and limited. To fully realize the near-term and long-range transportation plans and visions for the region, new tools are required.

The benefits of ITS, advanced transportation controllers, Ethernet-based wide area networks (WAN), and other aspects of today’s state-of-the-art transportation systems are well known and documented. This plan puts forth how those tools should be applied to improve current conditions, meet the objectives of the region’s transportation professionals, and generate data that will help optimize the system and measure performance.

5.1 Safety

Multiple user needs and ATMS framework components identified as required features during this project serve to improve safety. Enroute driver information services advising approaching drivers of traffic conditions, incidents, inclement weather, and other hazards promote safety. The ability to remotely monitor and manage incidents and work zones using cameras in conjunction with communications systems can improve safety for responders, work crews, and the public. Vehicle detection systems, advanced transportation controllers, and connected vehicle equipment can be incorporated into projects. As a result, this plan can also provide a foundation for collision avoidance systems.

Emergency vehicle management user services are oriented to public safety and fast on-scene arrival by responders. The combination of coordinated dispatch systems, pre-emption systems, and interconnected advanced transportation controllers, along with a surveillance network of CCTV cameras can be used to effectively clear routes for fire-rescue services and evacuations when necessary. Currently, route guidance for regional fire-rescue dispatch is limited and routes may be delayed, or blocked by trains or other obstacles. The system proposed in this plan will include tools that can help reduce and eliminate such conflicts. The ATMS will also allow improved emergency management operations and coordination by providing comprehensive traffic monitoring, real-time data collection, and enhanced control of signal timing adjustments. For instance, agencies can develop predetermined scenarios that allow quick adjustment of signal timings along a corridor during an unplanned emergency or event.

Incident management services incorporated in the system not only serve to reduce delay, but also improve safety by reducing the time required for incident detection, verification, response, and clearance. In addition, the ATMS will provide roadway monitoring and command/control capabilities that are essential for managing evacuations as well as responding to incidents involving crashes. Incident management services and programs regularly serve to not only improve safety, but also contribute to other project goals such as mobility, efficiency, energy savings, and customer satisfaction.

5.2 Efficiency

ATMS improve efficiency in the context of vehicle throughput, travel time savings, and emissions reductions. In addition, modern traffic controllers are able to support the use of automated traffic signal performance measures (SPM). SPMs show real-time and historical functionality at signalized intersections. This, in turn, allows decision-making about signal performance and timing based on actual data rather than modelling. It also helps signal maintenance personnel identify vehicle and pedestrian detector malfunctions, yielding efficiency in maintenance programs through preventive actions and timely repair or replacement of malfunctioning devices. There is statewide and national interest in using SPMs. FDOT is currently researching and conducting pilot deployments of this technology, as are other states. The promise that these systems have shown to date to yield significant economic or qualitative benefits to users is evident by the support given to SPM projects and efforts by the American Association of State Highway and Transportation Officials Innovation Initiative.

This plan also recommends incorporation and use of probe-based vehicle detection systems to gather travel time and origin-destination data throughout the project life span. Probe data detectors use automatic vehicle identification (AVI) technologies to establish a unique (but anonymous) identifier for each vehicle they detect. This identifier is then transmitted to a central site where it can be matched to past or future detections of the same vehicle at different detector locations. Probe data detection systems using Bluetooth® technology can be rapidly deployed using solar power and cellular communications where existing power and interconnect is not available. Travel time information from these devices can be used to quantify the current performance of the regional roadway network as well as the improvements and benefits realized from future ATMS-related deployments, including future applications involving connected vehicle technologies that leverage equipment used in modern ATMS. For example, the proposed ATMS will likely be able to support future connected vehicle applications that provide speed recommendations to help eliminate unnecessary stops in order to improve fuel efficiency and reduce emissions.

5.3 Enhanced Mobility

Multiple user needs and ATMS framework components identified as required features during this project also serve to enhance mobility. Upgrading to current technology will provide the region with additional capabilities that can be used for transit systems, including queue jumping, signal priority, and fleet management, if desired.

5.4 Productivity and Economic Competitiveness

The success of Florida's tourism industry and other areas of commerce are directly related to the quality and effectiveness of its transportation system. Ample research and studies by the USDOT have demonstrated that ITS deployments have a positive impact with respect to time and fuel savings realized by reducing congestion and shortening incident durations. The driver information systems, advanced transportation controllers, vehicle detection systems, CCTV cameras, network devices, and other components expected to be part of the future regional ATMS will support regional productivity and economic competitiveness by improving operations, moving traffic, and reducing congestion as much as possible.

5.5 Quality of Life (Energy, Environment)

Multiple reports have studied and attempted to quantify the direct, indirect, and environmental costs of congestions. Direct costs are associated with the value of fuel and time wasted, and contribute to increased indirect costs related to transporting goods and providing services because these activities become more expensive and time-consuming resulting of wasted fuel and time. In addition, our physical environment is negatively impacted by carbon emissions generated by high concentrations of vehicles idling in congestion, evidenced by smog and other symptoms in major metropolitan areas. All of these factors relate to quality of life. A 2014 study by the Centre for Economics and Business Research, Ltd., an independent economics and business research consulting firm, investigated economic and environmental costs associated with road congestion in the United States, United Kingdom, France, and Germany. The research found that in 2013, $78 billion resulted from time and fuel wasted in traffic (direct costs) and $45 billion was the sum of indirect costs businesses passed onto American consumers. The studies general findings were that all three forms of costs (direct, indirect, and environmental) are substantial. Modern ATMS technologies provide tools to help transportation system operators reduce these impacts by maximizing the performance of roadway networks.

6 SUMMARY OF PREVIOUS WORK, FINDINGS, AND RECOMMENDATIONS

Significant work has been performed during the course of this project to identify and engage stakeholders, gather user needs, study the feasibility of a regional ATMS, and generally align this project implementation plan with the ITS architecture and vision for the region.

6.1 Interagency Coordination

Through the use of stakeholder workshops, meetings, and other facilitated discussions, Escambia County, Santa Rosa County, the City of Pensacola, the City of Milton, and the City of Gulf Breeze have coordinated to develop system user requirements that were incorporated into the ATMS Requirements Model discussed in section 6.2.1. Various agreements exist to foster coordination and cooperation between regional stakeholders, such as signal maintenance agreements between local operators and FDOT and agreements by TPO members adopting strategic plans that have identified the need for regional transportation management systems.

This project included working with stakeholders to develop resolutions expressing support for the construction and operation of a unified advanced traffic management system and a RTMC for Escambia County, Santa Rosa County, the City of Pensacola, the City of Milton, and the City of Gulf Breeze. Stakeholder agencies have adopted these resolutions and committed their support, recognizing the benefits of ATMS and ITS, and resolving to establish interagency cooperation and coordination for the joint development, operation, and maintenance of the ATMS and RTMC through a Regional Transportation Management Team. This team will serve to move this plan forward, help develop and execute additional inter-local agreements that may be necessary in the future, and help formally establish future roles and responsibilities of organizations that are part of the operation and maintenance of the future regional ATMS.

6.2 Feasibility Study

Task 2 of the Scope of Services called for the development of an Advanced Traffic Management System Feasibility Study, which consists of multiple deliverables as described in the following subsections. This section briefly summarizes each deliverable.

6.2.1 ATMS Requirements Model

The development of an ATMS requirements model was a multi-part process involving stakeholder workshops and other opportunities for stakeholder engagement. Based on information obtained during stakeholder workshops, a User Needs Technical Memorandum has been developed to capture user needs and requirements from identified stakeholders. An extensive inventory of legacy systems and infrastructure for Escambia County, Santa Rosa County, the City of Pensacola, the City of Milton, and the City of Gulf Breeze has been collected and presented as a Technical Data Collection Report. This report provided a description of each agency's traffic signal system including an inventory of controllers, preemption systems, signalized intersections, vehicle detectors, and communications network. Staffing and traffic signal maintenance practices have also been discussed.

6.2.2 ATMS Framework

The user needs identified in the ATMS Requirements Model User Needs Technical Memorandum are used as inputs to the ATMS Framework document. Using established ITS architecture processes, each user need was mapped to National ITS Architecture user services that were further mapped to appropriate service packages. The complete mapping of services packages can be found in Appendix C of the ATMS Framework document.

6.2.3 Technology Review

The Technology Review identified market-ready technologies to support the ITS service packages selected for the Escambia/Santa Rosa Regional ATMS Study and Implementation Plan project framework. This document presented technologies that are prime candidates for near-term deployment.

Based on outputs from the ATMS framework document described above, the following technology categories were identified as candidates for implementation:

- Communications and networking
- Traffic signals
- Emergency vehicle preemption
- Transit signal priority (bus priority)
- DMS
- CCTV video monitoring
- Incident detection
- Data collection and monitoring system
- Traffic operations center
- Regional center-to-center communications
- A public information portal

The Technology Review Technical Memorandum described each technology category in detail, along with relevant industry standards and market-ready examples for potential use.

6.2.4 Alternatives Analysis

Starting from user needs and existing conditions, three alternative system concepts were developed and presented as part of the Alternatives Analysis Technical Memorandum. The alternatives analysis included research into the advantages and disadvantages of various communications methods. In summary, it included analysis of the following communication design strategies:

1. Establishing a regional wide area network for the ATMS using wireless technology exclusively.
2. Establishing a regional wide area network for the ATMS using primarily fiber optic technology, with use of wireless where appropriate, such as connecting isolated signals or remote corridors in the interest of cost savings.

The analysis concluded that using a WAN using primarily fiber optic interconnect is the best option for the proposed ATMS at this time. Currently, cellular modems and routers are used in transportation systems, but typically only when hardline connections are unavailable, reliability and capacity is not critical, or rapid temporary deployment of equipment is desired. Agency-owned WANs using enterprise and industrial Ethernet networking equipment and fiber optic interconnect remain the gold standard for reliability and capacity. Fiber optic networks are generally far superior to wireless systems, not only in reliability and capacity, but also for their immunity to solar flares, weather, and other environmental conditions that negatively affect wireless.

This plan also recognizes the significant advances made in recent years to improve the capacity and reliability of cellular services and other wireless technologies, which is expected to continue. Future designs should not discount the possibility of incorporating additional wireless technology as appropriate.

7 PROJECT IMPLEMENTATION

This plan recommends that the ATMS be realized following one of the two scenarios generally described below.

7.1 Scenario 1

Scenario 1 is a fallback plan that allows gradual system build-out under the assumption that only a conservative, static year-to-year funding level is available for limited improvements. Investments of less than $25M will only allow incremental system improvements and not fund a comprehensive regional ATMS construction project. However, the list of prioritized corridors in this plan, along with budget estimates, can guide the Regional Transportation Management

Team's prioritization of corridor-based projects in the event that the preferred full two-county region network deployment is not possible. Scenario 1 uses relatively small improvement projects and prioritizes corridors based on benefit to the traveling public. Each project phase would include full ATMS functionality and RTMC construction can be scheduled at a point where corridor-based expansion and the number of intersections managed clearly warrants additional space for expanded staff requirements.

Future design and construction under this scenario should be done in accordance with the ranked list of priority corridors, as captured in table 7-1, provided by signal system operators and maintaining agencies who are members of the TPO stakeholder group. If future adjustments are necessary in rankings or desired sequence of construction, the Regional Transportation Management Team should make those determinations.

Table 7-1: Order of Corridor-based Design and Construction

Rank	Corridor	From	To	Length (Mi)	AADT	Estimated Cost (Millions)	Estimated Construction Schedule (Months)	Notes
TIER 1 PRIORITY						**6.20**	**20-24**	
1	Gregory Street/ Pensacola Bay Bridge (US 98)/ Gulf Breeze Pkwy (US 98)/ Navarre Pkwy (US 98)	Palafox St (US 29)	Orion Parker Dr	28.0	37656	6.20	---	Connects at existing I-110 fiber
	Pensacola Beach Blvd (SR 399)/ Bob Sikes Bridge	Gulf Breeze Pkwy (US 98)	Fort Pickens Rd/Via Deluna Drive	2.2	25500	---	---	
	Stewart St (SR 87)	Navarre Pkwy (US 98)	East Bay Blvd/ CR 399/ Turkey Bluff Rd	2.1	9882	---	---	
TIER 2 PRIORITY						**7.00**	**24-30**	
2	Davis Hwy (SR 291)	Brent Lane (SR 296)	9 Mile Rd/ (US 90)/ SR 10A	4.5	32184	1.75	---	Connects at existing fiber on Brent lane
	9 Mile Rd/Davis Highway (Alt US 90)	Davis Hwy (SR 291)	Scenic Highway (US 90)	0.4	22447	---	---	
3	North Palafox Street/Pensacola Blvd (US 29) (SR95)	East Fairfield Drive (SR 295)	Morris Ave/ (CR 95A)	13.2	29733	2.29	---	Connects at existing fiber on Brent lane
4	US 90	Alt US 90 (SR 10A)	SR 87	17.1	27140	2.95	---	Connects at existing I-110 fiber
	SR 87	Caroline St (US 90)	Nichols Lake Rd	3.3	11609	---	---	
TIER 3 PRIORITY						**7.50**	**16-20**	
5	Palafox St/ US 29 (SR 95)	Main St (CR 196)	Texar Dr (SR 752)	2.7	9381	1.15	---	Connects at existing fiber on Fairfield
6		Sunset Ave		6.3	25914	3.38	---	

Rank	Corridor	From	To	Length (Mi)	AADT	Estimated Cost (Millions)	Estimated Construction Schedule (Months)	Notes
	Navy Blvd/New Warrington Blvd/Fairfield Dr (SR 295)		Texar Dr (SR 752)					Connects at existing fiber on Fairfield
	9th Ave (SR 289)/ Creighton Road (SR 742)	Bayou Blvd (SR 296)	Scenic Hwy (US 90)	4.4	25000	---	---	
	Jackson Street (CR 298A)	New Warrington Blvd (SR 295)	Old Corry Field Rd (CR 295A)	0.2	8478	---	---	
7	Cervantes Street/ Mobile Highway (US 90) (SR 10A)	Perry Avenue	Blue Angel Parkway (SR 173)	10.3	23357	3.00	---	Connects at existing fiber on I-110
	New Warrington Road (SR 295)	Lillian Highway (SR 298)	Cervantes Street (US 90)	0.4	--	--	--	
TIER 4 PRIORITY						**7.50**	**30-36**	
8	Pine Forest Road (SR 297)	Mobile Highway (US 90)	Interstate 10	3.3	26190	0.70	---	Connects at Project 7 and I-10
	Longleaf Drive	Pine Forest Road (SR 297)	Community Drive	0.5	18453	---	---	
9	9 Mile Road (US 90 Alt)	Beulah Road (CR 99)	Scenic Highway (US 90)	11.3	22447	1.96	---	Connects at Project 2, 5 and I-10 fiber
10	Saufley Field Drive (SR 296)/ Michigan Avenue/ Beverly Pkwy/ Brent Lane	Blue Angel Parkway (SR 173)	N Palafox Road (US 29)	5	22285	1.50	---	Connects at Project 7 and Brent lane fiber
11	Lillian Hwy (US 98)	Bauer Road (CR 293)	Navy Boulevard (SR 295)	7.5	18928	1.21	---	Connects at Project 6
	Bauer Rd (CR 293)	West Escambia County Sports Complex	Lillian Highway (US 98)	1	7700	---	---	
12	Sorrento Road/ Gulf Beach Highway/ Barrancas Avenue/ Pace Blvd (SR 292)	Gulf Beach Highway (CR 292A)	Herman Street	16.1	17161	2.09	---	Connects at Project 6 and 7
	Blue Angel Parkway (SR 173)	Gulf Beach Highway (CR 292A)	Dog Track Rd (CR 297)	3.2	10900	---	---	
TIER 5 PRIORITY						**6.75**	**22-28**	
13	Cervantes Street/ Scenic Highway (US 90)	Summit Boulevard	Olive Road (SR 290)	5.2	15654	0.81	---	Connects at Project 6
	Langley Ave	Spanish Trail Road	Scenic Highway (US 90)	0.5	12085	---	---	
	Summit Boulevard	Spanish Trail Rd	Scenic Highway (US 90)	0.8	5300	---	---	

Rank	Corridor	From	To	Length (Mi)	AADT	Estimated Cost (Millions)	Estimated Construction Schedule (Months)	Notes
14	Dogwood Drive (SR 89)	Caroline Street (US 90)	Stewart Street (SR 87)	3.6	15446	0.66	---	Connects at Project 4
15	Stewart Street (SR 87)	Caroline Street (US 90)	Dogwood Drive (SR 89)	3.4	11609	0.26	---	Connects at Project 4
	Munson Highway (SR191)	Stewart Street (SR 87)	Alabama St (CR 87A)	0.2	4400	--	--	
16	Chumuckla Highway (CR 197 Spur)	(US 90)	Woodbine Road (CR 197A)	3.4	10900	0.37	---	Connects at Project 4
	Norris Rd (CR 197B)	Chumuckla Highway (CR 197 Spur)	Spencer Field Rd	0.7	--	--	--	
17	Avalon Boulevard (SR 281)	(US 90)	Interstate 10	5	8894	0.84	---	Connects at Project 4
18	9th Avenue (SR 289)	Creighton Road (SR 742)	Olive Road (SR 289)	1.2	25000	0.44	---	Connects at Project 6
	Creighton Road (SR 742)	Tippin Avenue	9th Avenue (SR 289)	0.4	13937	---	---	
19	Airport Boulevard (SR 750)	Hancock Lane	9th avenue (SR 289)	1.6	22384	0.66	---	Connects at Project 2 and 6
20	University Parkway	Davis Highway (SR 291)	Campus Drive	2.3	21454	0.54	---	Connects at Project 2 and 9
	Campus Dr	University Parkway	Campus Drive	0.7	--	---	---	
21	Navy Boulevard/ Garden Street	Navy Boulevard/ New Warrington Drive (SR 295)	Wright Street	4.5	20052	1.29	---	Connects at Project 5, 6 and 12
	Old Corry Field Rd (CR 295A)	Navy Boulevard	Chiefs Way	0.1	--	---	---	
22	9th Aveneu (SR 289)	Cervantes Street (US 90)	Fairfield Drive (SR 295)	2.2	17677	0.88	---	Connects at Fairfield, Projects 1 and 7
	Blount Street	Dr Martin Luther King Jr Blvd (SR 291)	9th Avenue (SR 289)	0.3	--	---	---	
	Jordan Street	Dr Martin Luther King Jr Blvd (SR 291)	9th Avenue (SR 289)	0.3	--	---	---	
	Texar Drive (SR 752)	Dr Martin Luther King Jr Blvd (SR 291)	12th Avenue	0.5	--	---	---	
TIER 6 PRIORITY						**6.20**	**22-28**	
23	W Street (CR 453)	Jackson St (CR 298A)	Fairfield Dr (SR 295)	1.8	17588	0.43	---	Connects at Project 6 and 7
24	W Street (CR 453)	Massachusetts Avenue	Marcus Pointe Boulevard	1.9	17588	0.43	---	Connects at Project 6 and 10
	Marcus Pointe Boulevard	Enterprise Drive	W Street (CR 453)	0.5	---	---	---	

Rank	Corridor	From	To	Length (Mi)	AADT	Estimated Cost (Millions)	Estimated Construction Schedule (Months)	Notes
25	Fairfield Drive (SR 727)	Jackson Street (CR 298A)	New Warrington Road (SR 295)	4	17575	0.65	---	Connects at Project 6 and 7
26	Olive Road (SR 290)	Cody Lane	Davis Highway (SR 291)	1	15900	0.24	---	Connects at Project 2
27	Main Street	Barrancas Avenue (SR 292)	Palafox Street	1.4	14757	0.62	---	Connects at Project 5 and 12
	Barrancas Avenue	Pace Boulevard (SR 292)	Government Street	0.5	18300	---	---	
	Spring Street	Main Street	Government Street	0.1	4400	---	---	
	Government Street	Spring Street	Baylen Street	0.1	--	---	---	
28	Chemstrand Road (CR 749)	Ten Mile Road	Kingsfield Road (CR 186)	1.5	13800	0.33	---	Connects at Project 3
	Ten Mile Road	Pensacola Boulevard (US 29)	Chemstrand Road (CR 749)	1.2	--	---	---	
29	Palafox Street (CR 95A)	Pensacola Boulevard (US 29)	9 Mile Road (US 90 Alt)	4.8	12283	0.87	---	Connects at Project 3 and 28
30	Chase Street	Baylen Street	Bayfront Parkway (SR 196)	1.1	--	0.48	---	Connects at Project 5 and 21
31	Berryhill Road (CR 184A)	Chumuckla Highway (CR 197)	Dogwood Drive (SR 89)	7.9	11000	0.38	---	Connects at Project 14 and 16
32	Lillian Highway (SR 298)	Blue Angel Parkway (SR 173)	N 57th Avenue	2.3	9041	0.63	---	Connects at Project 25
	Blue Angel Parkway (SR 173)	Lillian Highway (SR 298)	Muldoon Road	1	--	---	---	
	N 57th Avenue	Jackson Street (CR 298A)	Lillian Highway (SR 298)	0.6	--	---	---	
	Jackson St (CR 298A)	N 65th Ave	N 57th Ave	0.5	8478	---	---	
33	E Street (CR 443)	Cervantes Street (Business US 98)	Texar Drive (SR 752)	1.7	7709	0.53	---	Connects at Project 5 and 7
34	Creighton Street (SR 742)	Hillburn Road	Davis Highway (SR 291)	0.7	--	0.22	---	Connects at Project 2
35	N 12th Avenue/ Tippin Avenue	Bayou Boulevard (SR 296)	College Boulevard	0.9	6300	0.35	---	Connects at Fairfield
	Pine Forest Road	Interstate 10	CR 297A	1.2	25748	---	---	
Total: All Corridors						**$41.15 Mil**		

7.2 Scenario 2

Scenario 2 is the preferred scenario and is based on a three-phased approach that expands upon the relatively recent upgrade of 18 existing controller cabinets; installation of cameras and fiber optic cable along portions of SR-296 (Brent Ln./Bayou Blvd.), US-29 (SR-95/N Palafox Rd.), and SR-295 (Fairfield Dr.). The upgrade included the installation of central management software within the City of Pensacola and Escambia County TSOCs and was undertaken as Phase I of a future regional ATMS deployment. This plan recommends that Phase II establish a regionwide communications network and include key upgrades to intersections throughout the region, namely new controller cabinets and cameras. Phase III will follow as a complete build-out of the system by constructing an RTMC for collocated operations and adding additional ITS devices along system corridors.

7.3 Staging by Corridor and Region

Based upon the levels of funding available, it may also be necessary to further subdivide the deployment of the ATMS in terms of either coverage area or level of functionality.

7.4 Components for Initial and Subsequent Phases

The Alternatives Analysis Technical Memorandum presented alternative considerations for future system designs, particularly communications architectures, relative to user needs. Each alternative provides technology necessary to communicate with, monitor, and manage an ATMS network remotely. Each concept also included deployment of a variety of traffic control equipment, including ITS devices such as cameras and Bluetooth readers.

This plan provides information that can be used to scale the implementation of the regional ATMS up or down in a number of different ways. Consideration has been given to multiple alternatives that will allow subsequent design, construction, and general build-out of the ATMS to remain flexible and accommodate future unforeseen circumstance. It is likely that stakeholders may need to adjust the scope and speed of construction based upon limiting factors, particularly funding and budget. Generally, implementation strategies fall into one of the following categories:

- Full-region, full-function
- Full-region, partial-function
- Partial-region, full-function
- Partial-region, partial-function

A full-region, full-function deployment approach would be an accelerated effort to realize regionwide implementation by designing and constructing the entire system as a single project, including all aspects of the communications network and upgrades to all connected intersections, and include the full gamut of ITS tools envisioned for the ultimate ATMS. These tools include not only the Bluetooth readers, communications network, controller upgrades, and CCTV system associated with core functions, but also new pre-emption systems, DMS, RWIS, and a public information portal that comprise a complete, fully-optioned ATMS deployment. It is not likely that funding will permit this approach as cost is estimated at approximately $41M.

A full-region, partial-function deployment approach would seek to establish core functionality via a regionwide build-out of the communications infrastructure along with limited inclusion of modern signal controllers, and a CCTV system. This option would establish the regionwide communications infrastructure required for future build-out and integration of field devices. This plan recommends this approach and is optimistic that the estimated cost of approximately $25M will be funded via prioritization of the ATMS project at the top of regional transportation improvement budget requests.

If neither full-region deployment option is possible, the remaining options are partial-region deployments with either full- or partial- functionality as previously described. These approaches would allow improvements to be made in limited areas, such as along critical corridors or zones, if budgetary constraints or other factors prevent full-region deployment. In such cases, the partial-region, full-function approach is preferred since it would have a greater likelihood of realizing the benefits associated with ATMS. A corridor or zone having full ATMS functionality will not only improve traffic conditions in the immediate vicinity, but can also serve as a representative example of what is possible and help generate support for future expansion and build-out of the regional system from local leaders and the public.

As part of the preferred implementation plan, Bluetooth “sniffers” can be rapidly deployed to start collecting travel time along critical corridors. The data they collect will add value to current operations and, in addition, will capture baseline data that can help quantify future operational improvements resulting from system upgrades throughout the region. Bluetooth-based probe data detection systems are often packaged as small, self-contained devices using solar power and cellular communications. This contributes to their ease of deployment and widespread use for temporary traffic data collection. Bluetooth probe detectors are designed to buffer and store data locally in order to reduce the risk that data will be lost during intervals when cellular service is degraded, lost, or no other communication is available. In most cases, cellular data collection systems are designed to reconnect and report their data once cellular service is restored. In these types of applications, momentary cellular network outages are an acceptable trade-off for ease of deployment. Temporary use of cellular communications can be considered while more permanent infrastructure is constructed. Hardline communication is preferred when these devices are relied upon to generate travel times and other measures in near real-time for traffic operations.

The key component of constructing the ultimate regional ATMS desired by stakeholders is to establish a WAN that allows interconnection of system components, existing TSOCs, a future RTMC, and other partner agency networks and systems using Ethernet technologies. Private, secure fiber optic networks using industrial Ethernet devices are the core enabling technology of modern traffic control systems. Future project plans must incorporate network designs with connection speeds that are current and cost-effective. At present, a WAN capable of providing gigabit connections for each connected field device represents current, cost-effective technology. Establishing the communications network must be the first priority when designing and constructing the regional ATMS. Detailed designs arising from this implementation plan should also leverage existing FDOT fiber infrastructure along I-10 and I-110 and, as a project stakeholder, FDOT supports and encourages this design concept.

Upgrading existing intersections with modern signal controllers and CCTV cameras is equal in priority with building out the communications infrastructure. Detailed design and construction of projects, including controller upgrades, controller cabinet upgrades, and CCTV system installation, should be done as soon as possible and in conjunction with the build-out of the communications network.

An initial build-out that constructs the WAN and integrates a modern signal control system and CCTV system with a RTMC as previously described will immediately raise the capabilities of operators in the area and provide a foundation able to accommodate future needs and growth. It will also establish a network platform capable of supporting future technology, such as connected vehicle (CV) systems that utilize vehicle to infrastructure (V2I) communications.

Safety, incident management, and incident response have repeatedly been identified as primary goals for the regional ATMS. Therefore, consideration should also be given to incorporating pre-emption systems in the future build-out of the system. At present, connected vehicle systems that utilize dedicated short-range communications (DSRC) have a tremendous potential to serve as a foundation for future priority and preemption systems. The deployment of DSRC equipment for initial use to support priority and preemption would establish a field system that can serve as a platform for future connected vehicle applications, such as providing signal phase and timing information to in-vehicle systems, intersection collision avoidance, transit applications, and more.

It is imperative that existing TSOCs are upgraded as improvements are made to regional systems. Continued operation of existing signal systems is critical whether the future ATMS is realized through a large-scale, single project deployment or constructed in stages along priority corridors. Existing TSOCs will remain in operation for the foreseeable future. They are necessary for the continued operation of existing systems during construction and should ultimately serve as secondary remote operations centers and backups to the future RTMC.

8 PROCUREMENT AND FUNDING CONSIDERATIONS

The project team sought and researched multiple funding opportunities during the development of this plan. It also considered multiple procurement and construction management methodologies.

8.1 Funding Requirements

Preliminary cost estimates for full system deployment have been developed using estimated quantities for a variety of materials and equipment and historical FDOT cost information published by the FDOT Estimates Office. Table 8-1 provides a summary of estimated costs for each corridor that will ultimately be served by the regional ATMS.

The upgrade of the TSOCs has been included in the budget for Corridor Group 1. This upgrade should be included in the Phase II ATMS project in order to support the operations of the system as the system expands.

A regional map showing preliminary approximate device locations along various corridors for consideration in future designs has been included in Appendix A.

Table 8-1: Cost Estimates for Full ATMS per Corridor

Component	Estimated Cost
RTMC	$5.12 M
Corridor Group 1	$6,202,535
Corridor Group 2	$1,749,525
Corridor Group 3	$2,288,490
Corridor Group 4	$2,947,708
Corridor Group 5	$1,147,991
Corridor Group 6	$3,383,312
Corridor Group 7	$3,001,197
Corridor Group 8	$702,245
Corridor Group 9	$1,959,980
Corridor Group 10	$1,496,149
Corridor Group 11	$1,209,507
Corridor Group 12	$2,089,072
Corridor Group 13	$811,522
Corridor Group 14	$665,887
Corridor Group 15	$255,414
Corridor Group 16	$366,784
Corridor Group 17	$884,410
Corridor Group 18	$440,113
Corridor Group 19	$658,778
Corridor Group 20	$538,988
Corridor Group 21	$1,285,047
Corridor Group 22	$882,485
Corridor Group 23	$426,885
Corridor Group 24	$432,316
Corridor Group 25	$652,212
Corridor Group 26	$239,189

Component	Estimated Cost
Corridor Group 27	$617,207
Corridor Group 28	$329,462
Corridor Group 29	$873,305
Corridor Group 30	$484,843
Corridor Group 31	$381,097
Corridor Group 32	$628,963
Corridor Group 33	$530,440
Corridor Group 34	$216,393
Corridor Group 35	$351,188
Total	$41,130,639

8.2 Funding Sources

Funding is expected via traditional funding sources using local, state, and federal funds identified and allocated via Florida-Alabama TPO project prioritization as it relates to the Transportation Improvement Plan. Over the course of helping develop this plan, TPO stakeholders have put forward a budget request that ranks the "Phase II" ATMS project identified in this plan as a top priority. This request will subsequently be considered for inclusion in the FDOT Work Program, a five-year plan of transportation projects that identifies and funds needs-based projects consistent with FDOT program objectives and priorities.

ATMS projects are frequently funded using additional funding opportunities as well, such as federal grants encouraging specific transportation improvements. The Grants.gov program management office provides a centralized location for grant seekers to find and apply for federal funding opportunities. The Grants.gov website and system houses information on thousands of grant programs.

One of the most promising current opportunities is a funding opportunity titled Advanced Transportation and Congestion Management Deployment Initiative (USDOT funding opportunity number: DTFH6116RA00012). The opportunity notice states that "Eligible applicants are State or local governments, transit agencies, metropolitan planning organizations (MPO) representing a population of over 200,000, or other political subdivisions of a State or local government (such as publicly owned toll or port authorities), or a multijurisdictional group or consortia of research institutions or academic institutions." The following is an excerpt from the grant description:

"The DOT hereby requests applications to result in awards to eligible entities to develop model deployment sites for large scale installation and operation of advanced transportation technologies to improve safety, efficiency, system performance, and infrastructure return on investment. These model deployments are expected to provide benefits in the form of: reduced traffic-related fatalities and injuries; reduced traffic congestion and improved travel time reliability; reduced transportation-related emissions; optimized multimodal system performance; improved access to transportation alternatives, including for underserved populations; public access to real time integrated traffic, transit, and multimodal transportation information to make informed travel decisions; cost savings to transportation agencies, businesses, and the traveling public; or other benefits to transportation users and the general public."

For each fiscal year from 2016 through 2020, a maximum of $60 million, less up to $2 million for USDOT administrative expenses, will be available to make five to ten awards not exceeding $12 million each depending on the number of awards and the amount reserved for USDOT administrative expenses.

The vision, goals, and focus areas of this project are aligned with those of this grant opportunity.

USDOT also offers funding for FY 2016 National Infrastructure Investments (USDOT funding number: DTOS59-16-RA-TIGER8), which is another possible funding source. Per the grant description, "the FY 2016 Appropriations Act appropriated $500 million to be awarded." The passage below, found on the Transportation Investment Generating Economic Recovery (TIGER) Discretionary Grant site details their spending objectives:

"Like the first seven rounds, FY 2016 TIGER discretionary grants will fund capital investments in surface transportation infrastructure and will be awarded on a competitive basis for projects that will have a significant impact on the nation, a metropolitan area, or a region. The 2016 TIGER grant program will focus on capital projects that generate economic development and improve access to reliable, safe and affordable transportation for communities, both urban and rural. The Consolidated Appropriations Act, 2016, does not provide dedicated funding for the planning, preparation, or design of capital projects; however, these activities may be funded as part of an overall construction project."

Another FHWA funding possibility is the Accelerated Innovation Deployment (AID) Demonstration (funding number FHWA-2013-0048). The description on the grant page states, "The AID Demonstration provides incentive funding for eligible entities to accelerate the implementation and adoption of innovation in highway transportation." Announcements on the Center for Accelerating Innovation web site include:

"More than $6.4 million in grants from the Accelerated Innovation Deployment (AID) Demonstration program will fund innovative projects in Arizona, Delaware, Florida, Michigan, Minnesota and Rhode Island, as well as the Pueblo of Acoma tribal government in New Mexico. The grants will be used to improve safety, mobility and project delivery and will encourage similar innovations nationwide."

8.3 Procurement Alternatives and Recommendation

Various procurement methods can be used for future design and construction projects necessary to establish the integrated ATMS needed to serve the region and realize the visions set forth by this plan and its predecessors. Consideration of procurement methods was a key agenda item during a stakeholder meeting on March 23, 2016. Multiple methods of procurement and construction management were discussed and considered along with strategies to construct the regional ATMS (potentially in stages) using prioritized, prudent, cost-effective, and beneficial subcomponent projects.

The stakeholders identified several goals with respect to project design and construction delivery methods, including quality, schedule, public impact, futureproofing, and others. They considered these goals in the context of various delivery methods available for design and construction of transportation projects, such as various design-build methods, design-bid-build, system manager, public-private partnerships, and design-build-operate-maintain. Stakeholders were asked to rate each method on a scale of 1-5, with 1 representing "most likely to achieve goal" and 5 "least likely to achieve goal." Table 8-2 captures the results of the exercise.

Table 8-2: Scoring of Project Procurement and Delivery Methods

	Futureproofing / Interoperability	Cost Control	Administration of Contract	Quality Control	Schedule	Public Impact	Constructability	Technical Concept Review	Operations & Maintenance	Total
Design Build Adjusted Score	4	3	2	4	1	4	2	3	5	28
Design Build with Minimum Technical Requirements	2	4	2	3	1	4	2	3	3	24
Design Build with Invitation to Negotiate	1	3	4	3	3	3	2	2	2	23
Traditional Design Bid Build	1	4	4	2	5	3	2	1	1	23
System Manager	1	2	1	2	2	3	2	2	2	17
Public Private Partnership	2	3	5	3	3	3	2	3	3	27
Design Build Operate & Maintain	1	2	1	2	1	4	2	3	1	17

The final selection of a procurement method is also dependent on the amount of funding available for design and construction of the regional ATMS. Each procurement and delivery method will have advantages and disadvantages depending upon project size and scope.

8.4 General System Hardware and Equipment Recommendations

System hardware and equipment incorporated into designs for regional ATMS implementation must comply with the requirements of FDOT's Standard Specifications for Road and Bridge Construction. Technical special provisions or minimum technical requirements developed for roadside equipment not covered by statewide specifications must ensure that the equipment is suitable for use in roadside traffic control applications and the traffic cabinet environment (e.g., environmentally hardened).

8.4.1 Application of Standards

ATMS designs and plans must conform to applicable standards including, but not limited to, the state and national design, interface, and device standards identified in this section.

8.4.1.1 Design and Device Standards

- FDOT Standard Specifications for Road and Bridge Construction (Current Version)
- FDOT Design Standards for Construction and Maintenance Operations on the State Highway System (Current Version)
- Manual on Uniform Traffic Control Devices (Current Edition)

8.4.1.2 Interface Standards and Regulations

- Institute of Electrical and Electronics Engineers Standards for Ethernet
- Open Network Video Interface Forum specifications for interoperability of Internet Protocol-based physical security products
- National Transportation Communications for ITS Protocol standards for center-to-field and center-to-center connections
- SAE J2735 DSRC Message Set Dictionary
- FCC CFR Title 47

8.5 Recommended Systems and Devices

The project needs that have been mapped to service and equipment packages within the ITS architecture provide a framework that helps guide the development of future project plans and specifications. The service packages and related equipment packages documented and described in the ATMS framework for this project give a reasonably clear indication that user needs require a regional system that incorporates most of the systems and devices commonly found in regional transportation systems throughout Florida and the nation.

This plan recommends that the future ATMS for the region include a complete suite of tools and devices to facilitate TSM&O throughout the region incorporating a shared RTMC. This section identifies the systems and devices recommended for incorporation into future project designs.

8.5.1 Field Devices

Ultimately, the ATMS is expected to include various types of field devices; some field devices collect data and allow real-time surveillance, while other devices control traffic flow and communicate traffic situations to drivers.

Vehicle Detection Systems: Each of the following types of detection will enhance the ATMS.

- Probe data detection, utilizing Bluetooth or other approved AVI, should be installed along arterial corridors to gather travel time as well as origin/destination information for real-time operations and future planning purposes. These systems will also help identify the best routes for responders to follow for fire/rescue activities and incident response. Benefits of AVI include the ability to gather detailed travel time, origin-destination information, and determine preferred travel routes.

- In an effort to reduce emissions, shorten travel times, and increase traffic flow, advanced (upstream) detection with speed and classification information should be included along primary corridor and feeder routes. Stop bar detection, advanced detection, and downstream detection, along with implementing ATC controllers will allow adaptive signal control technology and collection of SPMs that will help optimize traffic flow.

Traffic Controller Assembly: Success of the future ATMS depends on deployment of interconnected ATCs. FDOT user agreements offer additional reimbursement for each connected city/county maintained intersection.

- ATCs at each intersection will provide a platform that is poised for the future, whether that be implementation of adaptive signal control, collection and use of signal performance metrics, or other state-of-the-art TSM&O strategies.

Managed Field Ethernet Switches: MFES are hardened Ethernet switches with routing and network management capabilities that provide connectivity between field devices and TMCs.

- Data transfer and device connectivity requires that MFES be installed at each cabinet integrated in the ATMS. MFES with all gigabit ports, including a minimum of two small form-factor pluggable ports and ten copper (RJ45) ports, are recommended for each field cabinet.

Video Equipment: The need for visual observation of traffic and traffic control devices in real-time requires CCTV camera installation along corridors.

- This plan recommends the installation of high-definition Internet Protocol cameras with pan/tilt/zoom control at all actuated, signalized intersections. This will allow operators the ability to view all intersection approaches as well as a large portion of the roadways in between in order to monitor traffic, verify the proper operation of equipment (signals, DMS, etc.), monitor incident response, and other events.

DMS: Arterial DMSs are necessary to convey critical information to motorists.

- DMSs are recommended on major arterials and corridors, particularly along evacuation routes. Designs must select a sign type, size, and structure appropriate for the location. Designs should also include the development of proposed message libraries in order to determine and select the appropriate sign type and size. Full-color, full-matrix light-emitting diode signs have become comparable in cost to monochrome models and should be considered as a first choice since they offer a degree of flexibility and futureproofing beyond that of a monochrome sign.

- Embedded dynamic elements can be considered for situations where limited text, such as travel time or toll rate information, is necessary and can be incorporated into a static sign panel.

Electronic Display Signs: Electronic display signs are recommended for the following applications:

- When conditions exist on the facility where the motorist needs to be warned (such as curve warning or wrong-way alerts), an electronic warning sign is appropriate. Curve warning and wrong-way warning devices should also send notification to the RTMC when triggered.
- Blank-out signs can be incorporated at intersections where certain movements are restricted based on time of day or other factors.
- When vehicle speed poses a threat or traffic calming is necessary, electronic speed feedback signs (ESFS) can be incorporated. These signs utilize radar to detect and display approaching vehicle.

Road Weather Information Systems: Statewide requirements for RWIS are currently governed by the FDOT developmental specification (Dev677) published online at http://www.dot.state.fl.us/programmanagement/OtherFDOTLinks/Developmental/Default.shtm.

Use of FDOT developmental specifications requires approval by the FDOT Central Office staff responsible for monitoring and authorizing their use and performance in the field. RWIS are recommended for the following applications:

- When road surface conditions are subject to frequent flooding and it is necessary to divert traffic to an alternate route, a water level environmental sensor station is appropriate.
- Critical infrastructure, including bridges along evacuation routes or routes frequently used for emergency response should have wind sensors installed. When a wind speed threshold is reached, the environmental sensor station can send warnings to the RTMC operator to monitor or close the bridge.

Signal Priority and Preemption Systems: The benefits of priority and preemption systems on arterial corridors includes reduced response times and improved travel times for emergency responders and public transportation. The construction of the ATMS infrastructure proposed in this plan will enable the addition of priority and preemption systems in the future.

- Because vehicular travel paths are intertwined with rail, it is imperative to maintain certain corridor movement flowing. Full-scale implementation of preemption is the best approach to reduce emergency response time. At a minimum, adding preemption for fire/rescue along the corridors that do not contain rail crossings is necessary. Configured properly, preemption can clear a path to an incident with minimal interference to side road traffic while ensuring the safety of both the responders and victims.

- As part of a complete ATMS, major corridors that meet a predefined threshold of public transportation should include priority signalization. Public transportation with enhanced travel time will reduce traffic volume, thereby reducing emissions and road usage.

Adaptive Signal Control: The proposed ATMS will allow future adaptive signal control operations that automatically assesses traffic conditions and adjusts signal timings within preset bounds for maximum throughput.

- Based on user needs, the ATMS must be able to improve system performance by implementing timing plans that reduce congestion to the maximum extent possible. Adaptive signal control will assess the volume of main and side streets along the corridor and modify signal timings to meet demand as effectively as possible.

8.5.2 TMC Equipment

Servers and networking equipment: The TMC design must accommodate the servers and networking equipment necessary to operate the interstate and intersection management software anticipated to be part of the ATMS, such as signal system software, FDOT's statewide SunGuide® software, and network management tools. Designs must provide secure space for servers, networking equipment, and cable paths associated with these systems.

Operator workstation: The TMC design must incorporate operator workstations. Each agency will have dedicated floor space including workstations, as needed, with access to the portions of the ATMS network their agency administers. Each operator station will have the ability to display various feeds (e.g. camera display, detector status, responder vehicle location, etc.) at their workstation.

- Open floor design – Depending on floor layout and security clearance level requirements, an agency area can be separated into pods on an open floor layout.

- Secure areas for law enforcement – Separate workspace with secure entrances may need to be incorporated for enforcement agencies.

Signal system software: The ATMS design must include a highly scalable suite of traffic management products that provide for monitoring and control of ATCs, geographical information system integration, and interfacing with web-enabled devices using Ethernet communications.

SunGuide software: SunGuide software is a critical component that will connect the ATMS RTMC with other TMCs across the state.

- Provisions to incorporate SunGuide software at the RTMC as well as any satellite locations that will access and manipulate components such as detectors, cameras, and DMS must be incorporated in the final ATMS design.

SPM: SPM integration shows real-time as well as historical performance at signalized intersections.

- Future ATMS plans should incorporate SPM as a means to provide an historical signal performance. This data can be used to further optimize mobility and enhance signal timing.

Video wall: The TMC design must include large-format video displays comprised of ultra-low bezel display modules. The design should standardize on a single type and size display module so that modules throughout the facility are interchangeable and to minimize the need to maintain a variety of different spares.

- One large wall comprised of ultra-low bezel inch display modules in a 3 by 6 layout (ability to upsize/downsize as needed in design) is recommended. The video display control system must allow portions of the wall to be shared and divided amongst various agency users within the TMC control room.

- A minimum of four satellite video walls in a 2 by 2 matrix comprised of ultra-low bezel light-emitting diode display modules should be installed along the perimeter of the TMC work area. These monitors provide each agency within the TMC the ability to display and share information associated with their functional area.

Video wall controller: A video wall controller allows operators to display workstation content and video feeds.

- The TMC design must incorporate a video wall controller integrated to the central operating software. The video wall controller may also allow collaboration with other agencies for emergency response.

8.5.3 Communication Infrastructure

FDOT specifications and standards are aligned with the best practice of using fiber optic-based network equipment to establish Ethernet WANs. Published FDOT specifications define minimum requirements for network devices and allow project designers to incorporate wireless technology where appropriate using project-specific technical special provisions as needed.

Fiber optic cable: This plan recommends that the future ATMS design include a network constructed primarily using fiber optic network equipment that allows a high volume of data transmission over long distances and redundancy.

- The need for interconnectivity along the corridors for ATMS management requires that single mode fiber optic cable be installed along each corridor connecting existing TSOCs, the future RTMC, and allowing connection of future satellite locations to the field devices as needed.

MFES: MFES with all gigabit ports, including a minimum of two small form-factor pluggable ports and eight copper (RJ45) ports, are recommended at each field site at a minimum. MFES will connect to field devices at that location and route data back to the TMC. The network design must also include distribution and core equipment to effectively aggregate and manage network traffic. Detailed network designs must be developed and incorporated into future project plans as a prerequisite to construction.

8.6 RTMC Requirements

The need for a RTMC that will support collocation of multiple agencies and coordinated operations has been identified multiple times in future regional plans, including the Regional ITS Plan and 2035 Florida-Alabama Long Range Transportation Plan produced and adopted in 2010. This implementation plan moves forward the vision of those documents by providing additional recommendations on location and facility requirements based on current conditions.

A key component of implementing the regional ATMS is to design and construct a RTMC that supports central command and control of future systems and has connection to ITS devices and other systems currently deployed and planned in the region.

If possible, the RTMC should be included in the initial construction phases of this project along with a build-out that constructs the WAN and integrates the modern signal control and CCTV systems as described earlier in this document. However, future designs must also allow for control of regional systems via upgraded TSOCs if funding or other limitations postpone or prevent construction of the RTMC.

8.6.1 Location

The project team has worked with local stakeholders to identify multiple potential RTMC site locations in the region. The RTMC will house centralized operations of signal systems for Escambia County and Santa Rosa County. Therefore, it should be located in reasonably close proximity to the principle area of service, near one of the major roadways served by the system.

Final selection of the site is dependent on a number of factors, including:

- Finalized user needs

- Required building layout and footprint
- Ability of facility to withstand storms, high wind speeds, and wind-born debris
- Number of collocated agencies and personnel
- Security requirements

Stakeholders identified the following potential TMC sites based on availability, ownership, and location. Future design activities will require additional research into potential sites to ensure that their location and size can accommodate needs identified to date:

- Escambia County Emergency Operations Center property, 221 Palafox Place, Pensacola, FL
- Escambia County Operations Center property, 3363 West Park Place, Pensacola, FL
- City of Pensacola Public Works property, 2757 N Palafox St, Pensacola, FL
- Undeveloped Property near W. Nine Mile Road @ Navy Federal, Pensacola, FL
- Adjacent to I-110 and Pensacola Police Department, East Jackson Street, Pensacola, FL
- Santa Rosa County Public Works property, 6075 Old Bagdad Hwy., Milton, FL

8.6.2 Operating Space

User needs were analyzed to arrive at proposed facility operating space requirements for this implementation plan. The TMC Design Concept Technical Memorandum developed during the ATMS Feasibility Study includes descriptions of required space, information on the projected number of employees, and estimated square footage requirements for areas identified as needs during a stakeholder workshop. Figure 8-1 shows the preliminary site plan generated from these estimates. The site plan is based on staffing levels and space requirements received from agencies that currently plan to occupy the facility. The layout of the facility will need to be developed and finalized in future designs. The preliminary site plan serves only as a means to estimate approximate square footage required if the TMC is constructed as a single-level structure. Future architectural designs must address these preliminary space requirements and be expanded if additional organizations desire collocation prior to final design.

Figure 8-1: Preliminary RTMC Site Plan

The preliminary site plan includes space identified for the following functional areas:

- Public (waiting area, reception, media room, etc.)
- Local Agency Traffic Operations
- FDOT Traffic Operations
- Road Ranger, Local Law Enforcement, and Florida Highway Patrol coordination
- Support Functions (mechanical rooms, server/network rooms, switchgear space, supply rooms, etc.)

8.7 Operations and Maintenance

Local and regional organizations currently involved in the operation and maintenance of their respective systems will continue to perform these activities for devices within their jurisdictions once the ATMS is completed. Repairs, upgrades, preventive maintenance, and other activities will be coordinated by a staffing structure to be developed and established by the Regional Transportation Management Team. The Concept of Operations document produced as part of this project contains additional information on current staffing levels and recommended future staff roles and responsibilities.

8.7.1 Partnership Agreements

Escambia County, Santa Rosa County, the City of Pensacola, the City of Milton, and the City of Gulf Breeze have adopted resolutions committing their support for the construction and operation of a unified ATMS and RTMC. These resolutions express support for FDOT to administer the design and construction of an ATMS and RTMC for Escambia County, Santa Rosa County, the City of Pensacola, the City of Milton, and the City of Gulf Breeze. The resolutions also express that these stakeholders recognize the benefits of ATMS and ITS and resolve to establish interagency cooperation and coordination for the joint development, operation, and maintenance of the ATMS and RTMC through a Regional Transportation

Management Team. The plan is that this team will work together to assign and recruit staff as required to operate the future ATMS as the system is realized in the future. Fundamental operation will begin using existing staff located at existing TSOCs agreed to by the Regional Transportation Management Team. The team will then work to gradually expand existing staff, including traffic engineers, signal technicians, operators, and support staff as the system is constructed and expanded in the future.

In addition to the resolutions previously described, FDOT currently provides funding to local transportation agencies via the FDOT Traffic Signal Maintenance and Compensation Agreements that are currently executed with local operators. The funds provided for signal maintenance agreements may be applied to a variety of equipment associated with the signal system, such as communication devices and other ITS equipment. Funds provided under the agreement can be used for minor upgrades of signal cabinet communication devices in order to maintain or restore system communications. Until the ATMS described in this plan is constructed, there are relatively low-cost stop-gap measures that can be employed on a case-by-case basis to establish connectivity to cabinets in the region where none currently exist. For instance, both Escambia County and the City of Pensacola are investigating the feasibility of using temporary cellular routers and cloud-based ATMS for near-term cabinet connectivity solutions as well as cabinet electronics that may allow connection to locations on the perimeter of the Phase 1 project using existing twisted pair cables.

8.7.2 Coverage Areas

The coverage area for the proposed regional ATMS is major corridors within the metropolitan boundary of the Florida-Alabama TPO. This area includes Escambia County, Santa Rosa County, the City of Pensacola, the City of Milton, and the City of Gulf Breeze.

8.7.3 Hours of Operation

While the ATMS will be capable of operating and managing the region’s traffic signal system on a 24x7 basis, initial core hours of operation are expected to be Monday through Friday from 8:00 a.m. to 5:00 p.m. Hours and shifts for RTMC operators can fall outside of these core hours so that there is coverage during morning and evening traffic peaks and special events.

As the scope and responsibility of the ATMS and RTMC increases, additional staff can be added into overlapping shifts that provides coverage from 6:00 a.m. to 7:00 p.m. and beyond. In all cases, on-call staffing will be required to respond to emergencies and special events outside normal business hours, such as major airshows held at area beaches and military installations, Mardi Gras, and other significant tourist events.

8.7.4 Staffing Requirements

The number of staff required, along with their job classifications, is dependent upon the number of intersections incorporated in the ATMS. The level of staff support required to operate and maintain the system will increase with the incorporation of additional intersections. Participating agencies already employ staff responsible for operation and maintenance of existing signal systems. These staff are expected to continue their current duties. The proposed ATMS will provide them with additional capabilities that will allow them to do their work even more effectively. For instance, regional intersection surveillance will immediately reduce the need for site visits to help confirm and troubleshoot reported problems. As the system expands, stakeholders have discussed how in-kind services can be used to support regional operation and offset costs associated with either future equipment purchases or staff recruitment. This plan recommends that staffing levels and qualifications follow guidelines established by the FHWA based upon research conducted on their behalf. Table 8-3 provides an example based upon the March 2008 Traffic Signal Timing Manual and March 2009 Traffic Signal Operations and Maintenance Staffing Guidelines published by the FHWA based on a phased deployment scenario.

Table 8-3: Staffing Recommendations

1-50 intersections	51-150 intersections	151-300 intersections	301-500 intersections
1 operator	2 operators	3 operators	4 operators
1 electronics specialist	1 electronics specialist	2 electronics specialists	2-3 electronics specialists
1 traffic engineer	1 traffic engineer	1-2 traffic engineers	2-3 traffic engineers
1 locator	1 locator	2 locators	2 locators
	1 shift supervisor	1 shift supervisor	2 shift supervisors
	1 traffic signal analyst	1 traffic signal analyst	1 traffic signal analyst
	IT support	1 IT support	1 IT support

8.7.4.1 Staff Training

In order to equip current and future staff with the skills to operate and maintain the system, comprehensive staff training opportunities are required. Staff training on the following system components is recommended at a minimum:

- Operation and maintenance of traffic signal systems, including vendor-based training on signal controllers and associated control software
- Vendor-based training on all other ITS equipment and software not associated with the traffic signal system
- Basic and advanced troubleshooting of ITS and signal systems
- Asset management systems, including fiber management systems
- Fiber optic training, including training on cable types, splicing, connectors, and jumpers
- Network operations and management, including programming and troubleshooting of network communications hardware

- ITS standards and technology

Additional refresher training sessions are recommended after agencies have had time to utilize the system and as new staff enter the program. Agencies should also review their inventory of maintenance equipment and tools. Training on the safe operation and proper use of a variety of specialized equipment and tools is necessary to maintain an ATMS. A routine maintenance program, including periodic refresher classes for staff, will also help effectively operate and maintain the system. The results of surveys published in the March 2009 Traffic Signal Operations and Maintenance Staffing Guidelines published by the FHWA indicates that training is necessary, but often not included as a specific line item in agency operating budgets.

If workforce training and professional development is not covered by other cost centers within a specific agency or organization, then this plan recommends that future budgets associated with the operation of the proposed RTMC include allocations for the training mentioned in this section. The 2016 Training Industry Report published by *Training*, now in its 35th year, is recognized as the training industry's most trusted source of data on budgets, staffing, and programs. The study found that, on average, employees were provided 43.8 hours of training per year. This equates to approximately 2% of total working hours per year. Organizations surveyed set aside anywhere from 1-5% of their budget on learning tools, services, and technologies. If RTMC staff training is not budgeted elsewhere, then this plan recommends that a budget for training and professional development be included in the operating budget of the RTMC. The baseline budget amount may be established as a percentage of the total operating budget as described above, with a recommended minimum annual budget no less than 2% of the total operating budget.

8.8 Project Scheduling and Staging

Contracts and documents for future design and construction should be scheduled according to the priorities set forth in this implementation plan. In addition, these activities must ensure that operation and maintenance of current regional signal systems are not interrupted. This plan recommends upgrades to the existing TSOCs used by Escambia County and the City of Pensacola to maintain operational capabilities during the build-out of the ATMS and so that the TSOCs can act as interim operations centers as the system is deployed and equipment is installed, connected, and brought online. Upon completion of the new RTMC, the TSOCs may remain as satellite facilities with command and control capabilities that can serve as cooperative remote operations center and backup to the RTMC.

9 ANTICIPATED OUTCOMES: EVALUATION PLAN

Evaluation of the ATMS deployment will be accomplished using before and after studies, with federal guidelines as a basis. Palm Beach County conducted an evaluation to determine the effectiveness of their active arterial management system, which can be used as a case study and example to follow for future evaluation of the Escambia/Santa Rosa Regional ATMS. This study used the FHWA's Tool for Operations Benefit Cost Analysis to calculate an estimated benefit/cost ratio for various corridors and the entire managed system. The cost of the system included costs of equipment and devices, plus the cost of support staff. The Tool for Operations Benefit Cost Analysis calculated the benefits, using link volume data and speed data collected on the corridor. While the analysis tool can use national average input data for crashes, fuel consumption, and the value of time, location-specific information can also be used if available.

More information on the Palm Beach County evaluation can be found online at: http://www.ops.fhwa.dot.gov/publications/fhwahop14032/ch5.htm#56

More information on the Tool for Operations Benefit Cost Analysis can be found online at: http://www.ops.fhwa.dot.gov/plan4ops/topsbctool/index.htm

10 SUMMARY / CONCLUSION

This implementation plan builds upon previous works and provides additional details concerning a regional ATMS initially introduced and incorporated as part of long-range and strategic plans for the area. This plan recommends that approximately $25M be secured to begin the design and construction of a comprehensive regional ATMS as described in this plan. The existing traffic control systems have served this area for decades and have aged to the point where they are no longer sufficient to meet the growing demands of the region. Upgrading the existing traffic control infrastructure and establishing a RTMC will serve the current and anticipated needs of the Florida-Alabama TPO and realize the vision and goals set forth by strategic plans adopted and agreed upon by the TPO and its neighboring area stakeholders.

APPENDIX A


LEGEND:
EXISTING TRAFFIC SIGNAL
PROPOSED MASTER HUB
WIRELESS CONNECTION
WIRELESS ACCESS POINT
DMS
MVDS PAIR (WHERE APPLICABLE)
BLUETOOTH READER
N
GULF BREEZE
Pop. 5,665
Pensacola Bay
East Bay
Escambia Bay
Santa Rosa Sound
EGLIN
FORT PICKENS STATE
AQUATIC PRESERVE