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South Carolina Department of Transportation

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South Carolina Statewide ITS Architecture

Prepared By

Stantec

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FINAL

SOUTH CAROLINA INTELLIGENT TRANSPORTATION SYSTEM ARCHITECTURE UPDATES

Prepared for:
SOUTH CAROLINA DEPARTMENT OF TRANSPORTATION

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Executive Summary

The purpose of this document is to update the South Carolina Statewide ITS Architecture to meet the evolving transportation needs of the state taking advantage of the advancements in ITS technology that has occurred in recent years. There is also a need to reassess how deployed ITS systems meet user needs and how any gaps in user services can be bridged. By going through the updating process, the state is also ensuring it remains in compliance with Federal ITS regulations.

The updated document describes the existing ITS architecture for South Carolina and the proposed ITS projects that can be implemented to enhance user services. The update has been developed around the following key functional areas:

- Archived Data Systems
- Arterial Management
- Commercial Vehicle Operations
- Electronic Fare/Toll Collection
- Emergency Management
- Freeway Management
- Incident Management
- Maintenance and Construction Management
- Parking Management
- Transit Services and
- Traveler Information.

The key stakeholders' roles and responsibilities have been described to ensure the ITS functions are as envisioned. Also included are the interconnect context diagrams, which show the connections between stakeholders or systems. The context diagrams show the information flows/data exchanges between stakeholders required to meet user services. These items have been compiled using the Turbo Architecture software which is a tool created by the federal government for developing ITS Architectures.

The Statewide ITS infrastructure is managed by the South Carolina Department of Transportation (SCDOT) and the ITS Coordinator is located in the Columbia traffic management center (TMC) facility. Through stakeholder feedback and a gap analysis of the existing system, potential projects to enhance user services have been identified and summarized in **Table ES 1**. Statewide needs must be reviewed periodically as user needs or services and technology evolve over time to ensure the Statewide ITS is current and relevant.

Executive Summary

Table ES 1: Summary of Proposed Projects

Project Title	Description
Commercial Vehicle Information Systems Network (CVISN)/ Performance and Registration Information Systems Management (PRISM)	Pre-Pass/Weigh-in-Motion desired to help Ports pre-clear commercial vehicles to improve efficiency of commercial vehicle operations and enhance the safety of carriers.
ITS Communications Upgrades	Because of the security, expandability, and bandwidth capability, SCDOT prefers the use of fiber optics for the ITS communication network. The project(s) will include implementation of fiber optic communications network to support ITS field device communications and communications between stakeholders (field-to-field and center-to-center communications). When fiber is not feasible, licensed wireless communications may be used. Unlicensed wireless may be feasible for use as Ethernet bridges when line of sight (<1mi) is unobstructed. Cellular modems may be used when the options above are not feasible. Also desired is integration of systems (networks) between stakeholders to facilitate information exchange and coordination for operations.
Field Device Upgrades	Upgrade CCTV Cameras to IP cameras (with PTZ, lens cleaning, etc.) and IP addressable connectivity (signal controllers, DMS, etc.)
Work Zone ITS	Deployment of portable devices (CCTV cameras, DMS, queue detection system, etc.) to help manage work zones to enhance safety of public and construction crew.
Emergency Vehicle Preemption	Provide signal preemption for emergency vehicles in critical corridors.
Traffic Monitoring and Detection	Deploy new field devices (CCTV cameras, detectors, DMS, etc.) to enhance CCTV coverage and improve incident detection and response and regional traffic management. Deployments will be focused on major arterials as coverage on the interstate routes is nearly complete.
State Highway Emergency Program (SHEP)	Expand SHEP to other areas of the state that need assistance for incident management.
511 Traveler Information and Way Finding	Expand traveler information coverage and dissemination to include all modes and provide real-time information to the public. Current needs identified include expansion to cover arterials, public transit and commercial vehicle operations (parking location and availability).
Comprehensive Detour Plan Analysis	Detour plans to manage incidents along segments of critical highway corridors must be established, and resources allocated in counties that will be affected for re-routing including staffing and training. Signal systems on detour routes must be upgraded with communication.
Arterial Signal Coordination and Communication	Upgrade signal systems on critical arterial corridors with communication and controllers that will support coordination, emergency timing plans and establish protocol for emergency signal activation. Needed upgrades also include CCTV cameras for intersection monitoring.
Expansion of 800 Megahertz Radio System	Expand public safety 800 MHz system

Executive Summary

Project Title	Description
Parking Management	Provide parking coordination between parking facilities and real-time parking usage to the public and parking management agencies
Ride Sharing for Emergencies	Coordinate ride sharing during emergencies
Ramp Metering	Deploy ramp metering on access ramps to freeway facilities to manage travel demand during peak commute hours to enhance freeway performance for travel time reliability and safety. Coordinate with traffic signal systems on arterials.
Lane Control	Provide overhead lane control signs and communication on freeways to help manage incidents that block travel lanes on critical freeway corridors
Commercial Vehicle Parking	Provide commercial vehicle parking facilities with monitoring for real-time parking management and information dissemination to commercial vehicle drivers
Incident Management	Upgrade incident management system to provide credible real-time incident response status. Include portable devices for incident monitoring especially in areas outside of urbanized areas.
Integrated Corridor Management	Establish and deploy integrated corridor management strategies for critical corridors to optimize the use of all transportation assets to reduce congestion and improve safety.
Highway Patrol Computer Aided Dispatch System Upgrades	Upgrade the Highway Patrol web CAD and provide adequate information for real-time incident response and incident response status
Archived Data Management System	Establish a data management system to make data readily available and accessible to stakeholders for planning and to support transportation operations.
Automatic Vehicle Location and Transit Traveler Information System	Deploy GPS tracking of all transit vehicles and integration of schedule and expected arrival times of transit vehicles into SCDOT 511 system, terminals and transit vehicles. This should also include development of mobile app to push transit information to the public.
Computer Aided Dispatch and Scheduling (Transit)	Deploy technologies to facilitate dispatch of transit vehicles (software, MDT, communications, etc.) to enhance transit operations.
Transit Signal Priority	Deploy technologies in arterial corridors to enhance transit operations and maintain headways for optimal operation.
Transit Security	Deploy technologies to monitor secure areas and transit vehicles for intrusion or passenger safety with communications to transit management center and public safety agencies
Advanced Passenger Counters	Deploy technologies that will collect passenger data on boarding and alighting by time and location.
Asset Management and Tracking (Transit)	Deploy management strategies to help keep assets (rolling stock, right-of-way, stations, facilities, systems and equipment) in good repair i.e. fit for the purpose for which they were intended.
Electronic Fare Payment	Deploy electronic equipment in-vehicle, at terminals and bus stops for electronic payment of services. This will include the use of debit or credit cards, smart cards, and potentially near field communications for smartphone based payments.

Executive Summary

Project Title	Description
Emergency Management Interface (Transit)	Deploy technologies to reduce vulnerability, improve detection, response and mitigation. Enhance communications and coordination between transit agencies, first responders and regional and federal agencies for transit related emergencies.
Weather Information System (Transit)	Develop an integrated and effective road weather information system (RWIS) with decision support system to enhance transit operations and traveler information. Deployment of additional environmental sensor stations (ESS) may be required to capture environmental data.
Mobile Data Collection	Deploy mobile data terminals (MDT) in transit vehicles to facilitate transit information and data (passenger and fare data) management to enhance operations.

Abbreviations

Abbreviations

AASHTO – American Association of State Highway and Transportation Officials

ADRC – Aging and Disability Resource Center

ANATS – Anderson Area Transportation Study

ARTS – Augusta Regional Transportation Study

ATIS – Advanced Traveler Information System

ATMS – Advanced Transportation Management System

CAD – Computer Aided Dispatch

CCTV – Closed Circuit Television

CFR – Code of Federal Regulations

CHATS – Charleston Area Transportation Study

CMP – Congestion Management Process

CMU – Conflict Monitor Units

CNG – Compressed Natural Gas

COATS – Columbia Area Transportation Study

COG – Council of Government

CONOPS – Concept of Operations

CORBA – Common Object Request Broker Architecture

CVISN – Commercial Vehicle Information Systems and Networks

CVO – Commercial Vehicle Operations

DCM – Data Collection and Monitoring

DHEC – Department of Health and Environmental Control

DMS – Dynamic Message Signs

DMV – Division of Motor Vehicle

DPW – Department of Public Works

EMS – Emergency Medical Service

ESS – Environmental Sensor Station

FHWA – Federal Highway Administration

Abbreviations

FMS – Field Management Stations

FLATS – Florence Area Transportation Study

GDOT – Georgia Department of Transportation

GPATS – Greenville-Pickens Area Transportation Study

GPS – Global Positioning System

GSATS – Grand Strand Area Transportation Study

HAR – Highway Advisory Radio

HERO – Highway Emergency Response Operators

ICMS – Integrated Corridor Management System

IEEE – Institute of Electrical and Electronic Engineers

ITE – Institute of Transportation Engineers

ITS – Intelligent Transportation Systems

IVR – Interactive Voice Response

LATS – Lowcountry Area Transportation Study

LRTP – Long Range Transportation Plan

MAP – Motorist Assistance Patrol

MPO – Metropolitan Planning Organization

MSAA – Mobility Services for All Americans

NOAA – National Oceanic and Atmospheric Administration

MS/ETMCC – Message Sets for External Traffic Management Center Communications

NEMA – National Electrical Manufacturers Association

NFC – Near Field Communication

NTCIP – National Transportation Communications for Intelligent Transportation System Protocol

O & M – Operations and Maintenance

PCMS – Portable Changeable Message Signs

PRISM – Performance and Registration Information Systems Management

RFATS – Rock Hill-Fort Mill Area Transportation StudyRR – Roles and Responsibilities

RVD – Radar Vehicle Detector

RWIS – Road Weather Information System

Abbreviations

SAE – Society of Automotive Engineers

SCDOT – South Carolina Department of Transportation

SCDPS – South Carolina Department of Public Safety

SCP – Signal Control and Prioritization

SDO – Standards Development Organizations

SHEP – State Highway Emergency Program

SLED – State Law Enforcement Division

SPATS – Spartanburg Area Transportation Study

SUATS – Sumter Urban Area Transportation Study

SSL – Signal System Local

SSM – Signal System Master

TMA – Transportation Management Area

TMCC – Travel Management Coordination Center

TIM – Traffic Incident Management

TIP – Transportation Improvement Program

TMC – Traffic Management Center

TMDD – Traffic Management Data Dictionary

TSS – Transportation Sensor Systems

USDOT – United States Department of Transportation

VSLS – Variable Speed Limit Sign

WIMS – Weigh-In-Motion System

XML – Extensive Markup Language

1.0 INTRODUCTION

Intelligent Transportation Systems (ITS) is the application of technology (electronic sensing, computer processing, and communications) to manage transportation on roadways. The goals are to increase throughput, improve safety, and reduce adverse impacts to the environment. ITS technologies collect and fuse traffic data into meaningful information that can be used to actively manage traffic: provide on-going monitoring of the transportation network; provide traveler information; reduce incident response times; and optimize the use of transportation assets.

The National ITS Architecture framework is used to support the identification and definition of the ITS functionality needed for the region. The ITS architecture development process provides a structured approach to the identification of stakeholders, existing ITS systems and elements, interfaces, and user services that will be needed to meet the stakeholders' regional technical and institutional objectives.

The ITS Architecture also serves as an overarching framework to ensure interoperability of ITS architectures developed in various regions. The ITS Architecture development process guides the development of ITS projects and programs for consistency ensuring that the project goals are met.

South Carolina Department of Transportation (SCDOT) has already developed a Statewide ITS architecture in line with the State's vision and goals for transportation. SCDOT's primary goal in deploying ITS is to provide safe and efficient traffic flow on the highway system[1].

The purpose of this document is to update the South Carolina Statewide ITS Architecture to meet the evolving needs of the State and to take advantage of the advancements in ITS technology that has occurred in recent years. There is also a need to reassess how deployed ITS systems meet user needs and how any gaps can be bridged.

This document describes the existing inventory of elements or programs under the current Statewide ITS architecture and the planned projects or programs based on stakeholder meetings held to update the existing Statewide ITS architecture.

1.1 ITS ARCHITECTURE DEFINITION

Intelligent transportation systems (ITS) is the application of a variety of technologies in information processing, communications, control, electronics and systems engineering to monitor, evaluate, and manage transportation systems to enhance efficiency and safety. The Federal Highway Administration (FHWA) defines a regional ITS architecture[2] as follows:

[1] SCDOT Statewide Intelligent Transportation Systems Architecture and Strategic Plan (June 2004)

[2] http://www.fhwa.dot.gov/pgc/results.cfm?id=4891 (Accessed 7/3/2014)

> "A specific, tailored framework for ensuring institutional agreement and technical integration for the implementation of ITS projects or groups of projects in a particular region. It functionally defines what pieces of the system are linked to others and what information is exchanged between them."

In this case, the "region" of interest is the State of South Carolina. An architecture or framework is important in order to describe the functional needs or "what" must be done without specifying the technology or "how" it should be done. This allows the architecture to be viable even as technology evolves.

1.2 FHWA FINAL RULE COMPLIANCE

The intent of the National ITS Architecture framework is to address compatibility, functionality, integration, and interoperability which can be a challenge in extensive complex systems such as the evolving ITS landscape. Federal Highway Administration (FHWA) Final Rule 940 Part 11 mandates that projects planning to use Federal Funds in their ITS deployments must have established an ITS Architecture for the region. Paragraph 940.9 (a) states that:

> *"A regional ITS architecture shall be developed to guide the development of ITS projects and programs and be consistent with ITS strategies and projects contained in applicable transportation plans. The National ITS Architecture shall be used as a resource in the development of the regional ITS architecture. The regional ITS architecture shall be on a scale commensurate with the scope of ITS investment in the region.*
>
> *Provision should be made to include participation from the following agencies as appropriate, in the development of the regional ITS architecture:*
>
> - *Highway agencies*
> - *Public safety agencies (e.g., police, fire, emergency/medical)*
> - *Transit operators*
> - *Federal lands agencies*
> - *State motor carrier agencies and*
> - *Other operating agencies necessary to fully address regional ITS integration."*

In view of the rule, **Table 1** summarizes how each requirement is met under the South Carolina Statewide ITS Architecture.

Table 1: FHWA Final Rule Compliance Matrix

Statewide/Regional ITS Architecture Requirement	Final Report	Turbo Architecture Database
Description of region	Section 1.5	Yes
Identification of participating agencies and other stakeholders	Section 3.2	Yes
Operational concept that identifies the roles and responsibilities of participating agencies and stakeholders	Section 3.1	Yes
A list of existing or new agreements for operations including ITS project interoperability, and utilization of standards	Section 3.5	Yes
System functional requirements	Section 3.4	Yes
Interface requirements and information exchanges with planned and existing systems and subsystems	Appendix E	Yes
Identification of ITS standards is supporting regional and national interoperability	Section 5.2	Yes
The sequence of projects required for implementation	Section 5.1	Yes
Agencies and stakeholders procedures and responsibilities for maintaining ITS architecture	Section 6.0	Yes

1.3 NATIONAL ITS ARCHITECTURE

The national ITS architecture is made up of three layers as illustrated below in **Figure 1**. The institutional layer addresses policies, funding mechanisms, the processes required for implementation, operation, and maintenance of the ITS. The transportation layer addresses the transportation needs or services. Subsystems, information flow interfaces, and data definitions required for the transportation service are addressed in this layer. The final layer is the communications layer which integrates the systems and subsystems for an effective exchange of information. It also addresses standards for information exchanges and security to ensure reliable and resilient system to support advanced transportation management.

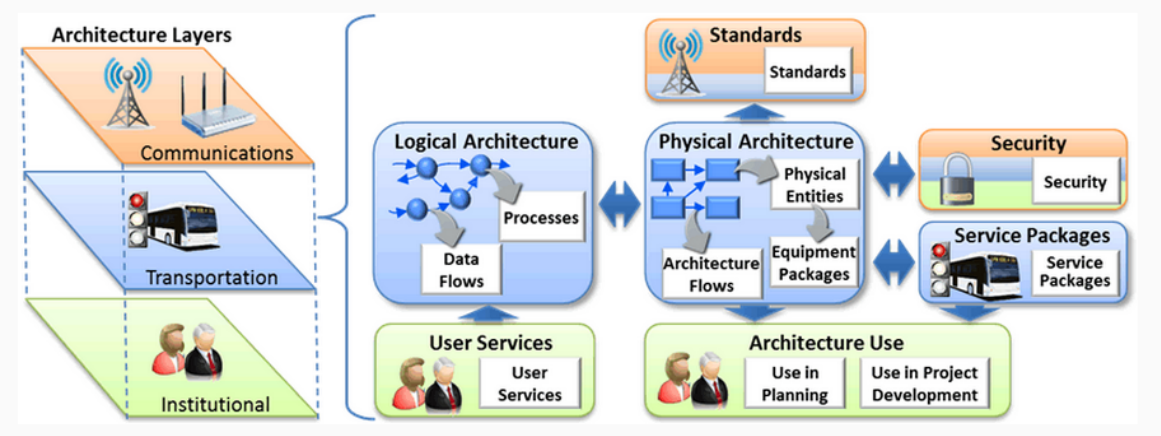

Figure 1: National ITS Architecture Layers

1.4 SOUTH CAROLINA ITS ARCHITECTURE UPDATE PROCESS

The SCDOT ITS architecture team used the following process to develop the updates to the Statewide ITS architecture:

1. Reviewed the existing Statewide ITS architecture document developed in 2004[3].
2. Conducted stakeholder meetings in Charleston, Columbia, Greenville, Myrtle Beach and Rock Hill with stakeholders with diverse backgrounds in planning, operations, maintenance, and public safety to assess existing and desired ITS architecture services.
3. Used the information obtained in Step 2 to develop the Turbo Architecture file which also outlines the inventory of elements, services, operational concept, requirements, interfaces, standards and the agreements.
4. Produced draft documents for stakeholder reviews.
5. Finalized and published the documentation for stakeholders to utilize.

1.5 GEOGRAPHIC AREA

The geographic area covered by this ITS architecture is the entire State of South Carolina. South Carolina is located on the eastern seaboard of the United States bordered to the north and south by North Carolina and Georgia and to the east by the Atlantic Ocean. The State's proximity to the Atlantic Ocean

[3] Statewide Intelligent Transportation Systems Architecture and Strategic Plan (June 2004)

makes it occasionally affected by hurricanes. The major roadway assets in the State of South Carolina include interstate highway systems and major principal arterials or US highway routes. These corridors are vital for socio-economic activities and commercial vehicle operations for intrastate and interstate commerce.

South Carolina DOT currently has transportation management centers that manage regional traffic in the following areas: Charleston, Columbia, Greenville, Myrtle Beach, and Rock Hill. The City of Columbia is the crossroads for three primary interstate systems – I-20, I-26, and I-77. Additionally, the County of Beaufort has its own traffic management center for managing traffic in the county. The South Carolina Statewide ITS architecture has interfaces with these regional TMCs.

Other transportation assets include airport, rail, and port facilities. There are numerous airport facilities for general aviation, commercial, and utilities. There are seven (7) significant regional airport hubs. Amtrak operates passenger rail service on four routes in the State with stops in about eleven (11) cities or towns. Additional rail service includes short lines and (Class 1) freight rail by CSX Transportation and Norfolk Southern. South Carolina has public seaport facilities in Charleston and Georgetown and an inland port in Greer. These port facilities generate significant international commerce for the State and country. **Appendix A** contains details of the major transportation assets in South Carolina. **Appendix B** describes the public transit agencies, a total of twenty seven (27). There are also eleven (11) metropolitan planning organizations (MPO) within South Carolina that address regional transportation needs. **Appendix C** shows the various MPOs in South Carolina and their boundaries.

2.0 REVIEW OF STATE AND LOCAL ITS RELATED DOCUMENTS

2.1 OVERVIEW OF EXISTING SOUTH CAROLINA STATEWIDE ITS

This document is intended to update the previous Statewide ITS document[4] prepared in June 2004. The 2004 document was reviewed along with the long range transportation planning document prepared by the MPOs. The goals are to document the existing and planned ITS deployments and identify potential projects to enhance the Statewide ITS infrastructure to improve user services. Furthermore, the state and local transit systems want to explore ITS deployments that will enhance transit efficiency. This document will also address ITS related to transit systems.

The 2004 document described the recommended system architecture for the development of ITS in South Carolina. It provided a framework for institutional collaboration and operational concept. The report identified stakeholders, existing and planned ITS deployments. The Ten Year Strategic Plan for ITS programs and projects was also developed to provide guidance on future deployments of ITS in the state.

SCDOT has deployed significant amounts of ITS devices and communication assets in the State. The existing ITS infrastructure includes:

- Traffic management centers (TMC)
- Closed circuit television (CCTV) cameras
- Dynamic message signs (DMS)
- Highway advisory radios (HAR)
- State highway emergency program (SHEP)
- Coordinated signal systems
- Road weather information system
- Electronic fare payment
- Vehicle detection
- Commercial vehicle operations systems
- 511

The Statewide TMC for the operation and management of Statewide ITS assets is located in the City of Columbia. The Statewide TMC manages CCTV cameras, traveler information, and monitor's incidents throughout the state. **Table 2** shows the list of SCDOT TMCs and hours of operation. Furthermore, the interconnectivity protocols allow each TMC to fully monitor and operate all ITS devices in the state and from remote locations.

[4] Statewide Intelligent Transportation Systems Architecture and Strategic Plan (June 2004). Prepared by Day Wilburn Associates, Inc.

Table 2: TMC Hours of Operation

TMC Location	Hours of Operation
State TMC (Columbia)	24/7
Greenville TMC	7am to 7pm Mon- Fri. 8am to 6pm Sat 8am to 4pm Sun
Charleston TMC	7am to 7:30pm Mon – Fri 9am to 7:30pm Sat 9am to 5:30pm Sun
Rock Hill TMC	6:30am to 6:30pm Mon – Fri 8am to 6pm Sat 8am to 4pm Sun
Myrtle Beach TMC	6:30am to 7pm Mon – Fri 8:30am to 7pm Sat 8:30am to 5pm Sun

The metropolitan planning organizations (MPOs) develop long-range transportation plans (LRTP) for their jurisdictions and these plans sometimes address ITS needs. The subsequent sections will summarize the ITS needs as discussed in the LRTP of MPOs.

2.1.1 Augusta Regional Transportation Study

The goal of the LRTP is to protect and preserve the existing highway infrastructure and extend service life. Intelligent transportation systems have been identified as a tool that can be used to improve congestion, safety, security, and air quality. The Augusta Regional Advanced Transportation Management System (ATMS) Master Plan (2002) outlined a twenty-year plan to deploy TMCs at Augusta and Aiken and several ITS field devices (CCTV cameras, signal controllers, fiber, speed detectors, DMS) for freeway management. The plan also included the deployment of SHEP and GDOT Highway Emergency Response Operators (HERO) in the area.

2.1.2 Charleston Area Transportation Study

In the CHATS MPO area, ITS is required to enhance transit services such as transit signal preemption and transit traveler information. The Charleston Area Regional Transportation Authority (CARTA) has

installed AVLs on buses and desires to push real-time arrival information to the SCDOT 511 system or website to enhance transit efficiency. Safety is another area where ITS can be exploited for network monitoring and hazard warning. ITS technologies that will enhance access management are also desired. Potential systems being considered in the area include adaptive signal systems, traffic monitoring systems and traveler information systems to improve corridor safety and mobility.

2.1.3 Columbia Area Transportation Study

COATS area MPO would like to define truck routes to track hazardous materials and mitigate freight truck and passenger train conflicts. ITS technologies are candidates to be deployed to facilitate commercial vehicle operations. For example, DMS can be deployed to inform truckers of lane restrictions. Some suggested routes include US 321 from Winnsboro to downtown Columbia, and I-26 from I-20 through Irmo. Other desirable ITS solutions include the following: weigh in motion systems (WIMS); speed detection systems to improve safety; and technologies to reduce emergency response time and cost especially through rural areas. Some state and Federal Guideshare funds can be used to provide ITS to improve intersection operations and congestion management.

2.1.4 Florence Area Transportation Study

The FLATS area MPO desires ITS to enhance transportation safety and security. ITS can be used as part of transportation system management to improve freight traffic.

2.1.5 Rock Hill-Fort Mill Area Transportation Study

Incident management, SHEP, traffic signal improvements, and wayfinding signage are the primary focus of ITS. SCDOT District Four (4) provides incident management services. CCTV cameras and vehicle detection are used to monitor I-77 through RFATS. Desirable congestion mitigation strategies include the use of ITS for ramp metering, traveler information and rerouting, electronic commercial vehicle clearance, and tolls. A prioritized list of ITS deployments will be based on outcomes of the transportation vulnerability assessment of critical RFATS transportation assets.

2.1.6 Spartanburg Area Transportation Study

Spartanburg County Transportation Service Board (TSB) is implementing ITS for public transit called Virtual Transit Enterprise. This will enhance routing, scheduling, billing, and reporting. Specific deployments include AVL and Mobile Data Consoles. SPATS desires to improve air quality by using ITS for congestion management. Other potential ITS deployments include travel demand management (TDM), traffic operations improvement, congestion pricing, incident management, and signal coordination.

3.0 OPERATIONAL CONCEPT

This section identifies and describes the participating agencies, stakeholders and their roles and responsibilities in the implementation, operation, maintenance, and replacement of the Statewide ITS system and or components. The operational concept describes the proposed system at a high-level showing the desired capabilities without specifying the design details. The operational concept has the following objectives[5]:

- Identification of high-level user needs and system capabilities
- Stakeholder agreement on roles and responsibilities for the ITS system
- Shared understanding by system owners, operators, maintainers, and developers on the who, what, why, where, and how of the system
- Agreement on key performance measures

The section defines each stakeholder in the ITS architecture's roles and responsibilities in implementing and operating the desired user services.

3.1 SOUTH CAROLINA ITS OPERATIONAL CONCEPT

The Operational Concept of the South Carolina Statewide ITS Architecture is to collect data on the transportation network to determine the system state, identify any issues that adversely affect the efficient and safe use of the transportation system, initiate mitigation measures, and monitor performance. This approach requires integrated management of all transportation assets to maximize efficiency and reduce cost of operation.

The Operational Concept must expand as the existing ITS architecture technologies expand to cover all assets in the corridor including transit efficiency and effectiveness and other modes, optimize their use, and help alleviate congestion and make travel safer for all modes.

The Operational Concept will facilitate response to any emergency, such as a hurricane event. The required coordination among emergency services such as the South Carolina Department of Public Safety (SCDPS), SCDOT, and other key stakeholders is also outlined.

[5] Systems Engineering for Intelligent Transportation Systems An Introduction for Transportation Professionals. Published by US Department of Transportation Federal Highway Administration January 2007

3.2 PARTICIPATING AGENCIES AND STAKEHOLDERS

The South Carolina Statewide ITS architecture has a broad range of stakeholders some with specific functions in a geographic area or the entire state. Generic stakeholder groups are used to aggregate stakeholders with similar functions, but limited to specific geographic area. For example, there are several Council of Governments (COG) that cater to regional transportation needs, and have identical roles, responsibilities, and functions within each jurisdiction. Rather than discuss each COG individually, they have been lumped together to simplify the architecture. **Table 3** shows the list of stakeholders for the South Carolina Statewide ITS Architecture.

Table 3: Statewide ITS Architecture Stakeholders

Stakeholder Name	Stakeholder Description
Airports	This represents the various airports in South Carolina, which are multimodal facilities that serve domestic and international flights. The airport facilities serve general aviation, commercial, and utility functions. The major airports in the state are: • Charleston International Airport • Columbia Metropolitan Airport • Florence Regional Airport • Greenville-Spartanburg International Airport • Hilton Head Airport • Myrtle Beach International Airport Other airports near the Stateline that impact regional travel include the following: • Augusta Regional Airport, GA • Charlotte/Douglas International Airport, NC • Savannah/Hilton Head International Airport, GA
Archived Data Users	This refers to individual or institutions that use archived data.
Commercial Vehicle Operators	This refers to privately owned commercial vehicles that carry freight to support both interstate and intrastate commerce.

Stakeholder Name	Stakeholder Description
Councils of Governments	The Council of Governments (COG) is a regional forum to allow local governments to collaborate and address common challenges in infrastructure, community and economic development, and general regional governmental issues. The COGs assist SCDOT in transportation planning for areas outside of the MPOs (rural road improvements). COGs are similar to MPOs by allowing public input into transportation decision making to ensure comprehensive, cooperative and continuing planning process. COGs also analyze the long-range transportation needs, and the five-year programs must be approved by SCDOT Commission. There are ten (10) COGs in South Carolina: • Appalachian Council of Governments • Berkeley-Charleston-Dorchester Council of Governments • Catawba Regional Planning Council • Central Midlands Regional Planning Council • Lowcountry Council of Governments • Lower Savannah Council of Governments • Pee Dee Regional Council of Governments • Santee-Lynches Council of Governments • Upper Savannah Council of Governments • Waccamaw Regional Planning and Development Council
Counties and Cities	This refers to the various municipal governments (i.e., counties and cities) within the State of South Carolina, who are stakeholders in transportation assets.
Department of Motor Vehicles	The Department of Motor Vehicles (DMV) is the agency responsible for motor vehicle licensing and registration.
South Carolina Department of Public Safety	The South Carolina Department of Public Safety (SCDPS) provides safety services to both its citizens and visitors to the state of South Carolina by: • Upholding and enforcing the laws • Administering regulatory programs • Managing records • Educating the public • Managing emergencies This is performed directly and through interaction with other agencies. This includes the State Highway Patrol, which enforces traffic laws to promote safety, communicates and collaborates with other law enforcement agencies on common objectives and assists with emergency management and disaster response.
Department of Public Works	The Department of Public Works (DPW) is a section within the local government agency responsible for maintenance of infrastructure such as roads, and may include traffic signals and ITS field devices maintenance.
DHEC	The South Carolina Department of Health and Environmental Control (DHEC) is responsible for public health and environment. DHEC among other things responds to environmental emergencies.
Emergency Management Division	The South Carolina Emergency Management Division (SCEMD) is the coordinating agency responsible for the statewide emergency management program. SCEMD is responsible for developing, coordinating, and leading state emergency management program for emergency response and recovery.
Emergency Medical Services	This includes local hospitals and emergency medical service providers (i.e., ambulance, air-evacuation, etc.) that are components of emergency management.

Stakeholder Name	Stakeholder Description
Financial Institutions	These are financial institutions that support electronic payment.
I-95 Corridor Coalition	The I-95 Corridor Coalition is an alliance of transportation agencies, toll authorities, and related organizations, including public safety, from the State of Maine to the State of Florida, with affiliate members in Canada. The Coalition provides a forum for key decision and policy makers to address transportation management and operations issues of common interest. This volunteer, consensus-driven organization enables its myriad state, local and regional member agencies to work together to improve transportation system performance far more than they could work individually. The Coalition has successfully served as a model for multi-state/jurisdictional interagency cooperation and coordination for over a decade.
Media	This stakeholder group includes local TV stations, radio stations, smart phone apps, and print media that are responsible for receiving and distributing transportation information, for example, traffic conditions, incidents and road weather conditions.
Metropolitan Planning Organizations	A metropolitan planning organization (MPO) is a federally mandated and federally funded transportation policy-making organization made up of representatives from local government and transportation authorities. MPOs are required in urbanized areas with a population of over 50,000 people. MPOs facilitate collaboration in the transportation planning process. There are eleven (11) MPOs in South Carolina and the name and location of each is listed below: • ANATS - Anderson • ARTS - Aiken/North Augusta • CHATS - Charleston • COATS - Columbia • FLATS - Florence • GPATS - Greenville/Pickens • GSATS - Grand Strand • LATS – Beaufort/Hilton Head • RFATS - Rock Hill/Fort Mill • SPATS - Spartanburg • SUATS - Sumter
Neighboring States (GA, NC)	This includes the states of Georgia and North Carolina to exchange traffic, road weather, and incident information with SCDOT.
NOAA	National Oceanic and Atmospheric Administration is responsible for forecasting changes in climate, weather, oceans and coasts, and disseminating that information to keep citizens informed. NOAA includes the National Weather Service (NWS) and the National Hurricane Center (NHC).
Office of Aging	The Lieutenant Governor's Office on Aging is a statewide leader for advocating, planning and developing resources to meet the needs of older South Carolinians.
Ports	This stakeholder represents the Ports which are transfer points or multimodal facilities and commercial vehicle operations. The South Carolina Ports Authority owns and operates seaport facilities in Charleston and Georgetown and the inland port at Greer. It is also the receiver and dispatcher of imported cargo (container and break bulk). This includes commercial vehicle operations.
Public	Members of the general public own and operate various devices/systems to access ITS information, including PDAs, cell phones, and personal computers.

Stakeholder Name	Stakeholder Description
Public Transit Providers	The Public Transit Providers includes all modes of transit (bus, rail, ferry, etc) responsible for establishing, financing, and sustaining effective public transit service in both urban and rural areas. There are a total of 28 bus public transit providers in South Carolina that provide fixed route (with deviation) and paratransit service in rural and/or urbanized areas. Intercity bus service is operated by Greyhound and Southeastern Stages. There are no commuter rail services in South Carolina however Amtrak currently provides intercity round trip rail service with stops in Columbia, Charleston, Savannah and Greenville. See **Appendix B** for description of statewide transit providers.
Rail Operators	This refers to private entities that operate freight rail and manage railways in the State of South Carolina.
Regional Event Promoters	This refers to private entities that promote concerts, sporting events and other activities that significantly impact highway travel in the state.
Regional Parking Operators	This refers to entities that provide and operate parking facilities.
Research Institutions	Research Institutions in academia conduct short-term and long-term research and provide technology assistance, engineering training and continuing education, technology transfer, and problem-solving services to SCDOT and others in the transportation community.
Trucking Association	This represents commercial vehicle operators associations that represent the interests of trucking companies that move freight throughout the state.
SCDOT	South Carolina Department of Transportation is an arm of the South Carolina government responsible for state-wide transportation. SCDOT responsibilities include statewide transportation system planning, operations and maintenance. Some of the typical responsibilities include incident detection and response, evacuation planning and management, transportation data collection, management, and distribution for the local region as well as for the entire state.
South Carolina Forestry Commission	The mission of the South Carolina Forestry Commission is to protect, promote, enhance, and nurture the forest lands of South Carolina.
SLED	State Law Enforcement Division (SLED) is the Chief Law Enforcement Agency in South Carolina. SLED oversees all law enforcement functions in the State and provides technical assistance to law enforcement agencies and conducts investigations on behalf of the state as directed by the Governor and Attorney General. SLED is responsible for initiating Amber Alerts.

3.3 ROLES AND RESPONSIBILITIES

The Statewide ITS architecture involves the participation of multiple stakeholders and integration of their systems to manage the overall transportation network. This section describes the stakeholders who either participated in the creation of the existing Statewide ITS Architecture or whom the participating stakeholders identified as needed to be included in the architecture development. The stakeholders have organized into groups, in order to reflect mutual participation and involvement in transportation services such as freeway or arterial management.

The Operational Concept lists the Roles and Responsibilities (RR) that each participating agency must take on to provide the ITS services included in the ITS Architecture. Changing needs may arise that defines new or additional roles and will require an agreement to be formed between all affected parties. Defining the roles and responsibilities of the participating stakeholders in the region and the willingness of agencies to accept their roles and responsibilities is an important step in realizing the common goal of an interoperable ITS throughout the state. SCDOT will lead the stakeholder group to ensure that the Statewide ITS architecture is current and relevant to the transportation needs of the region. Each stakeholder's operational roles and responsibilities to ensure the Statewide ITS architecture operates as envisioned for the services desired are summarized in **Table 4.**

Table 4: ITS Architecture Operational Concept

RR Area Name	RR Area Description	Stakeholder	RR Description	RR Status
Archived Data Systems	The Archived Data Management System for the South Carolina Statewide ITS System represents the functions that collect, process, store and utilize transportation data. The data includes volumes, speed, crashes, CVO, public transit, parking, etc. The system should log and store operational inputs and data collected by field devices. The data should be stored for a configurable amount of time, and reporting systems should allow users to create pre-defined reports or reports based on select data elements. The system should be capable of providing statewide reports or reports within smaller geographic boundaries or specific roadways using analytical tools. Examples of reports may include an incident report, traffic conditions report, work zones report, and maintenance reports. The data should be available to stakeholders to enhance decision making for planning and design.	Airports	provide travel data	Existing
		Archived Data Users	analyze traffic data for planning purposes	
		Councils of Governments	provide planning data	
		Emergency Management Division	provide data for emergency management	
			provide data for emergency planning	
		SC Trucking Association	provide data for commercial vehicle operations planning	
		Metropolitan Planning Organizations	provide planning data	
			provide operational data (VMT, emissions, etc.)	
		SCDOT	provide traffic data for planning and operations	
			maintain asset management data	
Arterial Management	Arterial streets will be managed by SCDOT and the local DPW. This will include traffic analysis and maintenance of traffic control devices. Local DPS will handle incidents. SCDOT TMC will provide traveler information and monitor incident status.	Councils of Governments	provide transportation planning and technical assistance	Existing
			provide incident management support	
		Counties and Cities	provide transportation planning	Existing
		Department of Public	incident response	Existing

RR Area Name	RR Area Description	Stakeholder	RR Description	RR Status
		Safety	dispatch emergency vehicles	
			coordinate with other emergency response agencies	
			work zone safety monitoring	
		Department of Public Works	maintain traffic signals and controllers	Existing
			roadway maintenance	
			provide traffic operations management	
		Emergency Management Division	support disaster response	Existing
		Media	disseminate traveler information	Existing
		Metropolitan Planning Organizations	develop travel demand models	Existing
			provide operation data	
			provide congestion management studies	
		Public Transit Providers	provide transit traveler information	Existing
			provide and operate transit services (transit terminals, transit stops, AVL, and transit security)	
			provide paratransit services	
		Rail Operators	provide rail crossing schedules	Planned
			coordinate with local traffic agency for road-rail crossing safety	
		SCDOT	disseminate traveler information	Existing
			coordinate incident response	
			provide an arterial monitoring system	
			maintain traffic control devices	
			implement improvements for traffic flow	

RR Area Name	RR Area Description	Stakeholder	RR Description	RR Status
Commercial Vehicle Operations	Commercial vehicle operations (CVO) represents the administrative functions that support commercial vehicle credentials, tax, and safety regulation. These functions may be embodied in the commercial vehicle information systems network (CVISN) or performance and registration information system management (PRISM).	Councils of Governments	commercial vehicle infrastructure and operations planning	Existing
		Metropolitan Planning Organizations	provide commercial vehicle operations data and planning	
		SCDOT	improve safety and operation of commercial vehicles	
		SC Department of Public Safety	enforce state and federal regulations for commercial vehicle operations	
		SC Trucking Association	commercial vehicle operator training	
			provide information, resources and support to commercial vehicle operators	
			commercial vehicle legislation advancement	
Electronic Fare Collection	Electronic Fare Collection represents the functions that support electronic payment of transportation services such as tolls, parking and transit services.	Councils of Governments	support electronic payments for parking garages, toll ways and transit	Planned
		Financial Institutions	support financial transactions	
		Metropolitan Planning Organizations	support electronic payments for parking garages, toll ways and transit	Planned
		Public Transit Providers	provide smart cards for fare collection	Existing
			provide electronic fare collection system	
		SCDOT	provide infrastructure to support electronic toll collection	Existing
			manage and operate electronic toll collection system	
Emergency Management	The Emergency Management Center (EMC) will coordinates with local, regional and state emergency management agencies and local public safety agencies to manage all emergencies. The transportation infrastructure especially the highway system is a key asset that will be is used for	Councils of Governments	support emergency management	Existing
			emergency call taking	
			coordinate with stakeholders for emergency evacuation	
		Department of Public	provide evacuation support	Planned

RR Area Name	RR Area Description	Stakeholder	RR Description	RR Status
	evacuation if needed EMC will coordinate with SCDOT and other stakeholders to develop evacuation plans and implement strategies and technologies to facilitate emergency evacuation. SCDOT will provide real-time information on traffic and roadway conditions to help assess the evacuation strategy. Public transit providers will provide buses to facilitate evacuation for residents with mobility needs.	Safety	coordinate with other emergency response agencies	
		Emergency Management Division	provide resources for and monitor emergency evacuation	Existing
			coordinate with other agencies for an emergency plan implementation	
			develop and implement emergency management plans	
		Metropolitan Planning Organizations	develop operational strategies and coordinate plans with others in region	Existing
			develop regional consensus of operational plans	
		NOAA	provide weather forecast and roadway weather information	Existing
		Public Transit Providers	coordinate with emergency response to develop emergency transit operations	Existing
			provide transit based evacuation	
		SCDOT	develop emergency evacuation plans	Existing
			monitor emergency evacuation	
			disseminate emergency traveler information	
Freeway Management	Freeway management is the primary responsibility of South Carolina Department of Transportation (SCDOT). SCDOT monitors detection and traffic monitoring systems using field devices, control roadside infrastructure for en-route traveler information. SCDOT is responsible for traffic engineering and freeway management and detour route analysis in the event that lanes are blocked, or there is heavy congestion. SCDOT processes any incident information and assess the impact on a region-wide level and provide incident coordination with first	Councils of Governments	support incident management plans	Existing
		Department of Public Safety	incident response	Existing
			coordinate with other stakeholders	
		Emergency Management Division	support incident response	Existing
			provide resources for incident management	
		I-95 Corridor Coalition	provide coordination between stakeholders	Existing
			promote safety	
			support congestion mitigation	

RR Area Name	RR Area Description	Stakeholder	RR Description	RR Status
	responders.	Media	disseminate freeway information	Existing
		Metropolitan Planning Organizations	develop travel demand models	Existing
			provide congestion management studies	
			provide operation data	
		SCDOT	develop incident response plans and detour routes for strategic locations	Existing
			control roadside equipment for active freeway management	
			disseminate freeway information en-route to travelers and other stakeholders	
			provide freeway patrol through SHEP	
Incident Management	The incident management subsystem is activated once a TMC operator receives an alert. The operator describes the details of the incident (severity; lanes blocked, HAZMAT, etc.). The incident management system supports operators to manage the incident using predefined incident response plans developed by the stakeholders for the location, incident type, severity and real-time traffic conditions. State Highway Emergency Program and local police and sheriff's office including the State Highway Patrol will help with incident response and coordination. These agencies secure the incident scene and ensure rapid clearance of debris or obstacles that may impede normal flow of traffic. SCDOT District Office provides maintenance support where needed. The TMC operator is responsible for traveler information and detour route information. The available field devices are used for incident monitoring and estimating and incident clearance times and also evaluating performance of detour	Councils of Governments	support incident response plans	Existing
		DHEC	provide monitoring and control for HAZMAT related incidents	Existing
		Department of Public Safety	provide incident response	Existing
			dispatch emergency vehicles	
			provide assistance to motorists	
		Emergency Management Division	coordinate with other stakeholders on major incident response	Planned
			provide incident response	
		Media	provide information about incidents to the public	Existing
		Metropolitan Planning Organizations	develop incident management strategies	Existing
			develop travel demand models	
		SCDOT	perform incident detection and verification using roadside ITS devices	Existing
			disseminate incident information to response agencies	

RR Area Name	RR Area Description	Stakeholder	RR Description	RR Status
	route.		support incident management	
			coordinate incident response plan for detour	
			develop incident response plans and detour routes for strategic locations	
Maintenance and Construction Management	Maintenance and construction management refers to systems that are used to track maintenance activities including ITS field devices to preserve and maintain the existing transportation system. The maintenance requirements may include activities such as snow and debris removal, and management of construction operations.	Councils of Governments	provide planning support for maintenance and construction	Existing
		Department of Public Safety	provide work zone safety monitoring	Planned
		Department of Public Works	perform infrastructure maintenance	Existing
		Metropolitan Planning Organizations	develop and update long range transportation plan	Existing
			provided integrated transportation planning	
		SCDOT	disseminate work zone information to travelers (portable DMS, HAR, 511, etc.)	Existing
			coordinate with municipalities for incident response and recovery	
			provide maintenance and track workflow	
Parking Management	Parking management represents the functions that provide monitoring and management of parking facilities and coordination between parking facilities.	Airports	support parking management and coordination with parking facilities	Planned
		Councils of Governments	provide coordination between parking facilities	Existing
			support planning for parking facilities	
		Media	provide parking information to the public	Existing
		Metropolitan Planning Organizations	develop travel demand models	Existing
			provide operation data	
		SCDOT	parking management support	Existing
Transit Services	Transit management is focused on	Councils of	plan and manage transit system	Existing

RR Area Name	RR Area Description	Stakeholder	RR Description	RR Status
	enhancing transit user experience by deploying technologies that the transit rider can use to access transit rider information, request services, perform electronic transactions and reservations. For the transit provider these technologies include computer aided dispatch, real –time transit vehicle tracking for expected arrival times and schedule adherence, electronic fare collection, etc. There is other ITS technologies that can be implemented to support transit such as transit signal preemption.	Governments	implement integrated corridor management strategies	
		Emergency Management Division	coordinate emergency evacuation with transit service provider	Existing
		Media	disseminate transit information to the public	Existing
		Metropolitan Planning Organizations	provide operation data	Existing
			provide planning data	
			provided integrated transportation planning	
		Public	receive and use transit information for decision making	Existing
		Public Transit Providers	coordinate with other stakeholders for evacuation and reentry planning	Existing
			coordinate transit services with other regional transit providers	
			provide electronic fare payment systems	
			provide paratransit services	
			provide transit traveler information	
			provide and operate transit services (transit terminals, transit stops, AVL, and transit security)	
		SCDOT	support transit service in the State	Existing
			provide transit information on 511	Planned
Traveler Information	Traveler information represents the functions that collects, processes and disseminates transportation information to the traveling public. SCDOT through the TMC provides traveler information. The TMC reports congestion, incidents or any events that disrupt the normal flow of traffic and cause significant delays to the traveling public. The media and other information	Airports	disseminate traveler information	Existing
			disseminate weather information to travelers	
			coordinate emergency response with the local department of public safety	
		Councils of Governments	provide transportation planning and technical assistance for ITS deployment	

RR Area Name	RR Area Description	Stakeholder	RR Description	RR Status
	service providers broadcast transportation system information based on information provided by SCDOT. SCDOT provides hubs for access to real-time information including CCTV cameras for live streaming in broadcasts. The 511 information system is an integral part of traveler information that will provide multi-modal traveler information that can be accessed via voice calls or web interface.		collect and archive transportation data	
		Emergency Management Division	coordinate with local, state, and federal agencies for emergency response	
			collect road weather information and disseminate to the public	
			provide emergency management center to coordinate statewide emergency operations	
			manage and operate emergency response center during emergencies	
			issue warnings related to extreme weather or events	
		Media	disseminate road weather information	
			disseminate roadway traffic information	
			disseminate other information to travelers	
		MPO	develop operational strategies and coordinate plans with others in region	
		Public	receive and respond to traveler information	
		Public Transit Providers	disseminate transit information	
		SCDOT	disseminate road weather information	
			operate and support 511 (telephone, online and app)	
			disseminate road network information using apps and social media and field devices	
			disseminate detour route information	
			disseminate road construction and maintenance information	
		SLED	Initiate and monitor Amber Alerts	

Table 5 describes the surface transportation inventory of elements for the Statewide ITS architecture. A transportation element can be a center, vehicle, traveler, or field equipment. Each transportation element listed below has one or more stakeholders associated with it from **Table 3**. In order to reduce the complexity of the architecture, some transportation elements with like functionality (for instance the police and sheriff) have been grouped together. Each transportation inventory element is mapped to at least one National ITS Architecture entity.

Table 5: Inventory of ITS Elements

Element Name	Element Description	Stakeholder	Element Status
911 Call Centers	911 Call Centers are where emergency calls are received and entered into the system database and then the information is routed to the appropriate public safety agency for dispatch or response.	Counties and Cities	Existing
Air Quality Management System	DHEC monitors air quality and can determine transportation related or mobile source pollutants and manage air quality issues.	DHEC	Existing
Airports	This represents the various airports in South Carolina which are multimodal facilities that serve domestic and international flights. The airport facilities serve general aviation, commercial, and utility functions	Airports	Existing
Archived Data User	This refers to individual or institutions that use archived data.	Archived Data Users	Existing
Beaufort County ITS Devices	This refers to the ITS field devices operated and maintained by Beaufort County.	Counties and Cities	Existing
Beaufort TMC	This element represents the traffic management center that is responsible for traffic management activities within the Beaufort area. The typical activities include traffic monitoring, traffic data collection, operation of ITS elements (CCTV, DMS, etc.), detection and verification of incidents, traffic signal monitoring, and other traffic management related activities. This also includes communicating with other agencies, districts, TMCs, and DOT for roadway maintenance activities.	Counties and Cities	Existing
COG	The Council of Governments (COG) is a regional forum to allow local governments to collaborate and address common challenges in infrastructure, community and economic development, and general regional governmental issues. The COGs assist SCDOT in transportation planning for areas outside of the MPOs (rural road improvements).	Councils of Governments	Existing
COG Database	This element refers to the database of the various Council of Governments in South Carolina who address regional transportation needs. The database includes transportation related information for planning and decision making.	Councils of Governments	Existing
County/City Database	This refers to the database of transportation related information for planning and operations.	Counties and Cities	Existing
County/City ITS Devices	This refers to ITS devices deployed by the County/City for traffic monitoring and control such as closed circuit television (CCTV) camera, DMS, etc.	Counties and Cities	Existing

Element Name	Element Description	Stakeholder	Element Status
County/City/SCDOT Traffic Signal System	This refers to the traffic signal systems deployed to control traffic flow. These may be pre-timed, semi-actuated or actuated and may be coordinated with other signal systems in the corridor.	Counties and Cities	Existing
County/City Websites	This refers to the webpages of the County/City that is used to disseminate traffic or emergency information to the general public.	Counties and Cities	Existing
CVO	This refers to privately owned commercial vehicles that carry freight to support both interstate and intrastate commerce.	Trucking Association	Existing
CVO Inspection Stations	Commercial vehicle inspection stations are responsible for the inspection of commercial vehicles traveling in the region.	SC Department of Public Safety	Existing
CVO Parking Facilities	This refers to parking facilities at rest areas, truck stops and inspection stations for commercial vehicles.	SC Department of Public Safety	Existing
		SCDOT (rest areas only)	Existing
DHEC	The South Carolina Department of Health and Environmental Control (DHEC) is responsible for public health and environment. DHEC among other things responds to environmental emergencies.	DHEC	Existing
DHEC Air Quality Sensors	This represents field devices owned by DHEC for air quality monitoring.	DHEC	Existing
DMV	This DMV provides commercial driver's license and vehicle registration in South Carolina.	Department of Motor Vehicles	Existing
Drawbridge Operations	Bridges open and close to allow marine traffic on navigable waters. The US Coast Guard determines the schedule for marine traffic and SCDOT bridge tenders operate the drawbridges.	SCDOT	Existing
Emergency Management Center	This refers to the Emergency Operations Center which is staffed during emergencies by critical personnel from responding agencies.	Emergency Management Division	Existing
Emergency Management Center (Local)	This refers to the Emergency Management Centers operated locally by the Counties/Cities and staffed during emergencies by critical personnel from responding agencies.	Counties and Cities	Existing
Event Promoter	Event Promoter refers to the agency that is responsible for marketing and organizing, live events such as concerts, festivals, sports, etc. These activities generate high-traffic demands	Regional Event Promoters	Existing
Financial Institutions	This refers to financial institutions that other entities will use to service electronic fare payment systems for tolls or transit.	Financial Institutions	Existing

Element Name	Element Description	Stakeholder	Element Status
Forestry Commission Database	This refers to the permits database for controlled burns of forest in South Carolina	South Carolina Forestry Commission	Existing
Infrastructure Monitoring Equipment	This refers to equipment used to monitor the safety and security of key infrastructure elements such as motion sensors, infrared cameras and CCTV cameras. Project SeaHawk is an example instituted in 2003 by Congress for Port of Charleston to enhance port security operations.	SC Department of Public Safety	Existing
ITS Field Equipment	This refers to ITS devices such as CCTV cameras, DMS, HARs that are deployed by the roadside for monitoring, traveler information, or traffic control etc.	SCDOT	Existing
Local DPW	This refers to the maintenance departments for the local municipalities and counties engaged in road infrastructure and control devices maintenance.	Department of Public Works	Existing
Local Police/Sheriff	This refers to the law enforcement agencies of the towns, cities, and municipalities.	Counties and Cities	Existing
Local TMC (Future)	This refers to a future traffic management center that is set up by SCDOT to manage regional traffic in the area.	SCDOT	Planned
Media	This refers to agencies that own newspapers, radio, television and other social media that can be used to disseminate information.	Media	Existing
MPO	A metropolitan planning organization (MPO) is a federally mandated and federally transportation policy-making organization made up of representatives from local government and transportation authorities. MPO's is required in urbanized areas with a population of over 50,000 people. MPOs facilitate collaboration in the transportation planning process. There are eleven (11) MPOs in South Carolina.	Metropolitan Planning Organizations	Existing
MPO Database	This refers to the database of the metropolitan planning organizations that contain transportation data for planning and decision making.	Metropolitan Planning Organizations	Existing
NOAA	NOAA provides information to the public about extreme weather events and provides forecasts and landfalls of hurricanes.	NOAA	Existing
Other Public Safety Agencies	This represents the local public safety agencies such as fire services and emergency medical responders that respond to emergencies and incidents.	Counties and Cities	Existing
Ports	Ports are intermodal facilities especially for the movement of freight and commercial vehicle operations.	Ports	Existing
Public	This refers to the general public using the transportation system inclusive of pedestrians, bicyclists, motorists, etc.	Public	Existing
Public Transit Management Center	This refers to all transit agencies including paratransit service in urbanized and rural areas.	Public Transit Providers	Existing

Element Name	Element Description	Stakeholder	Element Status
Public Transit Vehicles	This refers to the public transit vehicles equipped with ITS devices such as automatic vehicle locator (AVL), automated passenger counting, fare management system, and transit information system.	Public Transit Providers	Existing
Rail Operations Center	This represents heavy rail operations in South Carolina that move containers and trailers to major consumer markets.	Rail Operators	Existing
SC 511	SC 511 is a traveler information system available via web, app and interactive voice response for up to date information on traffic, incidents, construction, etc.	SCDOT	Existing
SC Highway Patrol	The South Carolina Highway Patrol is part of the South Carolina Department of Public Safety and responsible for reducing the number and severity of traffic collisions through the diligent enforcement of all traffic laws and promotion of traffic safety. It also cooperates and communicates with other law enforcement agencies with common objectives and responds to emergencies and disasters with all available resources.	SC Department of Public Safety	Existing
SCDOT	South Carolina Department of Transportation is an arm of the South Carolina government responsible for state-wide transportation. SCDOT responsibilities include statewide transportation system planning, operations and maintenance.	SCDOT	Existing
SCDOT District Traffic Office	This refers to the SCDOT district office responsible for maintenance and traffic management in the district.	SCDOT	Existing
SCDOT TMC	This element represents the traffic operations center owned by SCDOT that is responsible for traffic management activities within the location of the TMC. SCDOT currently has TMC at Charleston, Columbia, Greenville, Myrtle Beach and Rock Hill. The typical activities include traffic monitoring, traffic data collection, operation of ITS elements (CCTV, DMS, etc.), detection and verification of incidents, traffic signal monitoring, and other traffic management related activities. This also includes communicating with other agencies, districts, TMCs, and DOT for roadway maintenance activities.	SCDOT	Existing
SCDOT Traffic Data Collection	This refers to the traffic data collection systems for long term traffic data (speed, classification and counts) collected by SCDOT. This includes permanent count stations as well as probe data collection.	SCDOT	Existing
SCDOT Traffic Engineering	South Carolina Department of Transportation Traffic Engineering is the division of SCDOT responsible for state-wide traffic engineering. The division's responsibilities include statewide transportation system traffic operations management. Some of the typical responsibilities include incident detection and response, evacuation planning and management, transportation data collection, management, and distribution for the local region as well as for the entire state.	SCDOT	Existing
SCDOT Transportation Database	This refers to the transportation database with planning operations and maintenance information to support decision making.	SCDOT	Existing
SCDOT WIMS	This refers to weigh-in-motion stations that are used by SCDOT to determine the axle weights of commercial vehicles.	SCDOT	Existing

Element Name	Element Description	Stakeholder	Element Status
SHEP Vehicles	This refers to the motorist assistance patrol vehicles operated by SCDOT and dispatched by the TMC to help during an incident or patrol the highways to help with rapid response.	SCDOT	Existing
Toll Systems	This refers to the electronic toll collection systems which operate at toll ways. South Carolina currently has two toll roads: the Greenville Southern Connector and the Cross Island Parkway.	SCDOT	Existing
Transit Fare Cards	This refers to smart cards with magnetic strips for fare payments (single ride, transfer cards, unlimited day or monthly passes).	Public Transit Providers	Existing
Traveler Interface	This refers to interactive systems that accepts traveler profile or requests and returns transit (route, schedule and fare), traffic or special event information to the traveler. This includes transit kiosks and interactive voice response (IVR) systems.	Public Transit Providers	Existing
Work Zone Monitoring	This represents ITS applications for work zone monitoring to enhance safety and throughput. The equipment includes portable devices such as DMS, CCTV Cameras, HAR, and queue detection systems.	SCDOT	Existing

ITS services describe what can be done to improve the efficiency, safety, and convenience of the statewide transportation system through advanced systems, better information, and new technologies. Some services are specific to one primary stakeholder while others require broad stakeholder participation. **Table 6** describes the ITS services that meet the transportation needs in the region. A complete description of each service package based on the national ITS architecture is available in the Turbo Architecture file.

The interfaces of the transportation systems in the architecture are based on the National ITS Architecture and tailored to reflect the plan for the statewide architecture. Architecture diagrams display the transportation systems in the South Carolina Statewide ITS Architecture and, more importantly, how these systems are and will be connected with one another so that information can be exchanged, and transportation services can be coordinated. Stakeholders may use these diagrams to identify integration opportunities. Each system in the region can be represented with two types of diagrams: an overall interconnect diagram and element specific architecture flow context diagrams, both described below.

The interconnect context diagram shows the connections between systems (i.e., Elements). Interconnects are represented as single lines and indicate information sharing without specifying the type of information being shared or the direction of the information movement, shown as planned or existing. An architecture flow context diagram shows a particular system and all other systems with which it is interconnected, the information being shared (i.e. architecture flows), and the direction of the flow. Descriptions of the architecture flows are included in **Appendix D**. The architecture flow, and interconnect context diagrams have been included within this document as part of **Appendix E**.

Table 6: ITS Services

Service Package	Service Package Name	Service Package Status	Included Elements
AD1	ITS Data Mart	Existing	Archived Data User
			COG Database
			County/City Database
			CVO
			Forestry Commission Database
			MPO Database
			Public Transit Management Center
			SCDOT Traffic Data Collection
			SCDOT Traffic Engineering
			SCDOT Transportation Database
AD2	ITS Data Warehouse	Existing	SCDOT Transportation Database
APTS01	Transit Vehicle Tracking	Existing	Public Transit Management Center
			Public Transit Vehicles
APTS02	Transit Fixed-Route Operations	Existing	COG
			MPO
			Public Transit Management Center
			Public Transit Vehicles
			SCDOT
APTS03	Demand Response Transit Operations	Existing	Public Transit Management Center
			Public Transit Vehicles
APTS04	Transit Fare Collection Management	Existing	Public Transit Management Center
			Public Transit Vehicles
			Transit Fare Card
			Traveler Interface
APTS05	Transit Security	Existing	911 Call Centers
			Emergency Management Center
			Emergency Management Center (Local)
			Infrastructure Monitoring Equipment
			Local Police/Sheriff
			Other Public Safety Agencies
			Public Transit Management Center
			Public Transit Vehicles
APTS06	Transit Fleet Management	Existing	Public Transit Management Center
			Public Transit Vehicles
APTS07	Multi-modal Coordination	Planned	Airports
			Public Transit Management Center
			Rail Operations Center
			SCDOT

Service Package	Service Package Name	Service Package Status	Included Elements
APTS08	Transit Traveler Information	Existing	Media
			Public
			Public Transit Management Center
			Public Transit Vehicles
			SC 511
			Traveler Interface
APTS09	Transit Signal Priority	Planned	Beaufort County ITS Devices
			Beaufort TMC
			County/City ITS Devices
			County/City/SCDOT Traffic Signal System
			ITS Field Equipment
			Local TMC (Future)
			Public Transit Management Center
			Public Transit Vehicles
			SCDOT TMC
			SCDOT Traffic Engineering
APTS10	Transit Passenger Counting	Existing	Public Transit Management Center
			Public Transit Vehicles
ATIS01	Broadcast Traveler Information	Existing	911 Call Centers
			Beaufort TMC
			County/City Websites
			DMV
			Event Promoter
			Local TMC (Future)
			Media
			SC 511
			SCDOT TMC
			SCDOT Traffic Engineering
ATIS02	Interactive Traveler Information	Existing	Airports
			Event Promoter
			Public
			Public Transit Management Center
			SC 511
			Traveler Interface
ATIS04	Dynamic Route Guidance	Existing	Beaufort TMC
			Local TMC (Future)
			Public Transit Management Center
			SCDOT TMC
ATIS06	Transportation Operations Data Sharing	Existing	Airports

Service Package	Service Package Name	Service Package Status	Included Elements
			Beaufort TMC
			CVO Parking Facilities
			Local TMC (Future)
			Public Transit Management Center
			Rail Operations Center
			SCDOT District Traffic Office
			SCDOT TMC
			SCDOT Traffic Engineering
ATMS01	Network Surveillance	Existing	Beaufort County ITS Devices
			Beaufort TMC
			County/City ITS Devices
			ITS Field Equipment
			Local TMC (Future)
			SCDOT District Traffic Office
			SCDOT Signal System
			SCDOT TMC
			SCDOT Traffic Engineering
ATMS03	Traffic Signal Control	Existing	Beaufort County ITS Devices
			Beaufort TMC
			County/City ITS Devices
			County/City/SCDOT Traffic Signal System
			ITS Field Equipment
			Local DPW
			Local TMC (Future)
			SCDOT District Traffic Office
			SCDOT TMC
ATMS04	Traffic Metering	Planned	Beaufort TMC
			ITS Field Equipment
			Local TMC (Future)
			SCDOT TMC
			SCDOT Traffic Engineering
ATMS06	Traffic Information Dissemination	Existing	Beaufort County ITS Devices
			Beaufort TMC
			County/City ITS Devices
			ITS Field Equipment
			Local TMC (Future)
			Media
			SC 511
			SCDOT TMC

Service Package	Service Package Name	Service Package Status	Included Elements
			SCDOT Traffic Engineering
ATMS07	Regional Traffic Management	Existing	Beaufort County ITS Devices
			Beaufort TMC
			County/City ITS Devices
			County/City/SCDOT Traffic Signal System
			ITS Field Equipment
			Local DPW
			Local TMC (Future)
			SCDOT District Traffic Office
			SCDOT TMC
			SCDOT Traffic Engineering
ATMS08	Traffic Incident Management System	Existing	911 Call Centers
			Beaufort County ITS Devices
			Beaufort TMC
			County/City ITS Devices
			Emergency Management Center
			ITS Field Equipment
			Local DPW
			Local Police/Sheriff
			Local TMC (Future)
			Media
			Rail Operations Center
			SC 511
			SCDOT District Traffic Office
			SCDOT TMC
			SCDOT Traffic Engineering
			SHEP Vehicles
ATMS09	Transportation Decision Support and Demand Management	Existing	Beaufort TMC
			Local TMC (Future)
			Public Transit Management Center
			SCDOT District Traffic Office
			SCDOT TMC
			SCDOT Traffic Engineering
ATMS10	Electronic Toll Collection	Existing	Financial Institutions
			SCDOT
			Toll Systems
ATMS11	Emissions Monitoring and Management	Existing	Air Quality Management System
			DHEC Air Quality Sensors
			DMV

Service Package	Service Package Name	Service Package Status	Included Elements
			ITS Field Equipment
			SCDOT
ATMS13	Standard Railroad Grade Crossing	Existing	ITS Field Equipment
			SCDOT TMC
			SCDOT Traffic Engineering
ATMS15	Railroad Operations Coordination	Existing	Beaufort TMC
			Local TMC (Future)
			SCDOT TMC
			SCDOT Traffic Engineering
ATMS16	Parking Facility Management	Existing	COG
			CVO Parking Facilities
			ITS Field Equipment
			MPO
			SCDOT Traffic Engineering
			Toll Systems
ATMS17	Regional Parking Management	Planned	Airports
			COG
			CVO Parking Facilities
			MPO
			Public Transit Management Center
			SCDOT TMC
			SCDOT Traffic Engineering
ATMS20	Drawbridge Management	Existing	Drawbridge Operations
			ITS Field Equipment
			SCDOT District Traffic Office
			SCDOT TMC
			SCDOT Traffic Engineering
ATMS22	Variable Speed Limits	Existing	ITS Field Equipment
			SCDOT TMC
			SCDOT Traffic Engineering
ATMS25	VMT Road User Payment	Existing	Financial Institutions
			Public
			SCDOT
			Toll Systems
CVO01	Carrier Operations and Fleet Management	Existing	CVO
			Ports
CVO02	Freight Administration	Existing	CVO
			CVO Inspection Stations
			Ports
			SC Highway Patrol

Service Package	Service Package Name	Service Package Status	Included Elements
CVO03	Electronic Clearance	Existing	CVO
			CVO Inspection Stations
			SC Highway Patrol
			SCDOT Traffic Engineering
			SCDOT WIMS
CVO04	CV Administrative Processes	Existing	CVO
			DMV
			SC Highway Patrol
CVO06	Weigh-In-Motion	Existing	CVO
			CVO Inspection Stations
			SC Highway Patrol
			SCDOT Traffic Engineering
			SCDOT WIMS
CVO07	Roadside CVO Safety	Existing	CVO
			CVO Inspection Stations
			SC Highway Patrol
			SCDOT WIMS
CVO10	HAZMAT Management	Existing	CVO
			DHEC
			Emergency Management Center
			Emergency Management Center (Local)
			Local TMC (Future)
			Other Public Safety Agencies
			Ports
			SC Highway Patrol
			SCDOT TMC
			SCDOT Traffic Engineering
EM01	Emergency Call-Taking and Dispatch	Existing	911 Call Centers
			Local Police/Sheriff
EM02	Emergency Routing	Existing	911 Call Centers
			Beaufort TMC
			Local TMC (Future)
			SCDOT TMC
EM04	Roadway Service Patrols	Existing	Local TMC (Future)
			SCDOT TMC
			SHEP Vehicles
EM05	Transportation Infrastructure Protection	Existing	Emergency Management Center
			Infrastructure Monitoring Equipment
			Other Public Safety Agencies

Service Package	Service Package Name	Service Package Status	Included Elements
			SC Highway Patrol
			SCDOT
EM06	Wide-Area Alert	Existing	911 Call Centers
			Emergency Management Center
			ITS Field Equipment
			Media
			Other Public Safety Agencies
			Public
			SC 511
			SCDOT TMC
EM07	Early Warning System	Existing	911 Call Centers
			DHEC
			Emergency Management Center
			Emergency Management Center (Local)
			Infrastructure Monitoring Equipment
			Local Police/Sheriff
			NOAA
			Other Public Safety Agencies
			SCDOT TMC
EM08	Disaster Response and Recovery	Existing	911 Call Centers
			COG
			DHEC
			Emergency Management Center
			Emergency Management Center (Local)
			Local DPW
			Local Police/Sheriff
			Other Public Safety Agencies
			SC Highway Patrol
			SCDOT District Traffic Office
			SCDOT TMC
			SCDOT Traffic Engineering
EM09	Evacuation and Reentry Management	Existing	911 Call Centers
			Beaufort TMC
			COG
			Emergency Management Center
			Local DPW
			Local Police/Sheriff
			Local TMC (Future)
			Other Public Safety Agencies

Service Package	Service Package Name	Service Package Status	Included Elements
			Public Transit Management Center
			SC Highway Patrol
			SCDOT District Traffic Office
			SCDOT TMC
			SCDOT Traffic Engineering
EM10	Disaster Traveler Information	Existing	911 Call Centers
			Beaufort TMC
			County/City Websites
			Emergency Management Center
			Media
			Public
			SC 511
			SCDOT TMC
MC03	Road Weather Data Collection	Existing	Beaufort TMC
			County/City ITS Devices
			DHEC Air Quality Sensors
			ITS Field Equipment
			Local TMC (Future)
			SCDOT District Traffic Office
			SCDOT TMC
MC04	Weather Information Processing and Distribution	Existing	Media
			NOAA
			SCDOT District Traffic Office
			SCDOT TMC
			SCDOT Traffic Engineering
MC07	Roadway Maintenance and Construction	Existing	COG
			Local DPW
			SCDOT
			SCDOT District Traffic Office
MC08	Work Zone Management	Existing	Beaufort County ITS Devices
			Beaufort TMC
			County/City ITS Devices
			ITS Field Equipment
			Local Police/Sheriff
			Media
			SC 511
			SCDOT TMC
			SCDOT Traffic Engineering
			Work Zone Monitoring
MC09	Work Zone Safety Monitoring	Planned	ITS Field Equipment

Service Package	Service Package Name	Service Package Status	Included Elements
			Local DPW
			SCDOT Traffic Engineering
			Work Zone Monitoring
MC10	Maintenance and Construction Activity Coordination	Existing	Local DPW
			SCDOT
			SCDOT District Traffic Office
MC12	Infrastructure Monitoring	Existing	ITS Field Equipment
			Local DPW
			SCDOT
			SCDOT Traffic Data Collection

3.4 FUNCTIONAL REQUIREMENTS

The functional requirements describe what the Statewide ITS has to do. To enable an advanced transportation management system to meet user needs in South Carolina, each stakeholder operating elements of the ITS must perform specific functions. The functional requirements were developed based on the National ITS Architecture framework with the aid of the Turbo ITS Architecture Software. The functional requirements can be defined at a high-level based on subsystems or more detailed level based on the service packages. The architecture flows between the elements shows the data and communication exchanges required between elements. **Table 7** is a sample of the functional requirements. A complete list of the functional requirements for the Statewide ITS Architecture is available in the Turbo Architecture source file.

Table 7: Functional Requirements (Sample)

Element Name	Entity Name	Functional Area	Functional Area Description	Requirement ID	Requirement
911 Call Center	Emergency Management	Emergency Call-Taking	Provides an interface to the emergency call-taking systems such as the Emergency Telecommunications System (e.g., 911) that correlate call information with emergencies reported by transit agencies, commercial vehicle operators, or other public safety agencies. This allows the operator to verify the incident and forward the information to the responding agencies.	1	The center shall support an interface to the Emergency Telecommunications System (e.g. 911 or 7-digit call routing) to receive emergency notification information and provide it to the emergency system operator.
				2	The center shall receive emergency call information from 911 services and present the possible incident information to the emergency system operator.
				3	The center shall receive emergency call information from motorist call-boxes and present the possible incident information to the emergency system operator.
				4	The center shall receive emergency call information from mayday service providers and present the possible incident information to the emergency system operator.
				5	The center shall receive emergency notification information from other public safety agencies and present the possible incident information to the emergency system operator.
				6	The center shall receive emergency notification information from public transit systems and present the possible incident information to the emergency system operator.
				7	The center shall coordinate, correlate, and verify all emergency inputs, including those identified based on external calls, internal analysis of security sensor, and monitoring data.
				8	The center shall send a request for remote control of CCTV systems from a traffic management center in order to verify the reported incident.
				9	The center shall forward the verified emergency information to the responding agency based on the location and nature of the emergency.
				10	The center shall update the incident information log once the emergency system operator has verified the incident.

3.5 AGREEMENTS

Institutional agreements are required to identify the operations and maintenance funding, identify the roles and responsibilities of the stakeholders in the operations and maintenance, and interface management of the ITS systems. All stakeholders required to provide resources for the efficient operation of the system must identify and document interagency commitments. For instance, the interfaces and data flows between stakeholders identified with the Turbo Architecture software should be backed by agreements to establish parameters for such information exchange if one does not exist. These agreements are required for traffic management, incident management, emergency management, and other functions to implement, operate and maintain an advanced transportation management system. Formal agreements may be required between stakeholders for systems integration and access to databases. There are several types of agreements that may be implemented: memorandum of understanding (MOU), cooperative endeavor agreements (when the exchange of funds is involved), interagency and intergovernmental agreements, and master agreements. These agreements should be revised periodically as the needs of the region evolve; new stakeholders come on board or agency functionalities change. Advancements in technology over time may require some agreements to be revised and or new ones made. **Table 8** summarizes the existing and proposed agreements for the South Carolina Statewide ITS Architecture.

Table 8: Summary of Agreements

Title	Agencies Involved	Deliverables/Activities
EXISTING		
Signal Maintenance Agreement	SCDOT and Cities	Maintaining SCDOT signals (signal installation, modifications to existing, operation of signals and updating TSI)
Beaufort County ITS-TIM	Beaufort County - SCDOT	Incident response and traffic management
Video Broadcasting	SCDOT – Local Television Stations	Access to streaming video
TEAMS Data Use Agreement	SCDOT – MPO's, Counties, Consultants	Signal stakeholders have limited access to signal inventory information, and ability to add signal plans, timing plans and count data.
I-95 Corridor Coalition	I-95 Corridor	Data collection and sharing
PLANNED		
TBD	SCDOT – Local Governments	Traffic incident management

Title	Agencies Involved	Deliverables/Activities
TBD	SCDOT – City of Greenville	Incident response and traffic management

4.0 USER SERVICES AND ITS INVENTORY

User services describe what should be provided from the transportation system from the perspective of the User. This follows from the existing ITS system and the gaps that need to be bridged to meet desired user and stakeholder needs. South Carolina currently has deployed some ITS devices for operations. **Table 9** and **Table 10** provide an inventory of the ITS field devices and traffic signal systems respectively. There are several user packages that are described in the national ITS architecture framework. The user services are aggregated into eight (8) distinct functional groups: travel and traffic management; public transportation management; electronic payment; commercial vehicle operations; emergency management; advanced vehicle safety systems; information management; and maintenance and construction management. These define the high-level services that are typically provided to address identified problems.

Table 9: ITS Field Device Count

Region/Owned By	TMC	SHEP	CCTV Cameras	DMS	VSLS	Portable VMS	HAR	Cell Modems	Detectors	Toll System
Columbia	1	Yes	97	22						
Greenville/Gaffney	1	Yes	132	11	2					
Rock Hill	1	Yes	28	3						
Florence		Yes	41	12						
Charleston	1	Yes	73	10						
Myrtle Beach	1	Yes	30	30						
TOTAL (SCDOT)	5		371	58	2	75	30	180	1200 mi (Probes)	1
Beaufort	1	No	85				12			

Table 10: Traffic Signal Systems

Maintained By*	Number of Signals
SCDOT District 1	557
SCDOT District 2	286
SCDOT District 3	678
SCDOT District 4	322
SCDOT District 5	468
SCDOT District 6	244
SCDOT District 7	172
Aiken	71
Anderson	83
Beaufort	37
Beaufort County	34
Charleston	200
Columbia	214
Greenville	187
Hilton Head	23
Mount Pleasant	53
Myrtle Beach	50
North Augusta	32
North Charleston	54
Rock Hill	112
Spartanburg	131

*Information about SCDOT device counts was obtained from SCDOT, TEAMS, July 29, 2014

4.1 TRAVELER INFORMATION

Traveler information refers to the system for disseminating traffic and related information to travelers. This includes traffic conditions such as congestion, incident information, travel time, road weather, etc. Traveler information can be dispersed pre-trip or en-route. Websites such as the 511 can be used to obtain network status before a trip. Dynamic message signs (DMS) are roadway devices that are also used to disseminate information to en-route drivers. There are also apps available on smartphones that can be used to access traveler information both pre-trip and en-route. Other methods include highway advisory radio (HAR), partnerships with media (radio, television) and other information service providers

(ISP). SCDOT uses a mix of traveler information tools to disseminate traffic related information. These include DMS, 511 website and app, HAR and the media.

The benefits of traveler information cannot be overemphasized and indeed it is critical to the success of advanced transportation management. When appropriate traffic information reaches travelers in a timely manner, especially pre-trip, it helps travelers make decisions on 1) the need for a trip, 2) the best time for the trip, 3) the best mode for the trip. This traveler decision-making based on good traffic information will optimize travel times and modes. For example: if travelers choose to defer the trip to a less congested period, this will help reduce emissions and improve network performance.

En-route traveler information will also help travelers to alter routes to avoid congested areas or incidents, and that can improve incident response and recovery time. Also keeping travelers informed of incidents downstream that are causing heavy delays will reduce stress for the traveling public and may improve safety.

4.2 FREEWAY MANAGEMENT

ITS for freeway management refers to the implementation of technology, policies, strategies or programs to improve freeway performance. The goals of freeway management include improving safety, mobility, environmental quality, and incident management among others. Use of ITS technologies for freeway monitoring, congestion/incident detection, operate barrier systems or ramp meters for travel demand management can help improve mobility and travel time reliability of a corridor. Other freeway management strategies include implementation of high-occupancy vehicle (HOV) lanes, managed lanes, and reversible lanes.

South Carolina uses a range of management strategies and devices for freeway management within the state. There are several TMCs within the state that monitor detection and monitoring systems on the freeways for congestion and incident management. Diverse traveler information systems such as HAR, DMS, and 511 websites are used to disseminate travel advisories. Video distribution system is in place to share live traffic images with allied stakeholders for a coordinated incident and emergency response. SCDOT has also provided motorist assistance program (SHEP) to provide rapid response to stalled vehicles or incidents and enhance safety of travelers. Also, vehicle detection (probe) data is available throughout the state on major state routes. This data provides for travel times as well as incident detection.

The benefits of freeway management include congestion mitigation and enhanced traveler safety. Freeway management is critical during emergencies to help evacuate residents to safety in a timely manner. Predictive tools can help traffic engineers better manage freeways by using management strategies that will preempt foreseen issues with safety or congestion.

4.3 ARTERIAL MANAGEMENT

Arterial management refers to the use of strategies that will enhance the movement of travelers in arterial corridors. ITS technology such as vehicle detection and communication to signal controllers can be used to enhance the performance of a signalized corridor. Traffic detection data can be used to develop time-of-day signal timing plans to optimize intersection performance thereby improving the

travel time through the corridor. Responsive and adaptive traffic signal controllers can optimize the flow at intersections based on demand. Signal systems that are coordinated can facilitate the movement of traffic and emergency vehicles (emergency vehicle preemption) and transit vehicles (transit signal priority) through the corridor with little delay. The safety of pedestrians and bicyclists can also be enhanced with the use of detection systems. These objectives cannot be achieved without a robust communication system for signals.

South Carolina has coordinated signal systems with advanced detection and controller communication to facilitate management of some critical arterial corridors. Signal timing plans have been developed for implementation during emergencies or major incidents on the freeway that will affect regional travel. SCDOT has developed 511-traveler information system (web, telephone, and app) that provides travel advisories along key arterial routes from the beach inland. The “Reach the Beach" system, provides travel time information to and from the beach from various exit points on I-95 and Columbia.

The benefits of arterial management include improved mobility and reduction in travel delay, improved safety and reduced emissions. There is also an economic boost since arterials provide access to land use and many socio-economic activities.

4.4 INCIDENT MANAGEMENT

Incidents refer to the ITS systems and strategies that are used to manage incidents that occur on the roadway. Incidents can range from an object falling off a moving vehicle, crashes among vehicles with the potential loss of life, structural failure, or extreme weather (snow, fog, smoke, etc.). The severity of the incident significantly impacts operations, and the effects of delay may linger long after the incident is cleared. Also, incidents can lead to secondary incidents especially rear end collisions at the back of the queue and added environmental emissions due to delay. Incidents may reduce the capacity of the roadway when a lane is blocked. The random nature of incidents can be a challenge for travel time reliability. The ITS technologies used for incident management include detectors and CCTV cameras that can be used for speed detection and incident verification. Advanced algorithms can be used to automate the detection.

South Carolina has deployed many CCTV cameras and traffic detection systems that help with incident detection, verification, and response. SHEP vehicles provide rapid response and help secure the incident location and safeguard the traveling public. The video sharing program helps 911 Dispatch and emergency response to assess the severity of crashes and provide the requisite resources for incident management. The traveler information system (DMS, HAR, 511, and the media) are used to inform travelers of incidents, and alternate route information is also provided.

The benefits in incident management include faster incident detection and response times which help save lives in crashes with severe injuries. Also the sooner the incident is cleared, the shorter the time required to dissipate any queues that typically result from blocked lanes. Secondary incidents can be reduced when incidents are cleared rapidly.

4.5 ELECTRONIC TOLL/FARE COLLECTION

Electronic toll/fare collection refers to the use of technology to enhance toll/fare collection and reduce delays associated with toll plazas, transit vehicles, or other services between the traveler and transportation service provider. Electronic payment systems use roadside or on-board devices with communications for transactions. Automated tolling systems that can operate at freeway speed improve performance, improve safety, and reduce emissions. In transit systems, electronic fare collection systems can reduce dwell times especially when smart cards are used and improve schedule adherence.

South Carolina has two toll-road facilities: the Cross Island Parkway and the Greenville Southern Connector. Electronic toll collection systems have been deployed and the Palmetto Pass can be used to pay tolls on both the Southern Connector and the Cross Island Parkway.

The electronic toll/fare collection system has several advantages including faster processing time, fewer delayed stops, and fewer emissions.

4.6 EMERGENCY MANAGEMENT

Emergency operations involve managing the roadway system during and after disasters such as extreme weather. The management strategies are similar to that of incident management except that the scale of interruption to transportation services may be regional coupled with the urgency to save lives. Emergency management may be activated because of extreme weather (hurricane, flooding, snow, etc.) industrial and HAZMAT disasters or terrorism. Early warning systems are very critical to the success of emergency management strategies. Traveler information systems will be used to warn travelers of impending dangers. DMS, HAR, television and radio, as well as the 511 website and phone service and apps, will be required for traveler information. A multi-faceted approach is required in order to reach a greater proportion of the traveling public. Response plans and emergency management strategies must be developed by stakeholders and secure communication to ensure interoperability of agency systems is required.

South Carolina has emergency management systems in place for hurricane evacuation. There are many agencies that are activated to coordinate emergency response activities, and the Emergency Management Division provides oversight. The ITS deployments used for freeway and arterial management discussed in **Section 4.2, Section 4.3** and **Section 4.4** all apply to emergency management except that during emergencies the scale of involvement of emergency personnel and resources are greater. An ITS Technology development that may be important to emergency management is a GPS-based smartphone app currently being developed by SCDOT that will help travelers find fast evacuation routes based on current location.

Advance Warning Systems are an important element of the State's Emergency Management system. The more advance warning given, the more lives will be saved. By providing more advance warning the residents will have more time to evaluate to safer locations.

4.7 COMMERCIAL VEHICLE OPERATION

Commercial vehicle operations (CVO) refer to the use of ITS applications to enhance the movement of freight on the roadway system in a safe and fast manner. The technologies available include electronic credentialing (CVISN, PRISM), weigh-in-motion (WIM) systems, and fleet management using automatic vehicle location (AVL) systems. These systems enable safety information exchange, electronic credentialing, and electronic screening of commercial vehicles. Vehicles that pose a threat to travelers and can damage the infrastructure can be identified and addressed.

South Carolina has three weigh-in-motion facilities that provide electronic screening of commercial vehicles (I-85 near Townville, I-26 near Harleyville and I-95 in Dorchester County). The I-95 station is capable of screening commercial vehicles at highway speed and can, therefore, be used to target non-compliant commercial vehicles.

Use of ITS technology for CVO will enhance the operational efficiency of commercial vehicles, enhance safety for all users, and ensure travel time and delivery reliability which is critical to the freight and manufacturing industry. Commercial vehicle operators can be better monitored to ensure they meet federal regulations. Also, HAZMATs can be better tracked, and any deviation from assigned route promptly detected.

4.8 COMMUNICATIONS AND DATA MANAGEMENT

The national ITS architecture describes three layers: institutional, transportation, and communications. The communications layer is a vital component for the successful implementation of advanced transportation management system. The ability for all stakeholders to exchange information in a timely manner is critical for incident management, emergency operations and daily traffic management. Communication assets include telephone, email and fax for inter-agency communications. The reliability of communications assets is very important especially during emergency operations.

South Carolina has diverse communications assets for center-to-center and center-to-field communications to support advanced transportation management. The assets include fiber optics, wireline and wireless communication for data exchange between stakeholders and ITS field devices.

A reliable communication system is critical to ITS deployments to facilitate real-time traffic operations. It will support better data exchange and secure information sharing especially during emergencies.

4.9 TRANSIT MANAGEMENT

Transit management refers to the deployment of technologies and strategies that will enhance the efficiency of transit operations, safety, and the rider experience. Transit includes but is not limited to buses, commuter rail, light rail, bus paratransit, and ferryboats. There are several technologies that can be deployed for transit use; these include transit computer aided dispatch, vehicle tracking, expected arrival time information, electronic request of transit service and payment, transit signal priority, and multimodal coordination.

Generally, ITS related to transit applications can be divided into two categories: intelligent infrastructure systems and intelligent vehicle systems. Intelligent infrastructure systems refer to ITS deployments for arterial and freeway management, electronic payment, information management, traveler information, etc. Intelligent vehicle systems include vehicle safety monitoring, driver safety monitoring, advanced vehicle longitudinal control, collision avoidance systems, etc. The goal of these two types of ITS deployments for transit applications is to improve safety, mobility, efficiency, economic growth, environmental stewardship, security, and organizations excellence[6]. For instance surveillance at transit facilities and on transit vehicles enhance security. ITS deployments in the area of detection systems can also help transit operators be aware of passengers and other obstacles that can lead to crashes.

There are several possible benefits that may occur by improving the transit system and management using ITS. Ridership improvements can generate more revenue. Transit is critical in congestion mitigation and an important component in integrated corridor management strategy. For many people, transit is the only means to access employment and other social services. Transit provides mobility for adults and children who do not own automobiles or cannot drive. The importance of transit in the socio-economic development of any region cannot be overestimated. During emergencies (natural or artificially induced) public transit plays a key role by providing transportation to evacuate residents to safe locations. Transit helps to reduce mobile source emissions on roads and contributes to environmental preservation.

4.9.1 South Carolina Transit System

In South Carolina, transit is predominantly bus transit, and therefore the related ITS discussion for transit management focuses on application to bus transit. However, the concepts described are also applicable to other modal options (commuter rail, light rail, ferryboat, etc.). South Carolina has 28 bus public transit providers that serve the general travel needs of the public. The Multimodal Transportation Plan[7] provides an overview of the existing transit system including trends in transit use, service, expenditures, and efficiency. Generally, the public transit system can be classified as urban or rural. Seven (7) of the twenty eight (28) transit agencies operate exclusively as urbanized system, seventeen (17) as exclusively rural or non-urbanized, and four (4) offer both urban and rural service. The service options available to the public include fixed route, route deviation, paratransit, and commuter buses. See **Appendix B** for brief description of the transit agencies and the type of service offered to the public. The fixed route operations are typically used in the urbanized areas and the paratransit service is available in both urbanized and rural areas.

South Carolina is also serviced by two class A intercity bus carriers – Greyhound Lines and Southeastern Stages. These carriers have destinations in the cities of Columbia, Greenville, Myrtle Beach, and Orangeburg with connections to other regional destinations. Megabus which provides intercity bus

[6] http://www.fta.dot.gov/12351_7639.html (accessed 9/23/2014)

[7] South Carolina Statewide Public Transportation and Coordination Plan (November 2014)

service also started service in/out of Columbia in 2014. A comprehensive discussion of intercity and regional bus network plan has been published by SCDOT[8].

4.9.2 Statewide and Regional Transit Needs

The key stakeholders in public transit in South Carolina are listed below:

- SCDOT Intermodal and Freight Programs, Office of Public Transit
- South Carolina Department of Health and Human Services
- Regional Council of Governments (COG)
- Regional Transit Agencies (Statewide)
- Human Service Program Delivery Offices
- Non-Emergency Medical Transportation Brokers

A review of regional and statewide transit needs that could enhance the efficiency of day-to-day operations are discussed below. In addition to that, South Carolina lies on the eastern seaboard of the United States and therefore prone to hurricane emergencies which require mass evacuation of residents from coastal areas inland. Public transit is the only mode available to some residents for evacuation during such emergencies. This contingency underscores the need for a robust transit system that meets the challenges of day-to-day socio-economic activities and emergency management. Transit stakeholders review existing transit operations and management systems and provided Statewide and regional needs in transit operations and management listed below:

- Public transportation information management
    - Real-time
    - Shared between transit and regional or state program/project management agencies
- Travel and traffic management
- Data collection and reporting
- Operational efficiency
- Service delivery coordination
- Asset management
- Fleet maintenance
- Safety and security
- Emergency management, and
- Passenger travel information system

[8] South Carolina Statewide Intercity and Regional Bus Network Plan Final Report (May 2012)

These needs are discussed in subsequent sections below and **Table 7** includes potential transit projects that can be undertaken to address these transit needs in South Carolina.

4.9.2.1 Public Transportation Information Management

Information exchange between transit operators and regional or state program/project management agencies is critical to efficiently administer and manage the transit system. Transit data is important to evaluate the performance of programs or projects that have been implemented. Sharing archived data between stakeholders can be used to develop for instance operational strategies that will optimize efficiency. Real-time transit information is also critical for daily operations of the transit system. For instance, if a transit bus is running late, measures can be taken to mitigate its impact on riders and transit system as a whole. This will require investment in software, hardware, and communication systems to collect and share real-time transit information with regional and state management agencies.

4.9.2.2 Passenger Traveler Information System

Real-time transit information is desired for operations and management. Traveler information systems may be classified as pre-trip, in-terminal or wayside, and in-vehicle. Traveler information system may consist of display monitors at terminals showing route number, destination, departure time, departure bay, expected arrival time, and real-time transit status. The proliferation of smartphones usage makes it possible to push this information to the general public wherever they may be through the use of apps or the web for travel or trip planning. Such real-time transit information is important to riders for both pre-trip and en-route planning.

4.9.2.3 Travel and Traffic Management

Traffic demand management refers to the strategies used to influence the public and travel patterns. Travel trips made using transit is only a fraction of automobile based trips in many parts of the county and this leads to congested corridors often with transit vehicles virtually empty traveling side by side with automobiles. To optimize the use of all transportation assets to ensure all modes are being used efficiently, an integrated management approach is required. The TMCs monitor traffic in real time and implement demand management strategies by providing congestion, travel time and alternate routing information. Public transit is an integral part of any congestion mitigation strategy and can be used effectively to reduce travel demand in a corridor or the network. For instance, information about transit status, park-and-ride facilities, use of HOV lanes and vanpools can be shared with travelers to reduce single occupancy vehicles on the network. Posting real-time transit information including expected time of arrival of transit vehicles at park-and-ride facilities will encourage the public to use transit and reduce automobile based trips.

4.9.2.4 Data Collection and Reporting

Performance measurement is important for transit providers to evaluate efficiency, effectiveness, and quality of services provided to riders. This information is used for planning and system improvements or modernization. Data is required to develop performance measures, and therefore obtaining the appropriate data for performance measurement is critical to transit improvements. Some of the key performance measures are passenger trips per revenue hour, operating cost per revenue hour,

operating cost per passenger trip, and fare recovery ratio. Transit providers are also required to provide data for the national transit database (NTD). The quality of data put in the NTD is as good as the type of data and the method used in data collection, analysis, management, and reporting. Data collection can be manual or automated. Automated data acquisition systems with automated quality checks reduce the administrative burden to improve transit operations and management as well as meeting federal requirements. A public transit management system (PTMS) when implemented provides a rich source of data with reporting capabilities.

4.9.2.5 Operational Efficiency

There are many components of transit systems that need to work together to make transit systems work efficiently and attract riders of choice in order to enhance revenue which in turn can be reinvested into transit operations to improve operational efficiency. Toward this goal there are several technologies that can be deployed for an advanced public transportation system.

Transit arrival time reliability is critical to patronage and revenue generation. Automatic vehicle location (AVL) systems and geographic information systems help transit fleet managers to identify the location of the transit vehicle in real-time. The system can be configured with schedule adherence software that can inform the driver and the transit center if the vehicle is on-time, late or early at each stop. The transit management center can recommend appropriate action that will enhance operational efficiency. For instance, in the event that an incident disrupts service, the dispatcher can respond appropriately by sending another vehicle or undertaking other service adjustment as desired. Information about any service change can be communicated to riders and other transit users in a timely fashion. Furthermore AVL can facilitate response to transit security breach or other emergency related to passenger safety.

Automatic passenger counters (APCs) are electronic devices that count the number of passengers boarding or disembarking at each stop. It also records deployment of wheelchair lifts and bike rack utilization. The information collected per trip, geo-referenced (with aid of AVL and GIS) and time stamped. The data can be downloaded for further analytics. Data from APC can be used for transit planning and to determine schedule adherence and develop robust schedules.

Computer aided dispatch (CAD) systems help transit agencies operations planning including vehicle service. CAD systems enable transit schedulers to optimize vehicle trips and minimize passenger wait times. In the event of service disruptions, CAD systems help dispatchers to reroute vehicles and protect transfer connections. CAD systems can be interconnected with multiple transit agencies for service coordination. For instance a multimodal coordination system between transit agencies can enhance user experience at transfer points and improve operational efficiency. CAD systems are used to automate reservations, billing, and reporting.

Electronic fare collection systems are electronic payment systems used for transit fare collection on-board transit vehicles and at transit stops or terminals. A transit rider may use a bank card to pay for transit fares or purchase a smart card that can be used to pay the fares on transit vehicles. An integrated electronic payment system may use a single smart card to also pay for parking and tolls or any transportation service. The proliferation of smartphone usage and capabilities is opening opportunities for the public to use payment systems based on near field communications (NFC) for contactless transactions and data exchange. This could eliminate the use of fare cards for transit payments.

4.9.2.6 Service Delivery Coordination

Transit service delivery coordination will help improve transportation services by unifying all the services provided by transit providers in the state in the area of management and delivery of service. Coordination can be achieved at different levels such as administrative, operational or service delivery. For example transit agencies may collaborate and share infrastructure and resources such as vehicle fueling, maintenance, training etc. to minimize the cost of developing separate infrastructure or programs. Diverse transit providers can be brought under one management entity for delivery coordination. This entity will manage all transit affairs within the state.

Another approach is to use another entity (a broker) to unify delivery of transportation services between the independent transit agencies and the public. A broker can be used as a one-stop-shop to access transit services from all the participating transit agencies throughout the state to address an individual's unique transportation needs. A proof of concept special project was initiated by USDOT in a few places around the country including Aiken, South Carolina. Under the Mobility Services for All Americans (MSAA) Initiative, Aiken, South Carolina was selected for demonstration of travel management coordination. Many seniors, persons with disabilities and economic challenges depend heavily on public transportation to access basic needs including healthcare, employment, grocery stores, and other social activities. However, the transportation options available are often administered by different agencies and are uncoordinated. This leads to limited delivery of services and inefficiencies. While this concept may not be a solution for many regions due to local funding constraint or agency commitment, this MSAA Initiative was designed to integrate ITS technologies to enhance service delivery for all demographics. With the aid of ITS technologies, virtual travel management coordination centers (TMCC) were set up to provide a one-stop access to a unified transportation service. The TMCC simplified transportation access to residents and facilitated trip planning by coordinating transportation needs across providers and modes. The Aiken project was led by Lower Savannah Council of Governments and local transit providers. The TMCC has been integrated with the Aging and Disability Resource Center (ADRC).

4.9.2.7 Asset Management

Asset management describes a systematic approach to managing assets by maintaining, upgrading and operating physical and human assets cost-effectively. Asset management uses economics and engineering principles to develop cost-effective management, programming and resource allocation decision tools. This includes a preservation plan based on life cycle cost analysis. Generally the asset management plan includes goals and objectives and outline how people, processes, and tools interact to address the goals and objectives. Transit asset management system involves physical assets like vehicles, facilities, and equipment. For example, fleet management systems will help transit agencies track vehicle inventory, vehicle mileage, fuel usage, scheduled and unscheduled maintenance among others. Asset management systems will help to meet the challenge of providing acceptable transit

service in the face of limited resources. The United States Government Accountability Office[9] described the benefits as follow: transit asset management can "help transit agencies decide how best to prioritize their capital investments to strategically allocate their limited resources to manage their existing assets and plan appropriately for rehabilitation and replacement." An asset management system is an indispensable tool required to meet the challenge of increasing demand for transit services and dwindling resources available for transit operations and maintenance.

4.9.2.8 Fleet Maintenance

Transit fleet management systems can support automatic transit fleet maintenance scheduling and monitoring. Transit fleet with on-board condition sensors can perform periodic diagnostic tests and provide information to fleet managers. Transit vehicle may be removed from service for preventive or corrective action to be taken to keep vehicles in good repair and ensure passenger and operator safety. Fleet maintenance will be an integral part of the asset management system described in **Section 4.9.2.7**.

4.9.2.9 Safety and Security

Security of transit systems is critical for transit operations. Masses of people converge at transit infrastructure for transit services and that makes it a target for terrorism. The physical security of transit operators and passengers is important, and therefore it is necessary to secure transit systems and prevent disasters either natural or artificially induced. Transit vulnerability assessments should be performed by experts in counter terrorism, transit operations, and emergency planning. Coordination with local law enforcement, incident response and other local or federal agencies is required. The assessments must include potential applications of technologies that will enhance public transportation security. There are many technologies that can be deployed for transit security on-board the vehicles and at transit terminals. These include CCTV cameras, audio systems, chemical and biological sensors, detectors for explosives, etc. Monitoring of secure areas and public spaces such as park-and-ride lots enhances security and makes passengers feel safe to use public transit. Push button alarm systems can be activated by operators or transit users and communication with law enforcement agencies (public transportation police or local law enforcement agencies) for rapid response to any incidents. In advanced deployments, the transit vehicle can be remotely disabled and isolated to minimize impacts of any security breach of vehicles. Other safety systems may include detection systems to warn operators of potential crashes with passengers.

4.9.2.10 Emergency Management

Emergency plans consist of mitigation, preparedness, response, and recovery. Transit systems have a role to play in each of the four phases of emergency management. Transit related emergency plans and emergency response protocols need to be developed including detailed operations plan for each stage

[9] Transit Asset Management – Additional Research on Capital Investment Effects Could Help Transit Agencies Optimize Funding. Report to the Committee on Banking, Housing, and Urban Affairs, U.S. Senate (2013)

especially for evacuation. Transit will have limited benefits unless it is integrated into the emergency management plan.

4.9.2.11 Transit Signal Priority and Bus Rapid Transit

Transit signal priority is the use of technology to reduce the dwell time of transit vehicles at signalized intersections. This is achieved when an approaching transit vehicle makes a request to the signal controller and the green light is held longer until the transit vehicle passes or the red phase is shortened to reduce the wait time of the transit vehicle. The components of the system include detection aboard transit vehicles, priority request generator which may be in-vehicle or generated from a central location and communication infrastructure to signal controller. Transit signal priority increases the efficiency of transit operations by reducing travel time and improving schedule adherence.

Bus rapid transit is an integrated system to enhance the efficiency of bus transit and may include the use of bus lanes, busways, signal priority, stations, fare collection, traffic management improvements and ITS to increase the speed and reliability of bus service. High demand transit corridors can be targeted for transit signal priority and bus rapid transit operations. This may include the development of dedicated bus lanes or HOV lanes to facilitate the movement of transit buses during congested periods.

5.0 PROJECT SEQUENCING AND IMPLEMENTATION

This section discusses potential projects that can be undertaken to enhance the advanced transportation management system currently in place. These projects were identified based on stakeholder and user feedback and a gap analysis of the existing ITS architecture. The projects can be implemented as funds become available. See **Appendix F** for stakeholder meeting minutes.

5.1 RECOMMENDED ITS PROJECTS

Table 10 provides some Statewide ITS initiatives that can be implement to supplement existing functions to improve traffic, incident and emergency management.

Table 11: Recommended Statewide Projects

Project Title	Description	Project Type	Lead Stakeholders
Commercial Vehicle Information Systems Network (CVISN)/ Performance and Registration Information Systems Management (PRISM)	Pre-Pass/Weigh-in-Motion desired to help Ports pre-clear commercial vehicles to improve efficiency of commercial vehicle operations and enhance the safety of carriers.	CVO	SCDOT CVO SCDPS
ITS Communications Upgrades	Because of the security, expandability, and bandwidth capability, SCDOT prefers the use of fiber optics for the ITS communication network. The project(s) will include implementation of fiber optic communications network to support ITS field device communications and communications between stakeholders (field-to-field and center-to-center communications). When fiber is not feasible, licensed wireless communications may be used. Unlicensed wireless may be feasible for use as Ethernet bridges when line of sight (<1mi) is unobstructed. Cellular modems may be used when the options above are not feasible. Also desired is integration of systems (networks) between stakeholders to facilitate information exchange and coordination for operations.	Communications	SCDOT
Field Device Upgrades	Upgrade CCTV Cameras to IP cameras (with PTZ, lens cleaning, etc.) and IP addressable connectivity (signal controllers, DMS, etc.)	Incident Management	SCDOT DPW
Work Zone ITS	Deployment of portable devices (CCTV cameras, DMS, HAR, queue detection system, etc.) to help manage work zones to enhance safety of public and construction crew.	Safety	SCDOT
Emergency Vehicle Preemption	Provide signal preemption for emergency vehicles in critical corridors.	Communications	DPW

Project Title	Description	Project Type	Lead Stakeholders
Traffic Monitoring and Detection	Deploy new field devices (CCTV cameras, detectors, DMS, etc.) to enhance CCTV coverage and improve incident detection and response and regional traffic management. Deployments will be focused on major arterials as coverage on the interstate routes is nearly complete.	Incident Management	SCDOT
State Highway Emergency Program (SHEP)	Expand SHEP to other areas of the state that need assistance for incident management.	Incident Management	SCDOT State Highway Patrol
511 Traveler Information and Way Finding	Expand traveler information coverage and dissemination to include all modes and provide real-time information to the public. Current needs identified include expansion to cover arterials, public transit and commercial vehicle operations (parking location and availability).	Traveler Information	SCDOT
Comprehensive Detour Plan Analysis	Detour plans to manage incidents along segments of critical highway corridors must be established, and resources allocated in counties that will be affected for re-routing including staffing and training. Signal systems on detour routes must be upgraded with communication.	Incident Management	SCDOT DPW
Arterial Signal Coordination and Communication	Upgrade signal systems on critical arterial corridors with communication and controllers that will support coordination, emergency timing plans and establish protocol for emergency signal activation. Needed upgrades also include CCTV cameras for intersection monitoring.	Signal Systems and Communication Upgrades	SCDOT DPW
Expansion of 800 Megahertz Radio System	Expand public safety 800 MHz system	Communications	Public Transit Provider
Parking Management	Provide parking coordination between parking facilities and real-time parking usage to the public and parking management agencies	Travel Demand Management	Cities and Counties
Ride Sharing for Emergencies	Coordinate ride sharing during emergencies	Travel Demand Management	SCDOT Emergency Management Division
Ramp Metering	Deploy ramp metering on access ramps to freeway facilities to manage travel demand during peak commute hours to enhance freeway performance for travel time reliability and Safety. Coordinate with traffic signal systems on arterials.	Travel Demand Management	SCDOT

Project Title	Description	Project Type	Lead Stakeholders
Lane Control	Provide overhead lane control signs and communication on freeways to help manage incidents that block travel lanes on critical freeway corridors	Incident Management	SCDOT
Commercial Vehicle Parking	Provide commercial vehicle parking facilities with monitoring for real-time parking management and information dissemination to commercial vehicle drivers	CVO	SCDOT CVO SCDPS
Incident Management	Upgrade incident management system to provide credible real-time incident response status. Include portable devices for incident monitoring especially in areas outside of urbanized areas.	Incident Management	SCDOT SCDPS
Integrated Corridor Management	Establish and deploy integrated corridor management strategies for critical corridors to optimize the use of all transportation assets to reduce congestion and improve safety.	Travel Demand Management	SCDOT Transit Providers Cities & Counties
Highway Patrol Computer Aided Dispatch System Upgrades	Upgrade the Highway Patrol web CAD and provide adequate information for real-time incident response and incident response status	State Highway Patrol	SCDPS EMD
Archived Data Management System	Establish a data management system to make data readily available and accessible to stakeholders for planning and to support transportation operations.	Data Management	SCDOT MPO
Automatic Vehicle Location and Transit Traveler Information System	Deploy GPS tracking of all transit vehicles and integration of schedule and expected arrival times of transit vehicles into SCDOT 511 system and display boards at terminals and transit vehicles. This will require expansion of the SCDOT 511 to include multimodal transportation information.	Transit Management	SCDOT Public Transit Providers
Computer Aided Dispatch and Scheduling (Transit)	Deploy technologies to facilitate dispatch of transit vehicles (software, MDT, communications, etc.) to enhance transit operations.	Transit Management	Public Transit Providers
Transit Signal Priority	Deploy technologies in arterial corridors to enhance transit operations and maintain headways for optimal operation.	Transit Operation	SCDOT Public Transit Providers
Transit Security	Deploy technologies for data collection and analysis and to monitor secure areas and transit vehicles for intrusion or passenger safety with communications to transit management center and public safety agencies	Transit Security	Public Transit Providers SCDOT

Project Title	Description	Project Type	Lead Stakeholders
Advanced Passenger Counters	Deploy technologies that will automate collection of passenger data on boarding and alighting by time and location.	Transit Management	Public Transit Providers
Asset Management and Tracking (Transit)	Deploy management tools and strategies to help keep assets (rolling stock, right-of-way, stations, facilities, systems and equipment) in good repair i.e. fit for the purpose for which they were intended.	Transit Management	SCDOT Public Transit Providers
Electronic Fare Payment	Deploy electronic equipment in-vehicle, at terminals and bus stops for electronic payment of services. This will include the use of electronic payment systems (debit or credit cards, smart cards) and potentially near field communications for smartphone based payments.	Transit Operation	Public Transit Providers
Emergency Management Interface (Transit)	Deploy technologies to reduce vulnerability, improve detection, deterrence, response and mitigation. Enhance communications and coordination between transit agencies, first responders and regional and federal agencies for transit related emergencies.	Transit Operations	Emergency Management Division Public Transit Providers
Weather Information System (Transit)	Develop an integrated and effective road weather information system (RWIS) with decision support system to enhance transit operations and traveler information. Deployment of additional environmental sensor stations (ESS) may be required to capture environmental data.	Transit and Highway Operations	Public Transit Providers SCDOT
Mobile Data Collection	Deploy mobile data terminals (MDT) in transit vehicles to facilitate transit information and data (passenger and fare data) management to enhance operations.	Transit Operation	Public Transit Providers

5.2 NATIONAL ITS STANDARDS

The purpose of the national ITS Standards is to ensure that systems and components are compatible in technology and functionality. The standards are required so that the broad scope of stakeholders (engineers, planners, logistics, public safety, emergency responders, finance, users, etc.) can work collaboratively to enable data sharing and coordination for deployment and advancement of ITS systems. The benefits of standards will facilitate system interoperability and regional integration, makes testing easier and minimizes integration costs for future devices. Standardization will make it easier to switch to a different vendor product if necessary. **Table 11** shows the standards applicable to the South Carolina Statewide ITS Architecture. Detailed information on standards applicable to flows between the elements identified for this Statewide ITS is provided in **Appendix G**.

Table 12: Standards Group Definition (Sample)

SDO	Group Short Name	Group Name	Group User Defined	Included Standard Doc ID	Included Standard Title	Included User Defined
AASHTO/ITE/NEMA	NTCIP C2C	NTCIP Center-to-Center Standards Group	No	NTCIP 1102	Octet Encoding Rules (OER) Base Protocol	No
				NTCIP 1104	Center-to-Center Naming Convention Specification	No
				NTCIP 2104	Ethernet Subnetwork Profile	No
				NTCIP 2202	Internet (TCP/IP and UDP/IP) Transport Profile	No
				NTCIP 2303	File Transfer Protocol (FTP) Application Profile	No
				NTCIP 2304	Application Profile for DATEX-ASN (AP-DATEX)	No
				NTCIP 2306	Application Profile for XML Message Encoding and Transport in ITS Center-to-Center Communications (C2C XML)	No
AASHTO/ITE/NEMA	NTCIP C2F	NTCIP Center-to-Field Standards Group	No	NTCIP 1102	Octet Encoding Rules (OER) Base Protocol	No
				NTCIP 1103	Transportation Management Protocols (TMP)	No
				NTCIP 2101	Point to Multi-Point Protocol Using RS-232 Subnetwork Profile	No
				NTCIP 2102	Point to Multi-Point Protocol Using FSK Modem Subnetwork Profile	No
				NTCIP 2103	Point-to-Point Protocol Over RS-232 Subnetwork Profile	No
				NTCIP 2104	Ethernet Subnetwork Profile	No
				NTCIP 2201	Transportation Transport Profile	No
				NTCIP 2202	Internet (TCP/IP and UDP/IP) Transport Profile	No

SDO	Group Short Name	Group Name	Group User Defined	Included Standard Doc ID	Included Standard Title	Included User Defined
				NTCIP 2301	Simple Transportation Management Framework (STMF) Application Profile	No
				NTCIP 2302	Trivial File Transfer Protocol (TFTP) Application Profile	No
				NTCIP 2303	File Transfer Protocol (FTP) Application Profile	No
ASTM	DSRC 915MHz	Dedicated Short Range Communication at 915 MHz Standards Group	No	ASTM E2158-01	Standard Specification for Dedicated Short Range Communication (DSRC) Physical Layer using Microwave in the 902-928 MHz Band	No
ASTM/IEEE/SAE	DSRC 5GHz	Dedicated Short Range Communication at 5.9 GHz Standards Group	No	ASTM E2213-03	Standard Specification for Telecommunications and Information Exchange Between Roadside and Vehicle Systems - 5 GHz Band Dedicated Short Range Communications (DSRC) Medium Access Control (MAC) and Physical Layer (PHY) Specifications	No
				IEEE 1609.1-2006	Standard for Wireless Access in Vehicular Environments (WAVE) - Resource Manager	No
				IEEE 1609.2-2006	Standard for Wireless Access in Vehicular Environments (WAVE) - Security Services for Applications and Management Messages	No
				IEEE 1609.3	Standard for Wireless Access in Vehicular Environments (WAVE) - Networking Services	No
				IEEE 1609.4-2006	Standard for Wireless Access in Vehicular Environments (WAVE) - Multi-Channel Operation	No
				IEEE 802.11p	Standard for Information Technology - Telecommunications and Information Exchange Between Systems - Local and Metropolitan Area Networks - Specific Requirements - Part II: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specification	No

SDO	Group Short Name	Group Name	Group User Defined	Included Standard Doc ID	Included Standard Title	Included User Defined
				IEEE P1609.0	Standard for Wireless Access in Vehicular Environments (WAVE) - Architecture	No
IEEE	IEEE IM	Incident Management Standards Group	No	IEEE 1512 - 2006	Standard for Common Incident Management Message Sets for use by Emergency Management Centers	No
				IEEE 1512.1-2006	Standard for Traffic Incident Management Message Sets for Use by Emergency Management Centers	No
				IEEE 1512.2-2004	Standard for Public Safety Traffic Incident Management Message Sets for Use by Emergency Management Centers	No
				IEEE 1512.3-2006	Standard for Hazardous Material Incident Management Message Sets for Use by Emergency Management Centers	No
				IEEE P1512.4	Standard for Common Traffic Incident Management Message Sets for Use in Entities External to Centers	No
SAE	ATIS General Use	Advanced Traveler Information Systems (ATIS) General Use Standards Group	No	SAE J2266	Location Referencing Message Specification (LRMS)	No
				SAE J2354	Message Set for Advanced Traveler Information System (ATIS)	No
				SAE J2540	Messages for Handling Strings and Look-Up Tables in ATIS Standards	No
				SAE J2540/1	RDS (Radio Data System) Phrase Lists	No
				SAE J2540/2	ITIS (International Traveler Information Systems) Phrase Lists	No
				SAE J2540/3	National Names Phrase List	No
SAE	ATIS Low Bandwidth	Advanced Traveler Information Systems (ATIS) Bandwidth Limited Standards	No	SAE J2266	Location Referencing Message Specification (LRMS)	No
				SAE J2354	Message Set for Advanced Traveler Information System (ATIS)	No

SDO	Group Short Name	Group Name	Group User Defined	Included Standard Doc ID	Included Standard Title	Included User Defined
		Group		SAE J2369	Standard for ATIS Message Sets Delivered Over Reduced Bandwidth Media	No
				SAE J2540	Messages for Handling Strings and Look-Up Tables in ATIS Standards	No
				SAE J2540/1	RDS (Radio Data System) Phrase Lists	No
				SAE J2540/2	ITIS (International Traveler Information Systems) Phrase Lists	No
				SAE J2540/3	National Names Phrase List	No
SAE	Mayday	On-board Vehicle Mayday Standards Group	No	SAE J2266	Location Referencing Message Specification (LRMS)	No
				SAE J2313	On-Board Land Vehicle Mayday Reporting Interface	No
				SAE J2354	Message Set for Advanced Traveler Information System (ATIS)	No
				SAE J2540	Messages for Handling Strings and Look-Up Tables in ATIS Standards	No
				SAE J2540/1	RDS (Radio Data System) Phrase Lists	No
				SAE J2540/2	ITIS (International Traveler Information Systems) Phrase Lists	No
				SAE J2540/3	National Names Phrase List	No

6.0 STATEWIDE ITS ARCHITECTURE MAINTENANCE

The South Carolina Statewide ITS Architecture framework identifies both long-term and short-term ITS deployments in the State and ensures that scarce dollars are spent in an effective way. The operational concept, functional requirements and the roles and responsibilities described in the document delineate each stakeholder's responsibility to help implement an advanced transportation management system. The information and data exchanges between each agency have been identified along with the standards required for interoperability of systems.

This section discusses the proposed Maintenance Plan for the South Carolina Statewide ITS Architecture. FHWA's Final Rule on ITS Architecture and Standards (23 CFR Part 940) requires development of an architecture maintenance plan. Paragraph 940.9 (f) states that:

> *"The agencies and other stakeholders participating in the development of the regional ITS architecture shall develop and implement procedures and responsibilities for maintaining it as needs evolve within the region."*

In January 2004, FHWA issued guidance[10] on what should be contained in an architecture maintenance plan in order to be compliant with FHWA requirements. The White Paper on this subject is available at http://ops.fhwa.dot.gov/its_arch_imp/guidance.htm. The Maintenance Plan for the South Carolina Statewide ITS Architecture is based on the guidelines provided by FHWA's White Paper.

This report provides some background on the need for architecture maintenance and addresses key issues under the following headings:

- Why maintain a regional ITS architecture?
- Who will maintain the architecture?
- When will the architecture be updated?
- What will be maintained?
- How will the architecture be maintained?

6.1 WHY MAINTAIN THE ITS ARCHITECTURE?

As ITS projects are implemented, the Statewide ITS architecture will need to be updated to reflect new ITS priorities and strategies that emerge through the transportation planning process. It will also need to be updated to account for expansion in ITS scope and to allow for the evolution and incorporation of new ideas. The goal of the maintenance plan is to guide controlled updates to the Statewide ITS

[10] FHWA-HOP-04-004, Regional ITS Architecture Maintenance White Paper, prepared by the National ITS Architecture Team, January 31, 2004

architecture baseline so that it accurately reflects the South Carolina's existing ITS capabilities and future plans.

To maintain a consensus, ideally all stakeholders should participate in the ITS Architecture process. In practice, typically, one or two agencies take the lead responsibility to maintain the Statewide ITS architecture. The primary requirements of the Statewide ITS architecture maintainer are the mission/authority to perform such functions and the necessary skills to perform the same. The mission of the ITS architecture maintainer most closely resembles a regional planning body that, as consistent with its mission, has the authority to initiate, update, and document changes in regional planning documents. For the South Carolina Statewide ITS Architecture, SCDOT will assume the lead role as the ITS architecture keeper and maintainer.

6.2 WHEN WILL THE ARCHITECTURE BE UPDATED?

The Statewide ITS architecture is not static. It must change as plans change, as ITS projects are implemented, and as the ITS needs and services evolve in South Carolina. Therefore the Statewide ITS architecture should be reviewed periodically by SCDOT and architecture updates performed frequently to keep with the pace of the state's ITS implementation. Updates will include integrating completed projects into the Statewide ITS Turbo Architecture source file. A summary of the change could be added as an appendix to the Statewide ITS architecture document.

Regardless of the frequency selected for periodic updates, it is recommended that SCDOT recognize the potential need for "Exception Maintenance" to occur in the event of major project implementations, major revisions to the National ITS Architecture, or to meet the requirements of future regulations. It is recommended that Statewide ITS architecture be fully updated every ten years.

SCDOT and the affected stakeholders will collaborate on any revisions/changes/updates to the Statewide ITS architecture. The following list includes many of the events that may cause a change to the Statewide ITS architecture:

6.2.1 Changes in Statewide Needs

The Statewide ITS architectures are created to support transportation planning in addressing statewide needs. Over time, these needs can change and the corresponding aspects of the Statewide ITS architecture that addresses these needs may need to be updated. These changes in needs should be expressed in updates to planning documents such as the Statewide Transportation Plan.

6.2.2 New Stakeholders

As new stakeholders become active in ITS, the Statewide ITS architecture should be updated to reflect their place in the statewide view of ITS elements, interfaces, and information flows. New stakeholders might represent new organizations that were not in place during the original development of the Statewide ITS architecture.

6.2.3 Changes in Scope of Services Considered

The range of services considered in the Statewide ITS architecture will naturally evolve over time. This might happen because of National ITS Architecture updates to include new user services or to better define how existing elements satisfy the user services. The National ITS Architecture may be expanded to include a user service that has been discussed in the region, but not in the Statewide ITS architecture, or was included in only a very cursory manner. Changes in the National ITS Architecture are not of themselves a reason to update a Statewide ITS architecture, but the region may want to consider any new services in the context of their statewide needs.

6.2.4 Changes in Stakeholder or Element Names

The name of an agency or element used in the Statewide ITS architecture may change over time. Transportation agencies occasionally merge, split, or just rename themselves. In addition, element names may evolve as projects are defined. The Statewide ITS architecture should be updated to use the current, correct names for both stakeholders and elements.

6.2.5 Changes in Other Architectures

Currently, the South Carolina Statewide ITS architecture covers only elements and interfaces within the State. As the architecture expands, it may become necessary to integrate with adjoining architectures be it statewide or regional in neighboring states to manage traffic traveling into South Carolina. Changes in the statewide and/or regional ITS architecture in any of the adjoining states may necessitate changes in the South Carolina Statewide ITS architecture to maintain consistency between the two. Architectures may also overlap (e.g. a Statewide ITS architecture and a regional ITS architecture for the region within the state), and a change in one might necessitate a change in the other.

6.2.6 Changes due to Project Definition or Implementation

There are several changes relating to project definition that will cause the need for updates to the Statewide ITS architecture. When defined or implemented, a project may add, subtract or modify elements, interfaces, or information flows from the Statewide ITS architecture. Because the Statewide ITS architecture is meant to describe the current, as well as future, statewide implementation of ITS, it must be updated correctly to reflect how the developed projects integrate into the statewide architecture.

6.2.7 Changes due to Project Addition/Deletion

Occasionally a project will be added or deleted through the planning process, or through project delivery, and some aspects of the Statewide ITS architecture that are associated with the project may be expanded, changed, or removed.

6.2.8 Changes in Project Priority

Due to funding constraints, or other considerations, the planned project sequencing may change. Delaying a project may have a ripple effect on other projects that depend on it. Raising the priority for the project's implementation may impact other projects that are related to it.

6.3 WHAT WILL BE MAINTAINED?

Those constituent parts of the Statewide ITS architecture that will be maintained are referred to as the "baseline." This section considers the different "parts" of the Statewide ITS architecture and whether they should be a part of the baseline. Baseline parts are periodically updated within the Statewide ITS architecture Turbo file and the document. The parts discussed are:

- Description of Region
- List of Stakeholders
- Operational Concepts
- List of ITS Elements
- List of Agreements
- Interfaces between Elements
- System Functional Requirements
- Applicable ITS Standards
- Project Sequencing

One of the benefits of a Statewide ITS architecture is to enable the efficient exchange of information between ITS elements in the region with other regions. Efficiency refers to the economical deployment of ITS elements and their interfaces. The result of these ITS deployments should be contributions to a safe and efficient operation of the surface transportation network. Each of the components in the Statewide ITS architecture listed above has a role in this economy, and appropriate effort should be levied to maintain them.

6.4 HOW WILL THE ARCHITECTURE BE MAINTAINED?

SCDOT will oversee and ensure that the Statewide ITS architecture is maintained. The guidelines contained within FHWA's Regional ITS Architecture Maintenance White Paper[11] will be helpful in guiding the maintenance effort. In addition to detailing the recommended maintenance process, the White Paper also contains examples of Maintenance Plans developed by a range of agencies and regions throughout the country.

[11] http://ops.fhwa.dot.gov/its_arch_imp/ArchMaintrV5.htm

Appendix A SOUTH CAROLINA TRANSPORTATION ASSETS

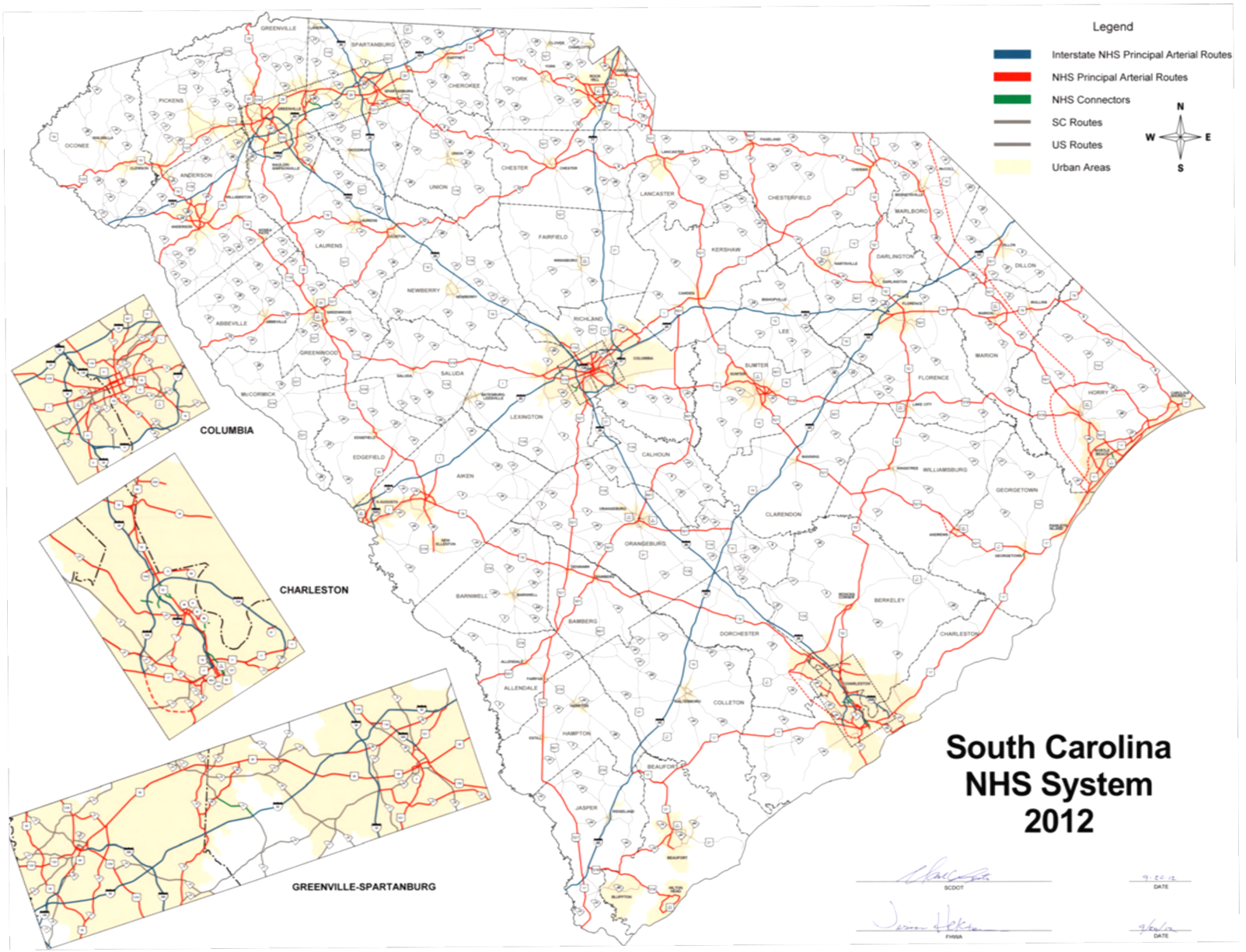

Figure 2: Major Highways in South Carolina

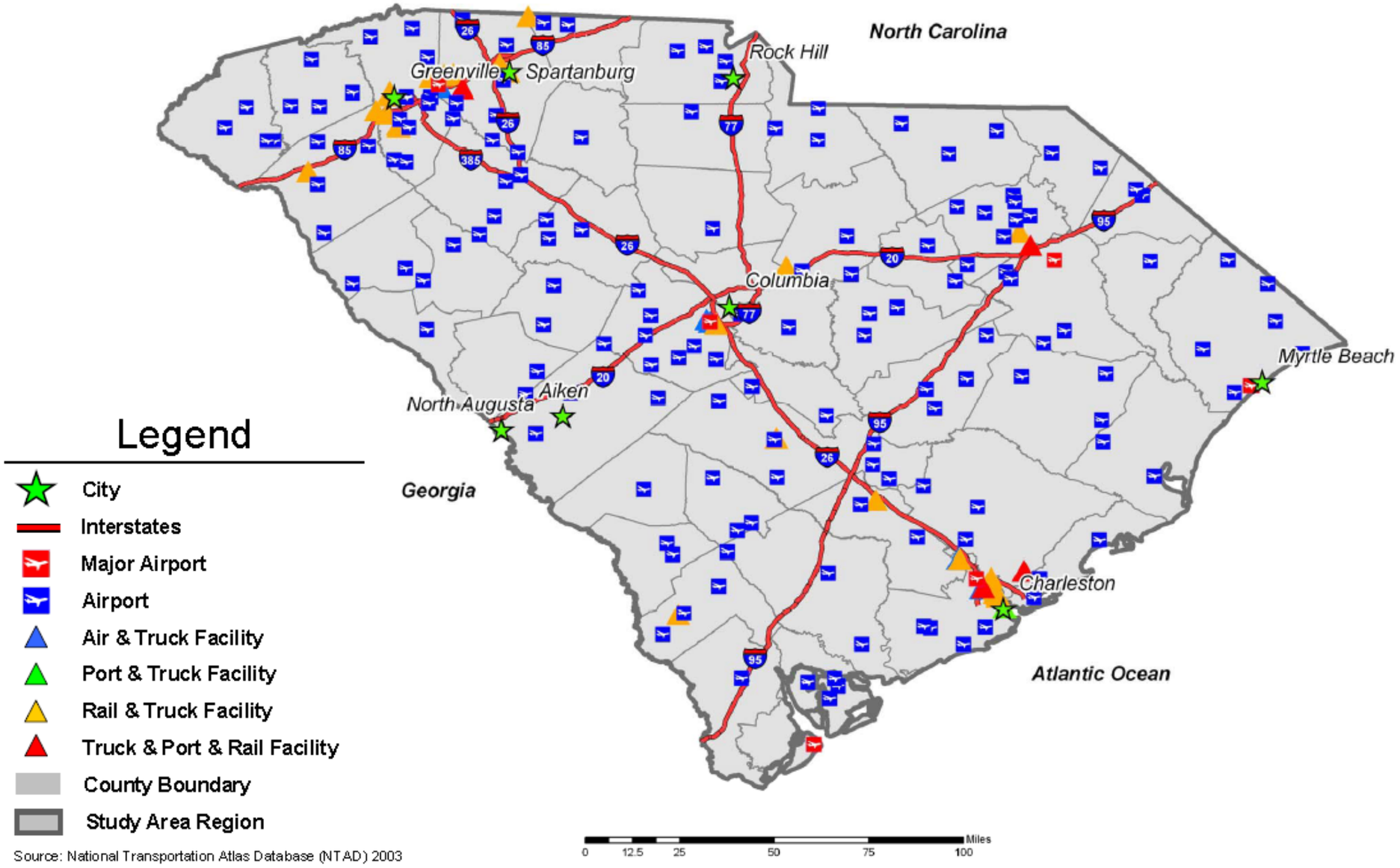

Figure 3: Commercial Transportation Facilities in South Carolina

Appendix B SOUTH CAROLINA PUBLIC TRANSIT PROVIDERS

During the 2013 fiscal year there were a total of 28 bus transit operations statewide in South Carolina in various areas. Seven (7) of these were in urbanized areas, seventeen (17) were in non-urbanized areas and four (4) in both urbanized and non-urbanized areas. A brief description of these transit agencies is given below.

Table 13: South Carolina Public Transit Providers

Public Transit Provider	Description	Operation Type
Aiken Area Council on Aging/Pony Express	The mission of AACOA is to provide health, wellness, nutrition, transportation, social, and other services that enhance the quality of life, independence, dignity and aid in the prevention of critical acute care needs of the public in the Aiken area. AACOA amended its charter in 1995 to include provision of transportation services to the general public. This transit system is known as the Pony Express.	Non-Urbanized
Bamberg County Transportation / Handy Ride	The Bamberg County Transportation system known as Handy Ride provides transportation to non-Medicaid medical appointments, shopping, employment, etc. to its residents.	Non-Urbanized
Best Friend Express/ Lower Savannah Council of Governments	LSCOG has many transportation related responsibilities and runs the State's only Aging, Disability, and Transportation Resource Center. ADTRC provides transportation options to its residents to support independent, healthy and engaged community living by providing paratransit services for medical appointments, errands, and work. LSCOG receives federal transit funds and works with other transit providers to meet the transportation needs of residents in Allendale, Bamberg, Calhoun and Orangeburg Counties. The services include fixed route and paratransit services.	Urbanized
Central Midlands RTA/ Santee Wateree RTA at Lower Richland	The CMRTA provides public transit services in the Midlands including Columbia, Cayce, West Columbia, Forest Acres, Arcadia Lakes, Springdale and St. Andrews area. CMRTA also provides service to the non-urbanized areas in Lower Richland.	Urbanized & Non-Urbanized
Charleston Area Regional Transportation Authority	CARTA provides fixed route, flex service, express commuter service, paratransit service in the Charleston metropolitan area, and trolley service in the Historic Peninsula area of Charleston. CARTA surpassed annual ridership of 4.9 million passengers in 2013. CARTA provides free bus services during emergencies to evacuate residents especially the disabled and evacuees with pets.	Urbanized
City of Anderson/Electric City Transit	Electric City Transit provides fixed route with route deviation service for riders who live outside the regular routes. Riders can wait at a designated bus stop or call at least an hour ahead of travel for pick up. The transit system operates Monday through Friday from 6:30am to 6:30pm except on holidays. City of Anderson/Electric City Transit also provides limited non-urbanized area service under contract with County of Anderson for specific week-day route.	Urbanized & Non-Urbanized

Public Transit Provider	Description	Operation Type
City of Clemson Transit/Clemson Area Transit	The Clemson Area Transit provides public transportation services through the collaboration of Clemson University, City of Clemson, Town of Central, Town of Pendleton, City of Seneca, Anderson County, SCDOT and Federal Transit Administration. The transit system provides paratransit service for those who qualify.	Urbanized
City of Rock Hill Transit	The City of Rock Hill Transit offers ride-to-work service within the City of Rock Hill and provides transportation to work. The operating hours are Monday – Friday 5:30am to 9:00am and 3:30pm to 6:00pm.	Urbanized
City of Seneca Transit	The Clemson Area Transit System described above has a route that services the City of Seneca. The Seneca route operates throughout the year from Monday through Friday except for specified holidays.	Non-Urbanized
City of Spartanburg/SPARTA	SPARTA provides public transportation for areas within the city and other destinations outside the city limits.	Urbanized
Coast/Waccamaw RTA	The Coast RTA provides mass transit needs from North Myrtle Beach to Georgetown including Surfside Beach, Garden City, Murrells Inlet, Pawleys Island, Georgetown, Andrews, Conway and Loris.	Urbanized & Non-Urbanized
Cross County Connector	The Cross County Connector is administered and operated by the County of Orangeburg to provide transit services for rural Orangeburg and Calhoun Counties.	Non-Urbanized
Edgefield County Senior Citizens Council/ECSCC	The ECSCC owns and operates a public transportation system for Edgefield County. Residents approved for Medicaid transportation to medical appointments must call three days in advance for reservation.	Non-Urbanized
Fairfield County Transit System	The Fairfield County transit system provides public transportation services to its residents and operates a deviated fixed route service to meet the needs of riders. Transportation services vary depending on the route and time of day. For additional fee a route deviation service allows the public to be alighted closer to destination.	Non-Urbanized
Generations Unlimited/Local Motion	Local Motion which is a division of Generations Unlimited provides public transportation services within Barnwell County and the surrounding counties. Advance transit reservation is required 3 working days prior to pick up and customers must pay fares in order to receive service.	Non-Urbanized
Greenlink/GTA	Greenlink provides 11 fixed route transit service throughout Greenville County. The Greenville Area Paratransit (GAP) service is also available to provide paratransit service to those who qualify. GTA provides limited contracted fixed route service for the cities of Mauldin and Simpsonville small urbanized areas.	Urbanized

Public Transit Provider	Description	Operation Type
Lancaster Area Ride Service	The Lancaster Area Ride Service is operated by a joint effort between local nonprofit organizations to provide transportation services to the residents. The service is operated by the Lancaster County Council on Aging.	Urbanized & Non-Urbanized
McCormick County Transit	McCormick County Senior Center runs a demand responsive transit service that serves McCormick County, Greenwood, Abbeville, Augusta, and surrounding counties. The program services seniors and Medicaid. There are 13 vehicles in the fleet that run from 4:30am – 5 pm.	Non-Urbanized
Newberry County COA/Newberry Express Smart Ride	The Smart Ride commuter services provides transportation to downtown Columbia during the work week. This service is commuter focused and provided through a partnership between SCDOT, Newberry County Council on Aging, local communities, businesses and commuters.	Non-Urbanized
Palmetto Breeze/Lowcountry RTA	The Palmetto Breeze is a public transportation system that services five counties in the Lowcountry counties. Public transportation is offered in coach buses from 4:30am to 8:00pm, Monday through Sunday.	Urbanized & Non-Urbanized
Pee Dee RTA	The Pee Dee Regional Transportation Authority provides public transportation in Darlington, Florence and Marion counties all in the Pee Dee region of South Carolina. PDRTA offers commuter service in these counties. PDRTA also offers a fixed route service in the City of Florence through the Florence Transit System. Paratransit service is also provided to individuals with disabilities and van pools are offered on a limited basis.	Urbanized & Non-Urbanized
Santee Wateree RTA	SWRTA provides a variety of transit services: fixed route, paratransit and van pool. The service area includes Clarendon, Kershaw, Lee and Sumter counties. Fixed route and paratransit services are provided in the City of Sumter and shuttle services to Cherryvale and Shaw Air Force Base Communities. Paratransit service is provided in both the urbanized and non-urbanized areas.	Urbanized & Non-Urbanized
Senior Services of Chester Co./Chester Connector	The Chester County Connector (CCC) provides transportation services to all residents in Chester County to surrounding counties. The funding for this service is provided by SCDOT, local government, United Way and private foundations. CCC also offers connection to the Charlotte Area Transit park-and-ride facility located in downtown Rock Hill.	Non-Urbanized
Spartanburg County Transportation Service Bureau	The City of Spartanburg runs a transit and paratransit service for residents who live within the service area. The City of Spartanburg has a fixed route service and those who are not able to access this fixed route service can use the paratransit service after being ADA certified. There is a dial-a-ride service which is available to all residents in Spartanburg County through the Transportation Services Bureau. This connects people to healthcare, jobs, grocery stores, etc.	Urbanized & Non-Urbanized

Public Transit Provider	Description	Operation Type
Tri-County Link/Berkeley-Charleston-Dorchester	The Tri-County Link operates in the Berkeley, Charleston and Dorchester counties. The system consists of 9 regular fixed routes and 4 commuter routes. There is the option for route deviation. The Tri-County Link also administers transportation services under Medicaid.	Urbanized & Non-Urbanized
York County/York County Access	The York County Access provides public transportation for residents of York County and the City of Rock Hill through a partnership between these two entities. There are two types of services offered: essential service and ride-to-work service. The essential service is available countywide to residents who need transportation to meet their basic needs such as to see a doctor, pharmacy, grocery store or medical treatment center. The hours of operation for the essential service are Monday – Friday 6:00am to 6:00pm. Service must be requested at least 48 hours in advance.	Non-Urbanized
Williamsburg County Transit System	The Williamsburg City Transit System provides transportation services to the County of Williamsburg seven days a week, 24 hours per day except on Christmas Day. The public transportation includes fixed route and paratransit services.	Non-Urbanized

Appendix C METROPOLITAN PLANNING ORGANIZATIONS

(The MPO boundaries shown are limited to the regions within South Carolina.)

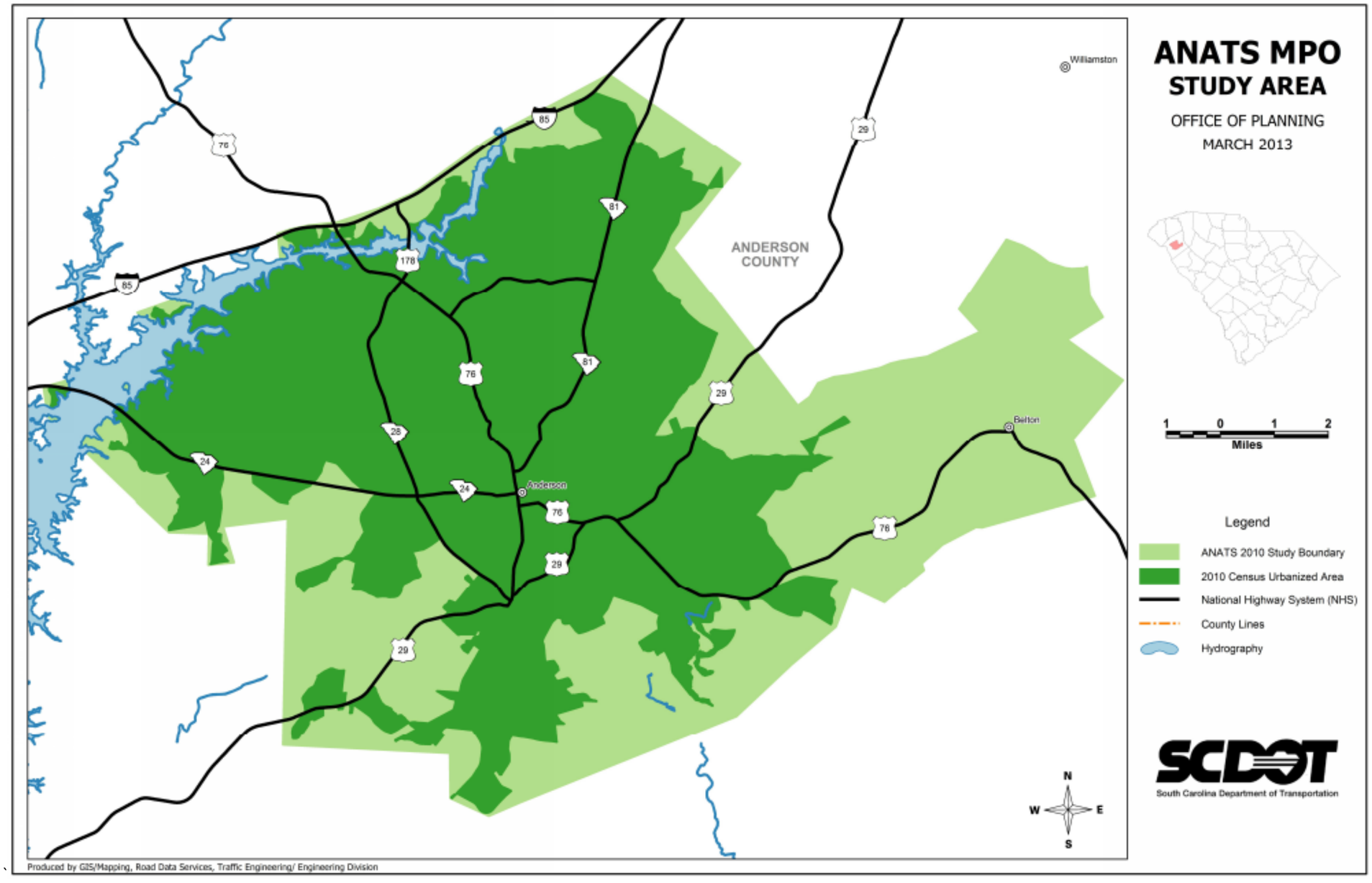

Figure 4: ANATS MPO Study Area

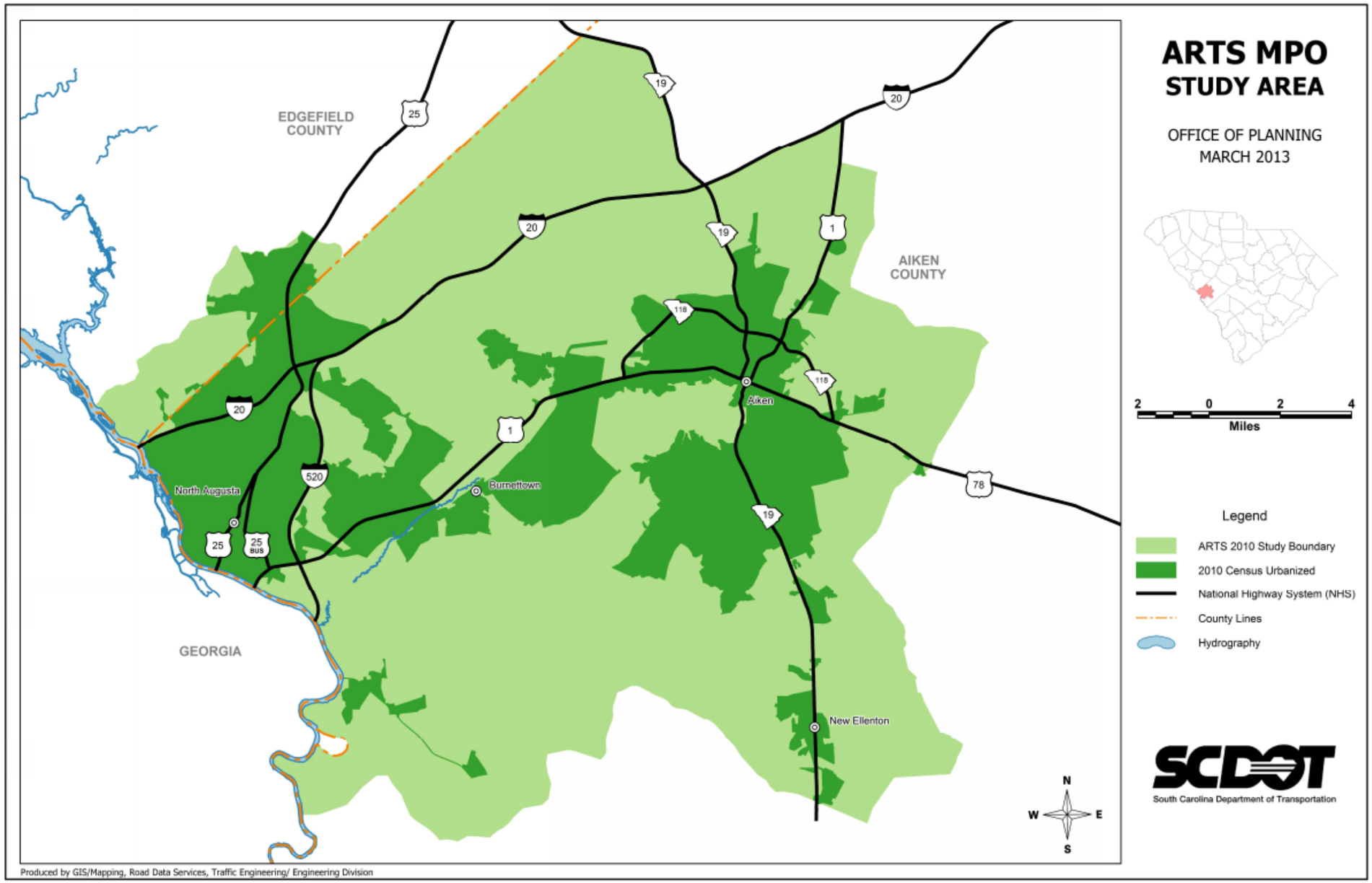

Figure 5: ARTS MPO Study Area

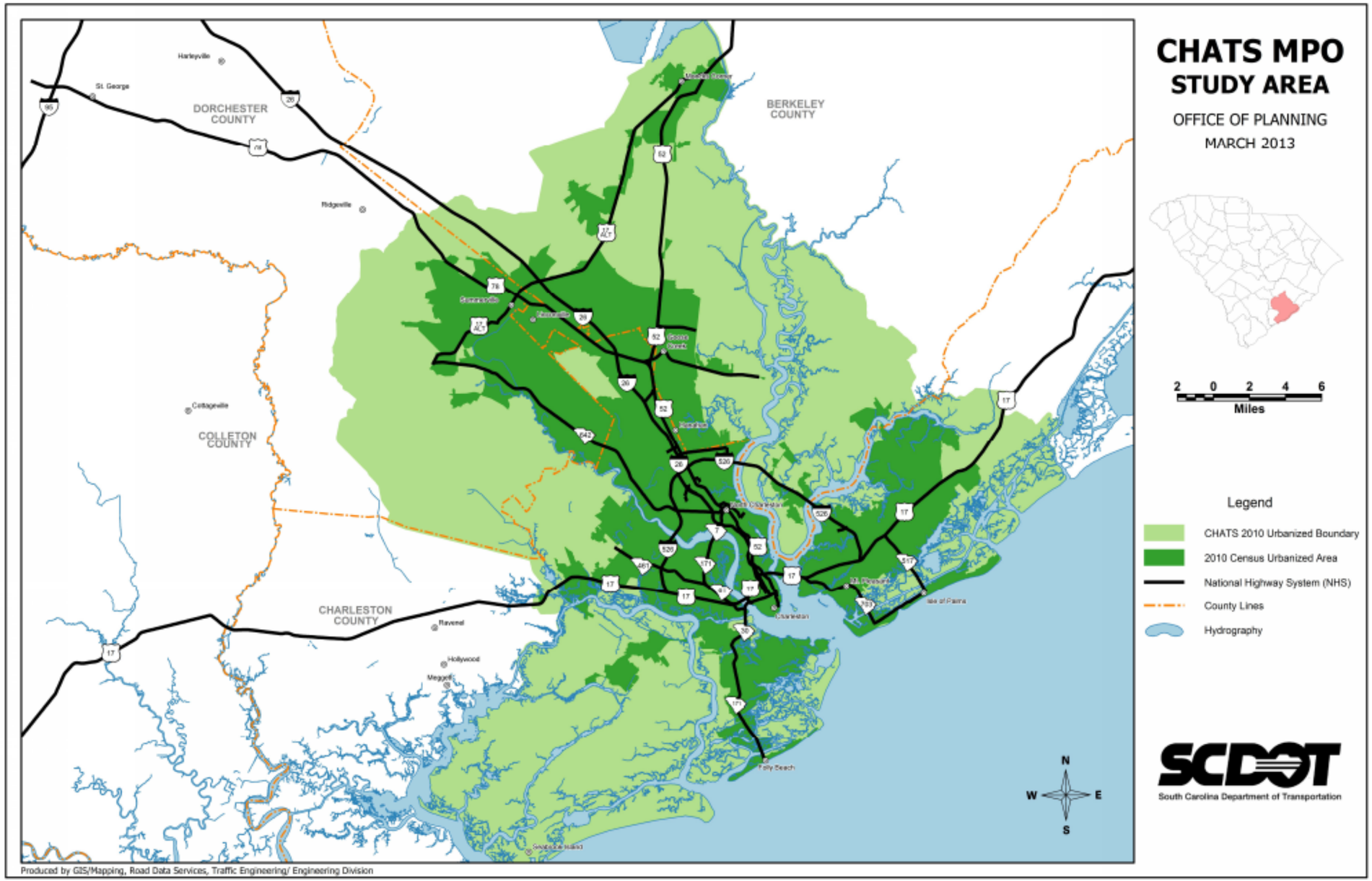

Figure 6: CHATS MPO Study Area

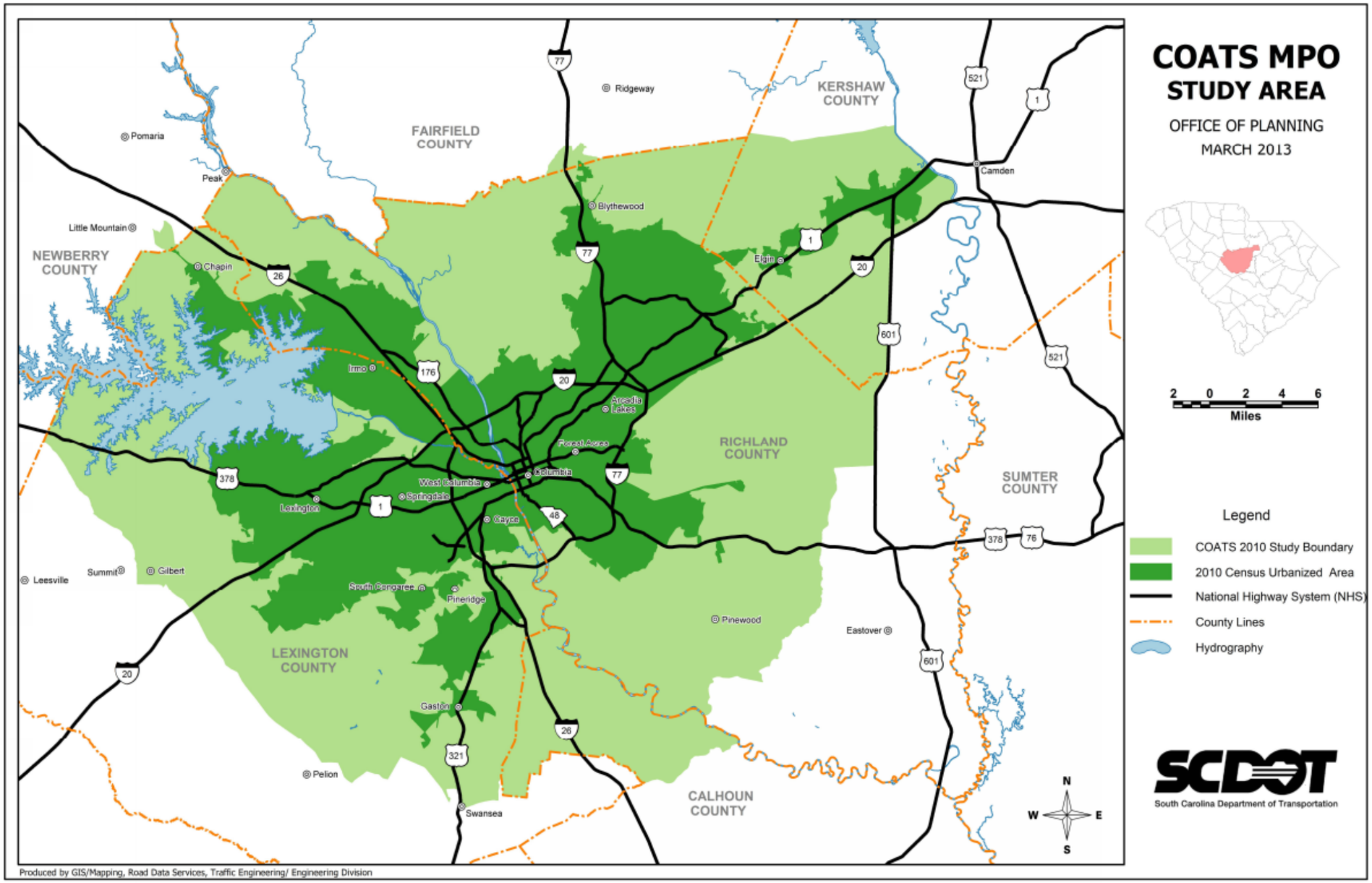

Figure 7: COATS MPO Study Area

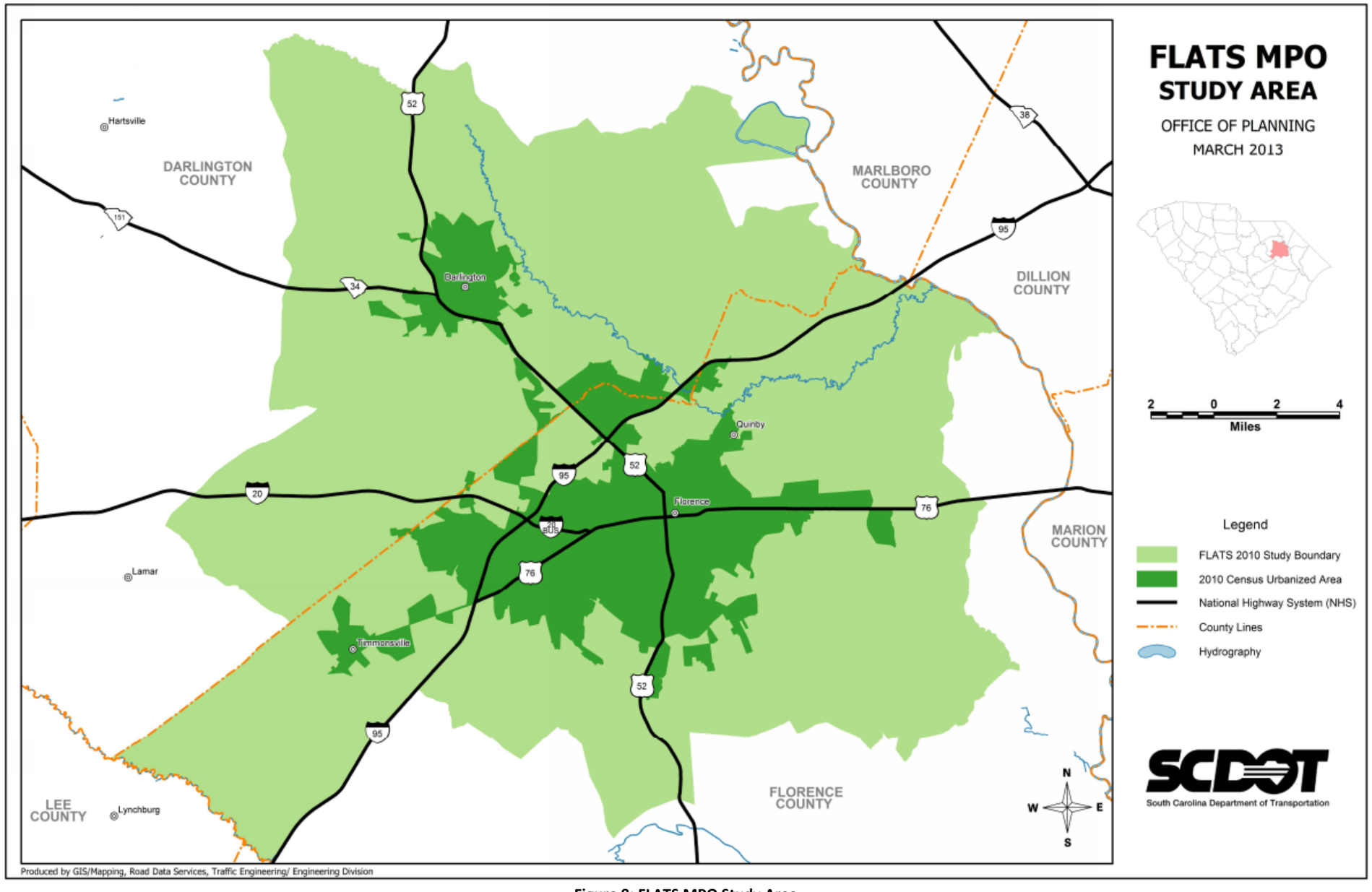

Figure 8: FLATS MPO Study Area

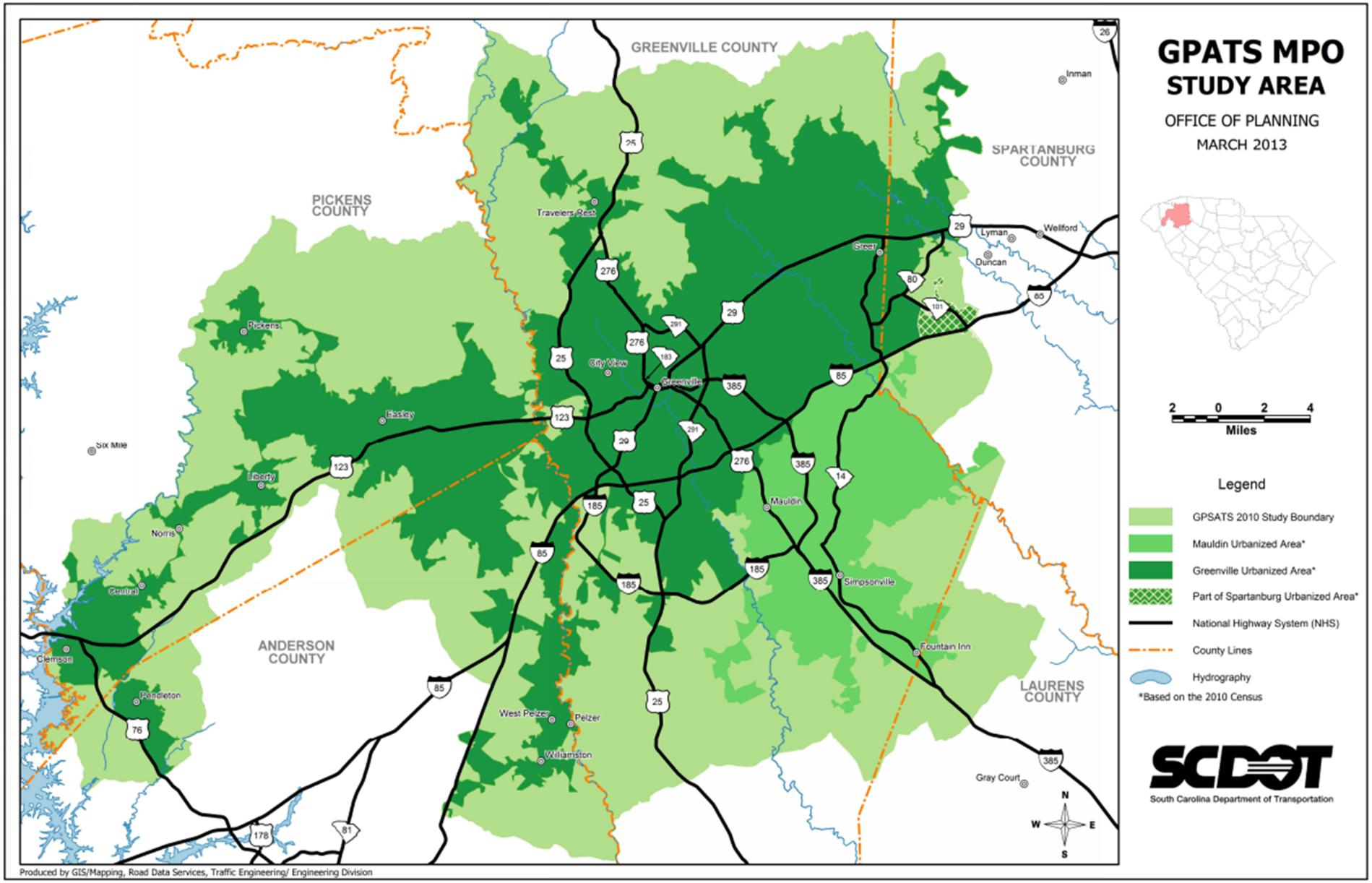

Figure 9: GPATS MPO Study Area

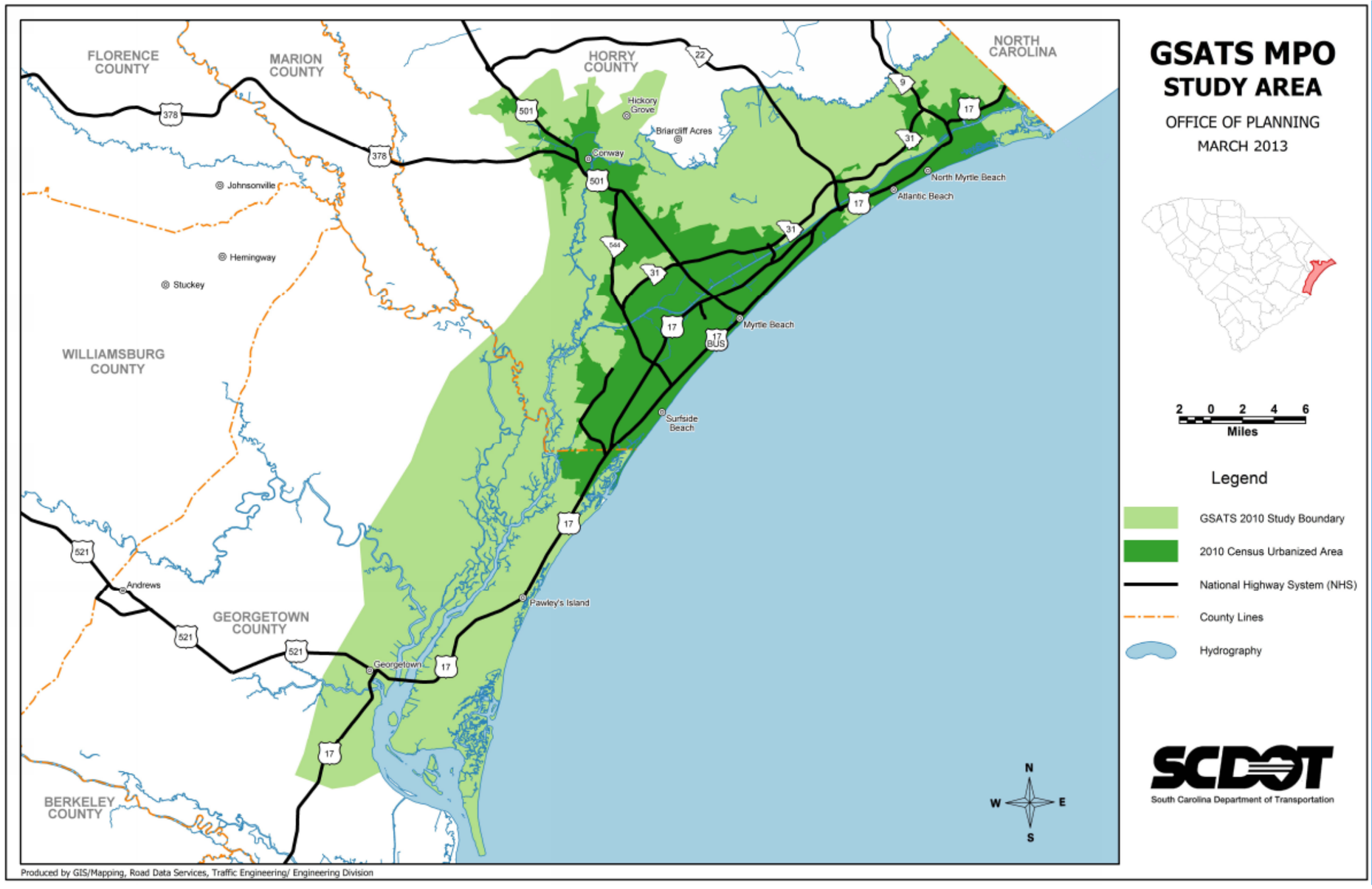

Figure 10: GSATS MPO STUDY AREA

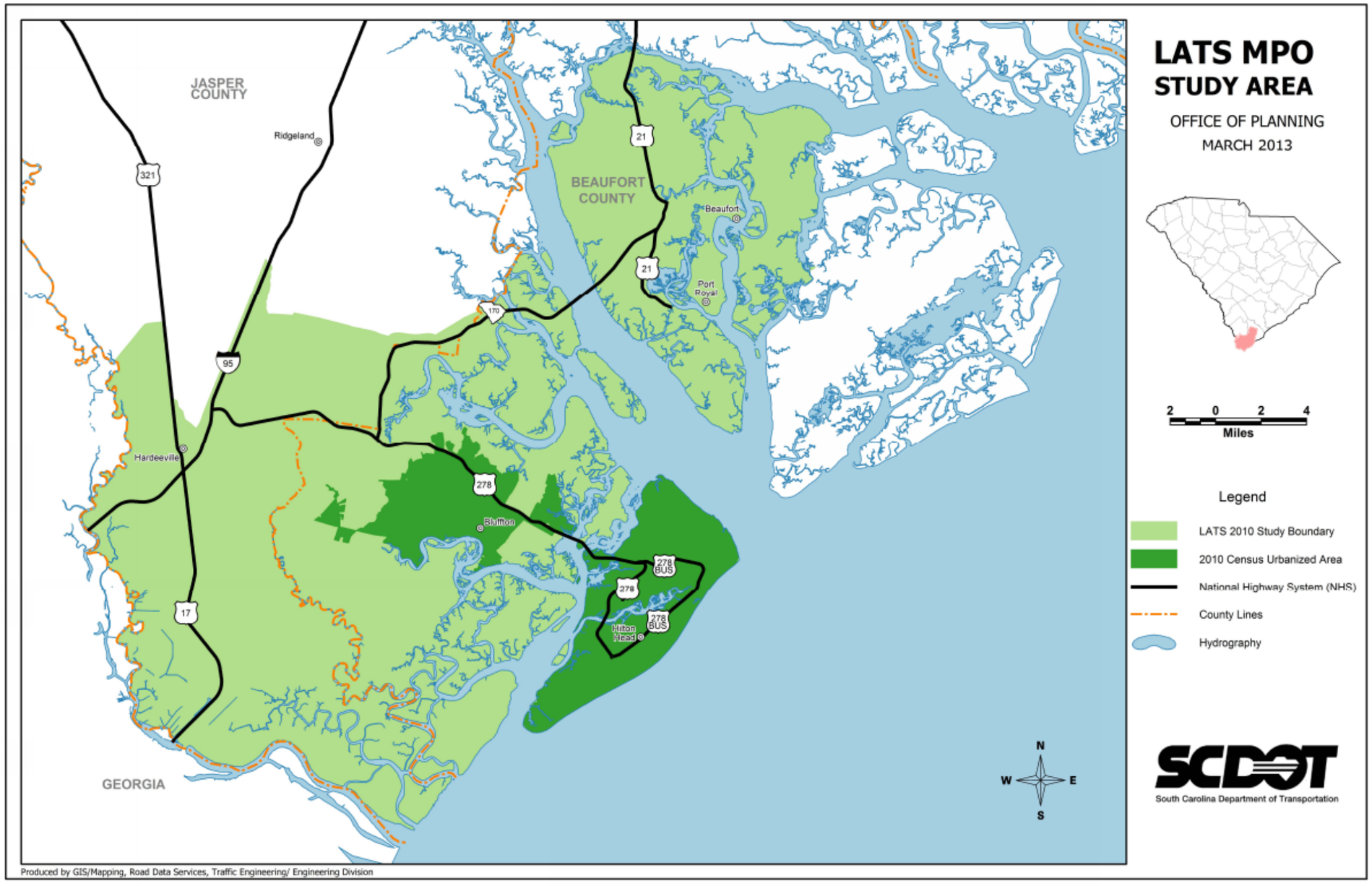

Figure 11: LATS MPO Study Area

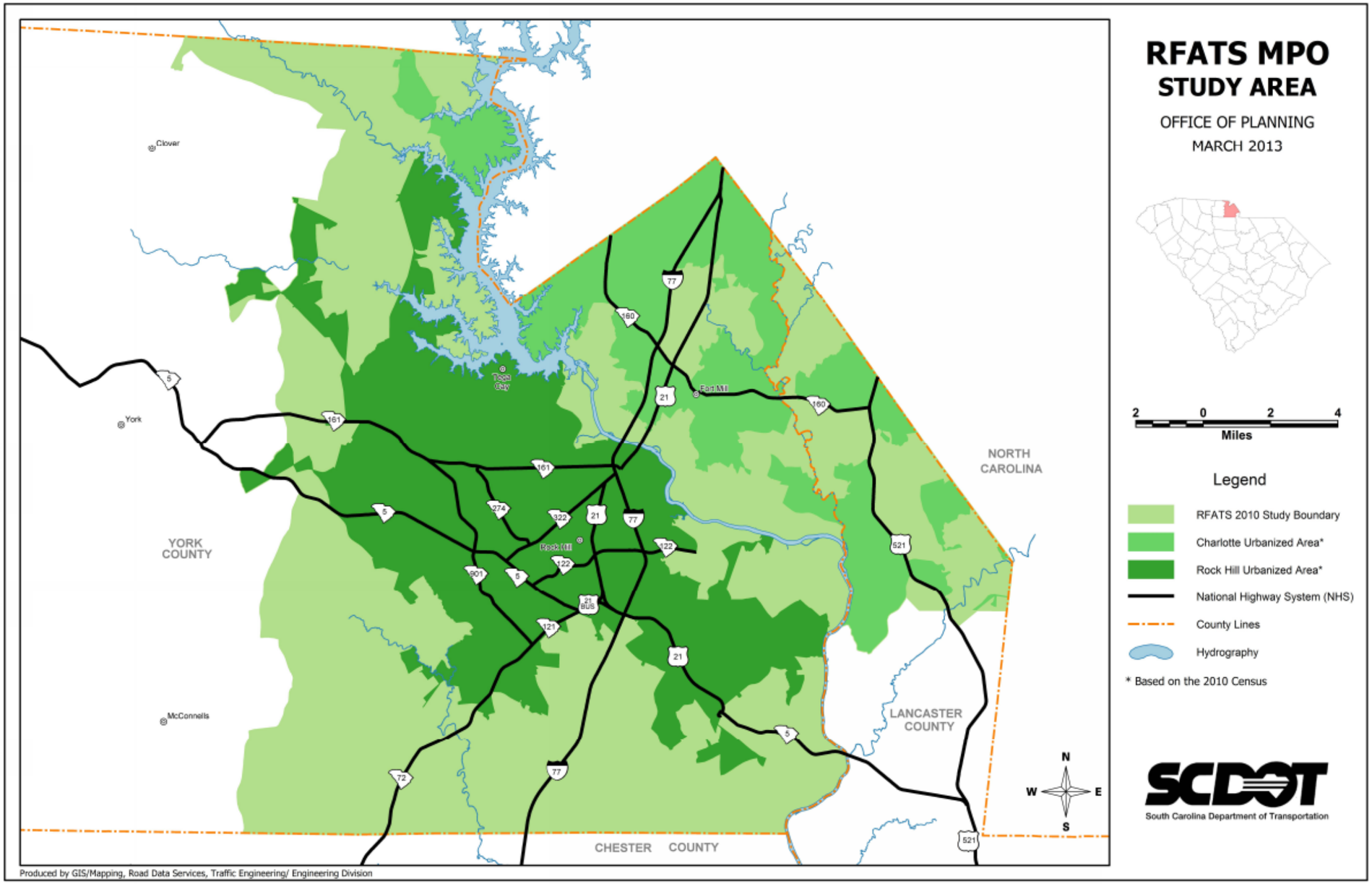

Figure 12: RFATS MPO Study Area

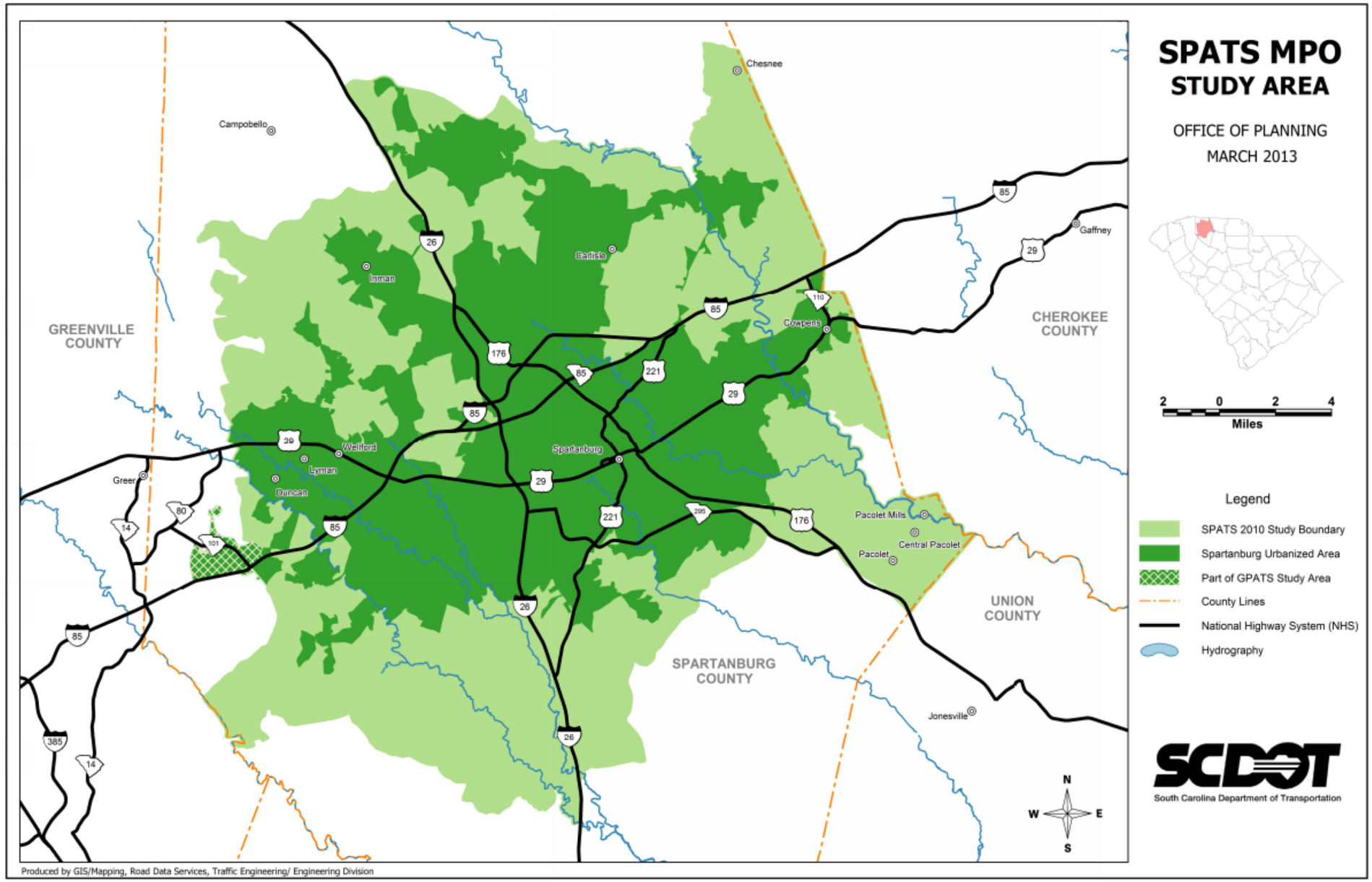

Figure 13: SPATS MPO Study Area

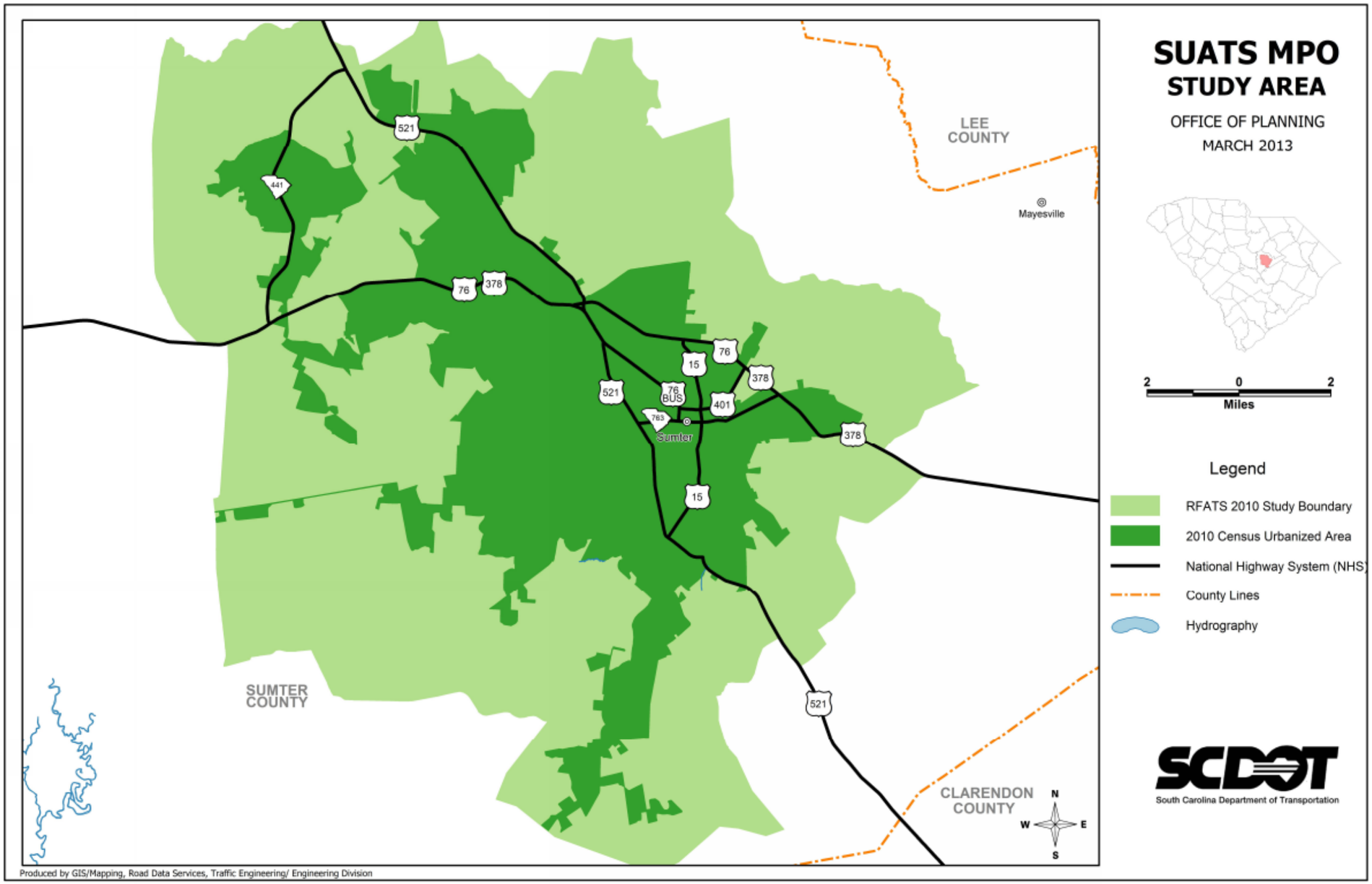

Figure 14: SUATS MPO Study Area

Appendix D FLOW DEFINITIONS

Table 14: Architecture Flow Definitions

Flow Name	Flow Description
accident report	Report of commercial vehicle safety accident. The information may be provided as a response to a real-time query or proactively by the source. The query flow is not explicitly shown.
air quality information	Aggregated region-wide measured air quality data and possible pollution incident information.
alarm acknowledge	Confirmation that alarm was received, instructions and additional information for the alarm initiator, and requests for additional information.
alarm notification	Notification of activation of an audible or silent alarm by a traveler in a public area or by a transit vehicle operator using an on-board device.
alert notification coordination	Coordination of emergency alerts to be distributed to the public. This includes notification of a major emergency such as a natural or man-made disaster, civil emergency, or child abduction for distribution to the public and status of the public notification.
archive analysis requests	A user request that initiates data mining, analytical processing, aggregation or summarization, report formulation, or other advanced processing and analysis of archived data. The request also includes information that is used to identify and authenticate the user and support electronic payment requirements, if any.
archive analysis results	Processed information products, supporting meta data, and any associated transaction information resulting from data mining, analytical processing, aggregation or summarization, report formulation, or other on-line processing and analysis of archived data.
archive coordination	Catalog data, meta data, published data, and other information exchanged between archives to support data synchronization and satisfy user data requests.
archive request confirmation	Confirmation that an archive request has been received and processed with information on the disposition of the request.
archive requests	A request to a data source for information on available data (i.e. "catalog") or a request that defines the data to be archived. The request can be a general subscription intended to initiate a continuous or regular data stream or a specific request intended to initiate a one-time response from the recipient.
archive status	Notification that data provided to an archive contains erroneous, missing, or suspicious data or verification that the data provided appears valid. If an error has been detected, the offending data and the nature of the potential problem are identified.
archived data product requests	A user-specified request for archived data products (i.e. data, meta data, or data catalogs). The request also includes information that is used to identify and authenticate the user and support electronic payment requirements, if any.
archived data products	Raw or processed data, meta data, data catalogs and other data products provided to a user system upon request. The response may also include any associated transaction information.

Flow Name	Flow Description
area pollution data	Measured air quality data, including measured levels of atmospheric pollutants including ozone, particulate matter, carbon monoxide, and nitrogen oxides, and operational status of the sensors.
broadcast traveler information	General traveler information that contains traffic and road conditions, link travel times, incidents, advisories, restrictions, transit service information, weather information, parking information, and other related traveler information.
carrier participation report	Report that summarizes motor carrier participation in CVO programs. Used to identify the level of active participation and to report which enrolled carriers are not participating as expected.
citation	Report of commercial vehicle citation. The citation includes references to the statute(s) that was (were) violated. It includes information on the violator and the officer issuing the citation. A citation differs from a violation because it is adjudicated by the courts. The information may be provided as a response to a real-time query or proactively by the source. The query flow is not explicitly shown.
commercial vehicle archive data	Information describing commercial vehicle travel and commodity flow characteristics. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.
commercial vehicle breach	Information about a breach or tamper event on a Commercial Vehicle or its attached freight equipment which includes identity, type of breach, location, and time.
commercial vehicle permit coordination	Information for the coordination of commercial vehicle permits for oversize, overweight, or for dangerous goods.
credentials information	Response containing full vehicle fuel tax and registration credentials information. "Response" may be provided in reaction to a real-time query or a standing request for updated information. The query flow is not explicitly shown.
credentials status information	Credentials information such as registration, licensing, insurance, check flags, and electronic screening enrollment data. A unique identifier is included. Corresponds to the credentials portion of CVISN "snapshots." The status information may be provided as a response to a real-time query or as a result of a standing request for updated information (subscription). This may also include information about non-U.S. fleets for use by U.S. authorities, and information regarding U.S. fleets made available to Mexican and Canadian authorities. The query flow is not explicitly shown.
current asset restrictions	Restrictions levied on transportation asset usage based on infrastructure design, surveys, tests, or analyses. This includes standard facility design height, width, and weight restrictions, special restrictions such as spring weight restrictions, and temporary facility restrictions that are imposed during maintenance and construction.
cv driver record	Information typically maintained by a state driver licensing agency about a driver of a commercial vehicle including driver identification data, license data, permit data, and driving history details. The query flow is not explicitly shown.
daily site activity data	Record of daily activities at commercial vehicle check stations including summaries of screening events and inspections.
data collection and monitoring control	Information used to configure and control data collection and monitoring systems.

Flow Name	Flow Description
demand responsive transit plan	Plan regarding overall demand responsive transit schedules and deployment.
demand responsive transit request	Request for paratransit support.
device control request	Request for device control action
device status	Status information from devices
electronic lock data request	Request from roadside for data regarding presence and status of electronic cargo locks.
electronic screening request	Request for identification data to support electronic screening.
emergency archive data	Logged emergency information including information that characterizes identified incidents (routine highway incidents through disasters), corresponding incident response information, evacuation information, surveillance data, threat data, and resource information. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.
emergency dispatch requests	Emergency vehicle dispatch instructions including incident location and available information concerning the incident.
emergency dispatch response	Request for additional emergency dispatch information and provision of en route status.
emergency notification	An emergency request for assistance automatically initiated by a vehicle or originated by a traveler using an in-vehicle or personal device.
emergency plan coordination	Information that supports coordination of emergency management plans, continuity of operations plans, emergency response and recovery plans, evacuation plans, and other emergency plans between agencies. This includes general plans that are coordinated prior to an incident and shorter duration tactical plans that are prepared during an incident.
emergency route request	Request for access routes for emergency response vehicles and equipment. This may be a request for ingress or egress routes or other emergency routes.
emergency traffic coordination	Coordination supporting disaster response including evacuation and reentry. Includes coordination of special traffic control strategies that support efficient evacuation and reentry while protecting and optimizing movement of response vehicles and other resources responding to the emergency.
emergency transit schedule information	Information on transit schedule and service changes that adapt the service to better meet needs of responders and the general public in an emergency situation, including special service schedules supporting evacuation.
emergency transit service request	Request to modify transit service and fare schedules to address emergencies, including requests for transit services to evacuate people from and/or deploy response agency personnel to an emergency scene. The request may poll for resource availability or request pre-staging, staging, or immediate dispatch of transit resources.

Flow Name	Flow Description
emergency transit service response	Response indicating changes to transit service, fares, and/or restrictions that will be made and status of transit resources to be deployed to support emergency response and/or evacuation.
emergency traveler information	Public notification of an emergency such as a natural or man-made disaster, civil emergency, or child abduction. This flow also includes evacuation information including evacuation instructions, evacuation zones, recommended evacuation times, tailored evacuation routes and destinations, traffic and road conditions along the evacuation routes, traveler services and shelter information, and reentry times and instructions.
emissions archive data	Air quality and vehicle emissions information that is collected by sensors or derived from models. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.
emissions sensor control	Data used to configure and control vehicle emissions sensors.
environmental conditions data	Current road conditions (e.g., surface temperature, subsurface temperature, moisture, icing, treatment status) and surface weather conditions (e.g., air temperature, wind speed, precipitation, visibility) as measured and reported by fixed and/or mobile environmental sensors and aggregated by the data collector. Attributes relating to the data collection (and aggregation) are also included.
environmental sensor data	Current road conditions (e.g., surface temperature, subsurface temperature, moisture, icing, treatment status) and surface weather conditions (e.g., air temperature, wind speed, precipitation, visibility) as measured and reported by fixed and/or mobile environmental sensors. Operational status of the sensors is also included.
environmental sensors control	Data used to configure and control environmental sensors.
equipment maintenance status	Current status of field equipment maintenance actions.
evacuation coordination	Coordination of information regarding a pending or in-process evacuation. Includes evacuation zones, evacuation times, evacuation routes, forecast network conditions, and reentry times.
evacuation information	Evacuation instructions and information including evacuation zones, evacuation times, and reentry times.
event confirmation	Confirmation that special event details have been received and processed.
event information	Special event information for travelers. This would include a broader array of information than the similar "event plans" that conveys only information necessary to support traffic management for the event.
event information request	Request for special event information.
event plans	Plans for major events possibly impacting traffic.
fare collection data	Fare collection information including the summary of on-board fare system data and financial payment transaction data.

Flow Name	Flow Description
fare management information	Transit fare information and transaction data used to manage transit fare processing on the transit vehicle.
field device status	Reports from field equipment (sensors, signals, signs, controllers, etc.) which indicate current operational status.
field equipment status	Identification of field equipment requiring repair and known information about the associated faults.
freight breach	Information about a breach or tamper event on Freight Equipment which includes identity, type of breach, location, and time.
freight equipment information	Container, trailer, or chassis information regarding identity, type, location, brake wear data, mileage, seal #, seal type, door open/close status, chassis bare/covered status, tethered / untethered status, Bill of Lading, and sensor status.
hazmat information	Information about a particular hazmat load including nature of the load and unloading instructions. May also include hazmat vehicle route and route update information.
hazmat information request	Request for information about a particular hazmat load.
hazmat spill notification	Information provided to emergency response organizations when cargo sensors detect a release of hazardous material. This information will include sensor information, vehicle location and identification, and carrier identification.
hri advisories	Notification of Highway-Rail Intersection equipment failure, intersection blockage, or other condition requiring attention, and maintenance activities at or near highway rail intersections.
hri control data	Data required for HRI information transmitted at railroad grade crossings and within railroad operations.
hri request	A request for highway-rail intersection status or a specific control request intended to modify HRI operation.
hri status	Status of the highway-rail intersection equipment including both the current state or mode of operation and the current equipment condition.
incident information	Notification of existence of incident and expected severity, location, time and nature of incident. As additional information is gathered and the incident evolves, updated incident information is provided. Incidents include any event that impacts transportation system operation ranging from routine incidents (e.g., disabled vehicle at the side of the road) through large-scale natural or human-caused disasters that involve loss of life, injuries, extensive property damage, and multi-jurisdictional response. This also includes special events, closures, and other planned events that may impact the transportation system.
incident response coordination	Incident response procedures and current incident response status that are shared between allied response agencies to support a coordinated response to incidents. This flow provides current situation information, including a summary of incident status and its impact on the transportation system and other infrastructure, and current and planned response activities. This flow also coordinates a positive hand off of responsibility for all or part of an incident response between agencies.
infrastructure monitoring sensor control	Data used to configure and control infrastructure monitoring sensors.

Flow Name	Flow Description
interactive traveler information	Traveler information provided in response to a traveler request. The provided information includes traffic and road conditions, advisories, incidents, payment information, transit services, parking information, weather information, and other travel-related data updates and confirmations.
local signal priority request	Request from a vehicle to a signalized intersection for priority at that intersection.
maint and constr archive data	Information describing road construction and maintenance activities identifying the type of activity, the work performed, and work zone information including work zone configuration and safety (e.g., a record of intrusions and vehicle speeds) information. For construction activities, this information also includes a description of the completed infrastructure, including as-built plans as applicable. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.
maint and constr resource coordination	Request for road maintenance and construction resources that can be used in the diversion of traffic (cones, portable signs), clearance of a road hazard, repair of ancillary damage, or any other incident response.
maint and constr resource request	Request for road maintenance and construction resources that can be used in the diversion of traffic (cones, portable signs), clearance of a road hazard, repair of ancillary damage, or any other incident response. The request may poll for resource availability or request pre-staging, staging, or immediate dispatch of resources.
maint and constr resource response	Current status of maintenance and construction resources including availability and deployment status. General resource inventory information covering vehicles, equipment, materials, and people and specific resource deployment status may be included.
maint and constr work plans	Future construction and maintenance work schedules and activities including anticipated closures with anticipated impact to the roadway, alternate routes, anticipated delays, closure times, and durations.
multimodal information	Schedule information for alternate mode transportation providers such as train, ferry, air and bus.
on-board safety data	Safety data measured by on-board sensors. Includes information about the vehicle, vehicle components, cargo, and driver. The query flow is not explicitly shown.
parking archive data	Data used to analyze and monitor trends in parking demand, pricing, and operational actions. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.
parking coordination	Information that enables parking management activities to be coordinated between different parking operators or systems in a region.
parking information	General parking information and status, including current parking availability.
parking lot data request	Request for parking lot occupancy, fares, and availability. The request can be a subscription that initiates as-needed information updates as well as a one-time request for information.
parking lot inputs	Instructions for operation of local parking facilities to support regional traffic management objectives (e.g. which parking lot exits to use). Also, includes inputs from traffic sensors to support calculation of parking lot occupancy and support more effective management of parking entrances and exits.

Flow Name	Flow Description
parking lot reservation confirmation	Confirmation for parking lot reservation.
parking reservations request	Reservation request for parking lot.
pass/pull-in	Command to commercial vehicle to pull into or bypass inspection station.
payment	Payment of some kind (e.g., toll, parking, fare) by traveler which, in most cases, can be related to a credit account.
payment request	Request for payment from financial institution.
personal transit information	General and personalized transit information for a particular fixed route, flexible route, or paratransit system.
pollution sensor control	Data used to configure and control area pollution and air quality sensors.
pollution state data request	Aggregated emissions data information request.
qualified environmental conditions data	Current road conditions (e.g., surface temperature, subsurface temperature, moisture, icing, treatment status) and surface weather conditions (e.g., air temperature, wind speed, precipitation, visibility) that has had quality checks performed on it and has been formatted and consolidated by the Clarus system. Attributes relating to the data collection (and aggregation) are also included.
rail incident response status	Status of the rail system's response to current incidents.
rail system status assessment	Assessment of damage sustained by rail lines and associated railroad infrastructure including location and extent of the damage, impact on current operations and necessary restrictions, and time frame for repair and recovery.
railroad advisories	Real-time notification of railway-related incident or advisory.
railroad schedules	Train schedules, maintenance schedules, and other information from the railroad that supports forecast of HRI closures.
registration	Registered owner of vehicle and associated vehicle information.
remote surveillance control	The control commands used to remotely operate another center's sensors or surveillance equipment so that roadside surveillance assets can be shared by more than one agency.
request for bad tag list	Request for list of bad vehicle tag IDs.
request for payment	Request to deduct cost of service from user's payment account.
request for vehicle measures	Request for vehicle performance and maintenance data collected by onboard sensors.
request tag data	Request for tag information including credit identity, stored value card cash, etc.

Flow Name	Flow Description
request transit information	Request for transit service information and current transit status.
resource coordination	Coordination of resource inventory information, specific resource status information, resource prioritization and reallocation between jurisdictions, and specific requests for resources and responses that service those requests.
right-of-way request notification	Notice that a request has occurred for signal prioritization, signal preemption, pedestrian call, multi-modal crossing activation, or other source for right-of-way.
road network conditions	Current and forecasted traffic information, road and weather conditions, and other road network status. Either raw data, processed data, or some combination of both may be provided by this architecture flow. Information on diversions and alternate routes, closures, and special traffic restrictions (lane/shoulder use, weight restrictions, width restrictions, HOV requirements) in effect is included along with a definition of the links, nodes, and routes that make up the road network.
road network status assessment	Assessment of damage sustained by the road network including location and extent of the damage, estimate of remaining capacity, required closures, alternate routes, necessary restrictions, and time frame for repair and recovery.
road weather information	Road conditions and weather information that are made available by road maintenance operations to other transportation system operators.
roadside archive data	A broad set of data derived from roadside sensors that includes current traffic conditions, environmental conditions, and any other data that can be directly collected by roadside sensors. This data also indicates the status of the sensors and reports of any identified sensor faults.
roadside data message	Data set collected by roadside sensors to identify and characterize a vehicle, carrier, and (potentially) driver.
roadway equipment coordination	The direct flow of information between field equipment. This includes transfer of information between sensors and driver information systems (e.g., DMS, HAR, variable speed limit signs, dynamic lane signs) or control devices (e.g., traffic signals, ramp meters), direct coordination between adjacent control devices, interfaces between detection and warning or alarm systems, and any other direct communications between field equipment.
roadway information system data	Information used to initialize, configure, and control roadside systems that provide driver information (e.g., dynamic message signs, highway advisory radio, beacon systems). This flow can provide message content and delivery attributes, local message store maintenance requests, control mode commands, status queries, and all other commands and associated parameters that support remote management of these systems.
roadway information system status	Current operating status of dynamic message signs, highway advisory radios, beacon systems, or other configurable field equipment that provides dynamic information to the driver.
roadway maintenance status	Summary of maintenance fleet operations affecting the road network. This includes the status of winter maintenance (snow plow schedule and current status).
route restrictions	Information about routes, road segments, and areas that do not allow the transport of security sensitive hazmat cargoes or include other restrictions (such as height or weight limits).
safety inspection record	Record containing results of commercial vehicle safety inspection.

Flow Name	Flow Description
safety inspection report	Report containing results of commercial vehicle safety inspection. The information may be provided as a response to a real-time query or proactively by the source. The query flow is not explicitly shown.
safety inspection request	Request for safety inspection record.
safety status information	Safety information such as safety ratings, security ratings or flags, inspection summaries, and violation summaries. A unique identifier is included. Corresponds to the safety and security portion of CVISN "snapshots." The status information may be provided as a response to a real-time query or as a result of a standing request for updated information (subscription). This may also include information about non-U.S. fleets for use by U.S. authorities, and information regarding U.S. fleets made available to Mexican and Canadian authorities. The query flow is not explicitly shown.
screening event record	Results of CVO electronic screening activity.
secure area sensor control	Information used to configure and control threat sensors (e.g., thermal, acoustic, radiological, chemical), object, motion and intrusion detection sensors. The provided information controls sensor data collection, aggregation, filtering, and other local processing.
secure area sensor data	Data provided by threat sensors (e.g., thermal, acoustic, radiological, chemical), and intrusion, motion, and object detection sensors in secure areas indicating the sensor's operational status, raw and processed sensor data, and alarm indicators when a threat has been detected.
secure area surveillance control	Information used to configure and control audio and video surveillance systems used for transportation infrastructure security in secure areas. The provided information controls surveillance data collection, aggregation, filtering, and other local processing.
secure area surveillance data	Data collected from surveillance systems used to monitor secure areas. Includes video, audio, processed surveillance data, equipment operational status, and alarm indicators when a threat has been detected.
security equipment maintenance status	Current status of security surveillance and sensor field equipment maintenance actions.
selected routes	Routes selected based on route request criteria.
short range communications status	Status of the short range communications equipment including the current state or mode of operation and the current equipment status.
signal control commands	Control of traffic signal controllers or field masters including clock synchronization.
signal control device configuration	Data used to configure traffic signal control equipment including local controllers and system masters.
signal control plans	Traffic signal timing parameters including minimum green time and interval durations for basic operation and cycle length, splits, offset, phase sequence, etc. for coordinated systems.
signal control status	Operational and status data of traffic signal control equipment including operating condition and current indications.

Flow Name	Flow Description
signal fault data	Faults from traffic signal control equipment.
signal system configuration	Data used to configure traffic signal systems including configuring control sections and mode of operation (time based or traffic responsive).
tag data	Unique tag ID and related vehicle information.
targeted list	List of carriers, drivers, and/or vehicles of interest for enforcement purposes.
threat information coordination	Sensor, surveillance, and threat data including raw and processed data that is collected by sensor and surveillance equipment located in secure areas.
toll transactions	Detailed list of transactions from a toll station.
traffic archive data	Information describing the use and vehicle composition on transportation facilities and the traffic control strategies employed. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.
traffic flow	Raw and/or processed traffic detector data which allows derivation of traffic flow variables (e.g., speed, volume, and density measures) and associated information (e.g., congestion, potential incidents). This flow includes the traffic data and the operational status of the traffic detectors.
traffic images	High fidelity, real-time traffic images suitable for surveillance monitoring by the operator or for use in machine vision applications.
traffic metering control	Control commands and operating parameters for ramp meters, interchange meters, mainline meters, and other systems equipment associated with roadway metering operations.
traffic metering status	Current operational status and operating parameters for ramp meters, interchange meters, mainline meters and other control equipment associated with roadway metering operations.
traffic operator data	Presentation of traffic operations data to the operator including traffic conditions, current operating status of field equipment, maintenance activity status, incident status, video images, security alerts, emergency response plan updates and other information. This data keeps the operator appraised of current road network status, provides feedback to the operator as traffic control actions are implemented, provides transportation security inputs, and supports review of historical data and preparation for future traffic operations activities.
traffic operator inputs	User input from traffic operations personnel including requests for information, configuration changes, commands to adjust current traffic control strategies (e.g., adjust signal timing plans, change DMS messages), and other traffic operations data entry.
traffic probe data	Vehicle data that is used to determine traffic conditions. In a basic implementation, the data could be limited to time stamped unique identifiers that can be used to measure a vehicle's progress through the network. In more advanced implementations, the vehicle may report current position, speed, and heading and snapshots of recent events including route information, starts and stops, speed changes, and other information that can be used to estimate traffic conditions.
traffic sensor control	Information used to configure and control traffic sensor systems.

Flow Name	Flow Description
transaction status	Response to transaction request. Normally dealing with a request for payment.
transit and fare schedules	Transit service information including routes, schedules, and fare information.
transit archive data	Data used to describe and monitor transit demand, fares, operations, and system performance. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.
transit fare and passenger status	Information provided from the traveler location that supports fare payments, passenger data, and associated record-keeping.
transit fare information	Information provided by transit management that supports fare payment transactions and passenger data collection.
transit incident information	Information on transit incidents that impact transit services for public dissemination.
transit information request	Request for transit operations information including schedule and fare information. The request can be a subscription that initiates as-needed information updates as well as a one-time request for information.
transit information user request	Request for special transit routing, real-time schedule information, and availability information.
transit request confirmation	Confirmation of a request for transit information or service.
transit schedule adherence information	Dynamic transit schedule adherence and transit vehicle location information.
transit schedule information	Current and projected transit schedule information used to initialize the transit vehicle with a vehicle assignment, monitor schedule performance, and develop corrective actions on-board.
transit traveler information	Transit information prepared to support transit users and other travelers. It contains transit schedules, real-time arrival information, fare schedules, alerts and advisories, and general transit service information.
transit user information	Information about individual transit users boarding a transit vehicle, used to track a user's progress on a scheduled transit trip.
transit vehicle conditions	Operating conditions of transit vehicle (e.g., engine running, oil pressure, fuel level and usage).
transit vehicle loading data	Data collected on board the transit vehicle relating to passenger boarding and alighting.
transit vehicle location data	Current transit vehicle location and related operational conditions data provided by a transit vehicle.

Flow Name	Flow Description
transit vehicle operator authentication information	Information regarding on-board transit operator authentication
transit vehicle operator authentication update	Results of authentication process or update of on-board authentication database.
transit vehicle operator information	Transit service instructions, wide area alerts, traffic information, road conditions, and other information for both transit and paratransit operators.
transit vehicle schedule performance	Estimated times of arrival and anticipated schedule deviations reported by a transit vehicle.
transportation information for operations	Information on the state of transportation system operations including traffic and road conditions, advisories, incidents, transit service information, weather information, parking information, and other related data.
transportation system status	Current status and condition of transportation infrastructure (e.g., tunnels, bridges, interchanges, TMC offices, maintenance facilities). In case of disaster or major incident, this flow provides an assessment of damage sustained by the surface transportation system including location and extent of the damage, estimate of remaining capacity and necessary restrictions, and time frame for repair and recovery.
traveler alerts	Traveler information alerts reporting congestion, incidents, adverse road or weather conditions, parking availability, transit service delays or interruptions, and other information that may impact the traveler. Relevant alerts are provided based on traveler-supplied profile information including trip characteristics and preferences.
traveler archive data	Data associated with traveler information services including service requests, facility usage, rideshare, routing, and traveler payment transaction data. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.
traveler inputs	User input from a traveler to summon assistance, request travel information, make a reservation, or request any other traveler service.
traveler interface updates	Visual or audio information (e.g., routes, messages, guidance, emergency information) that is provided to the traveler.
traveler profile	Information about a traveler including equipment capabilities, personal preferences, and traveler alert subscriptions.
traveler request	A request for traveler information including traffic, transit, toll, parking, road weather conditions, event, and passenger rail information. The request identifies the type of information, the area of interest, parameters that are used to prioritize or filter the returned information, and sorting preferences.
trigger control	Controls to enable or disable a particular trigger.
variable speed limit control	Information used to configure and control variable speed limit systems including the equipment used to provide current speed limits and other information to drivers and the equipment used to monitor traffic and environmental conditions along the roadway.

Flow Name	Flow Description
variable speed limit status	Current operating status of the variable speed limit systems including the state of the equipment.
vehicle emissions data	Measured emissions of specific vehicles comprised of exhaust pollutants including hydrocarbons, carbon monoxide, and nitrogen oxides.
vehicle payment information	Information provided for payment of tolls and parking fees including identification that can be used to identify the payment account or source and related vehicle and service information that are used to determine the type and price of service requested.
video surveillance control	Information used to configure and control video surveillance systems.
violation notification	Notification to enforcement agency of a violation. The violation notification flow describes the statute or regulation that was violated and how it was violated (e. g., overweight on specific axle by xxx pounds or which brake was out of adjustment and how far out of adjustment it was). A violation differs from a citation because it is not adjudicated by the courts.
weather archive data	Accumulated forecasted and current weather data (e.g., temperature, pressure, wind speed, wind direction, humidity, precipitation, visibility, light conditions, etc.) as well as qualified environmental sensor data. Content may include a catalog of available information, the actual information to be archived, and associated meta data that describes the archived information.
weather information	Accumulated forecasted and current weather data (e.g., temperature, pressure, wind speed, wind direction, humidity, precipitation, visibility, light conditions, etc.).
Wide area statistical pollution information	Aggregated region-wide measured emissions data and possible pollution incident information.
work plan coordination	Coordination of work plan schedules and activities between maintenance and construction organizations or systems. This information includes the work plan schedules and comments and suggested changes that are exchanged as work plans are coordinated and finalized.
work plan feedback	Comments and suggested changes to proposed construction and maintenance work schedules and activities. This information influences work plan schedules so that they minimize impact to other system operations and the overall transportation system.
work zone information	Summary of maintenance and construction work zone activities affecting the road network including the nature of the maintenance or construction activity, location, impact to the roadway, expected time(s) and duration of impact, anticipated delays, alternate routes, and suggested speed limits. This information may be augmented with images that provide a visual indication of current work zone status and traffic impacts.
work zone warning device control	Data used to configure and control work zone safety monitoring and warning devices.
work zone warning status	Status of a work zone safety monitoring and warning devices. This flow documents system activations and includes additional supporting information (e.g., an image) that allows verification of the alarm.

Appendix E INTERCONNECT AND FLOW CONTEXT DIAGRAMS

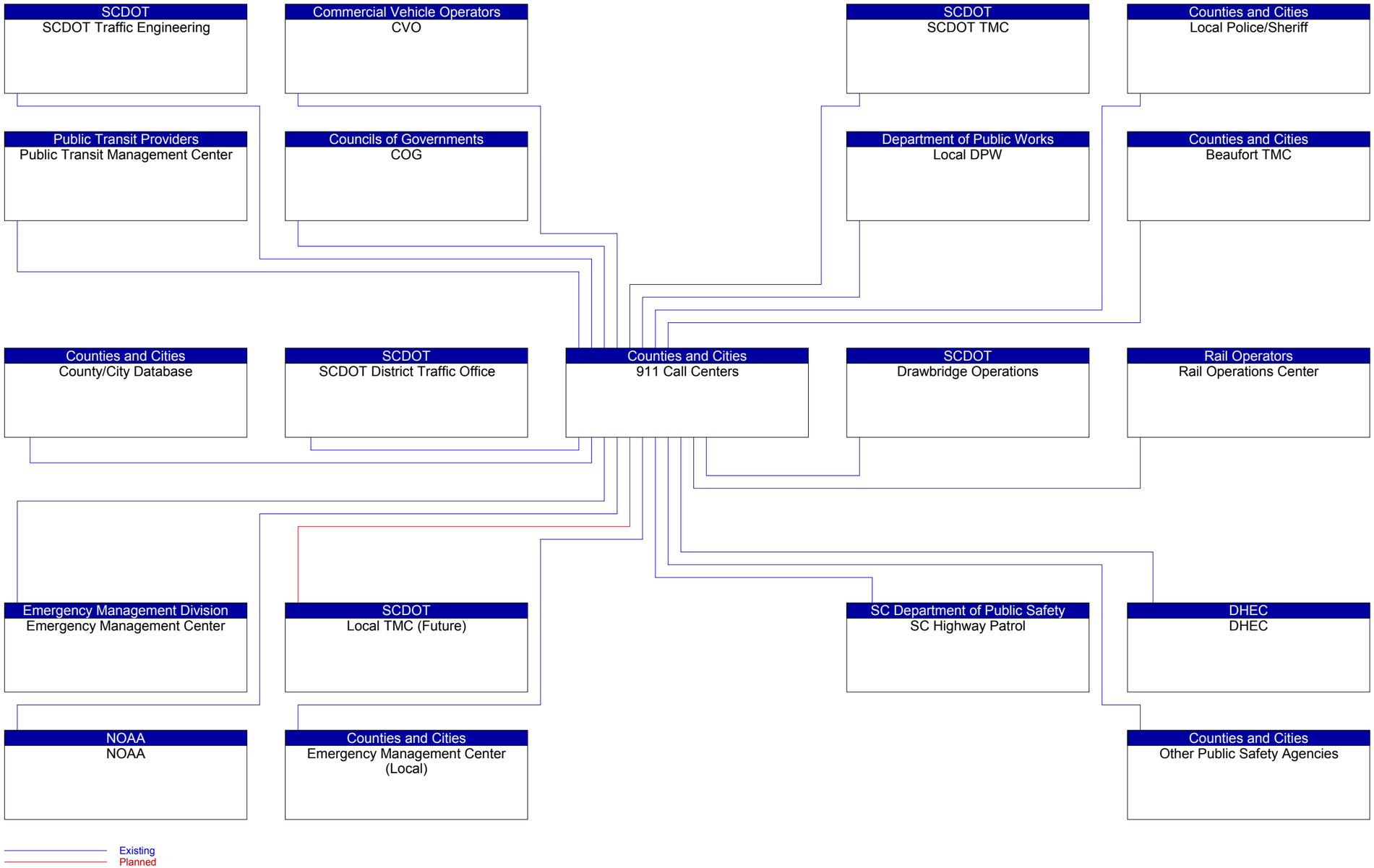

Figure 15: 911 Call Center Interconnect Context Diagram

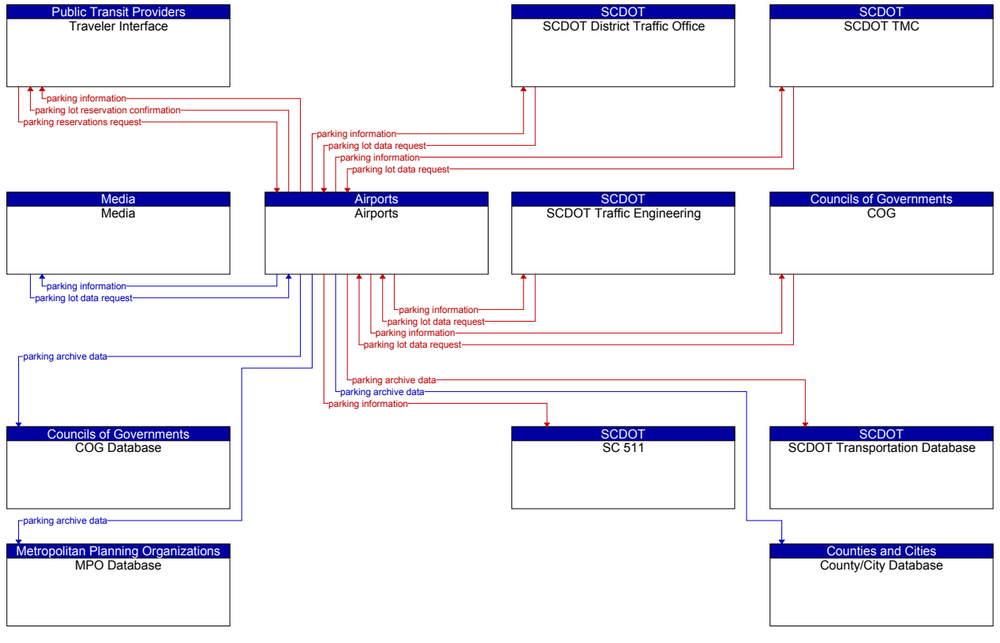

Figure 16: Airports Flow Context Diagram

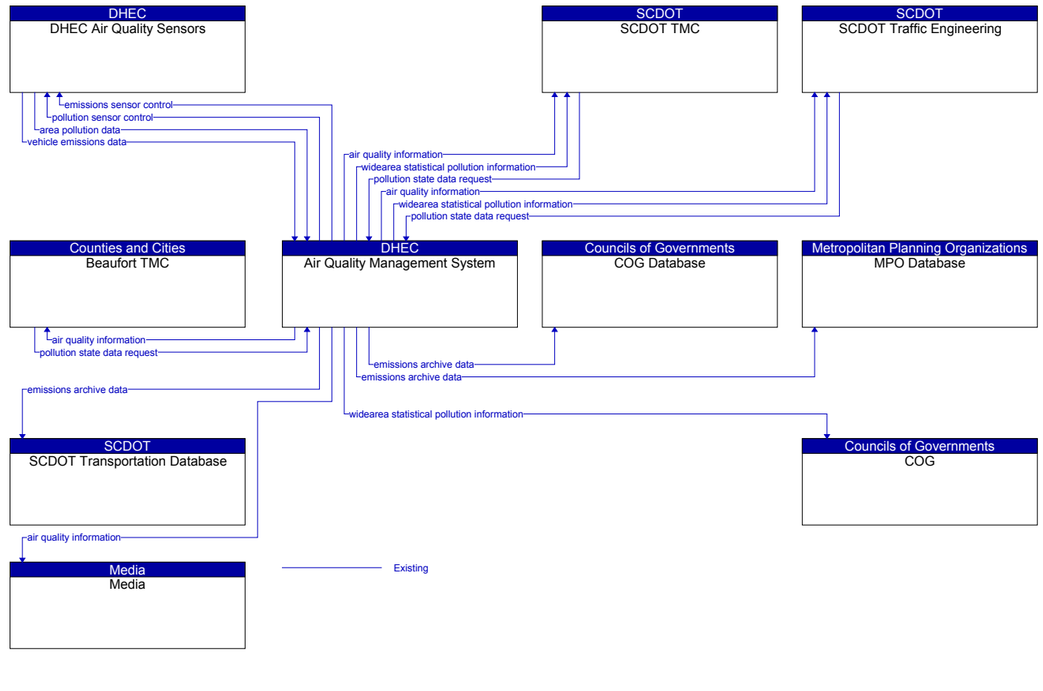

Figure 17: Air Quality Management System Flow Context Diagram

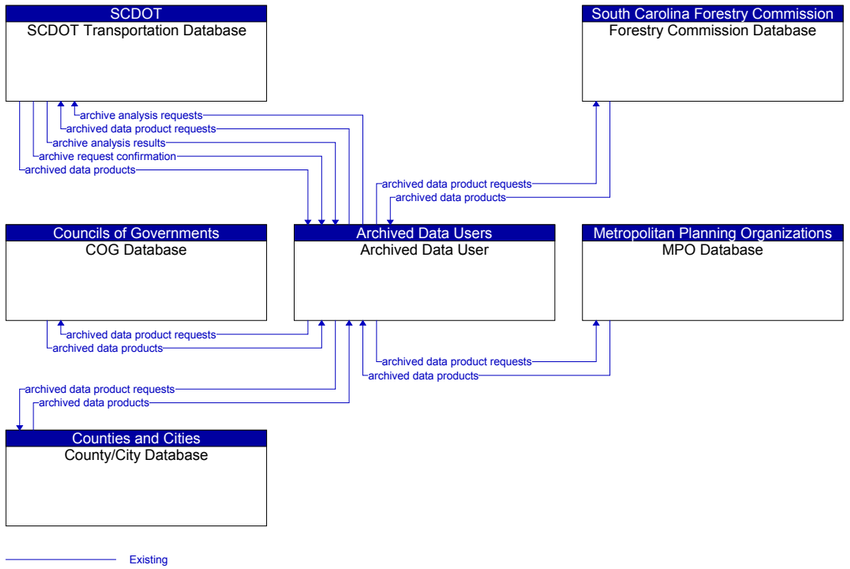

Figure 18: Archived Data User Flow Context Diagram

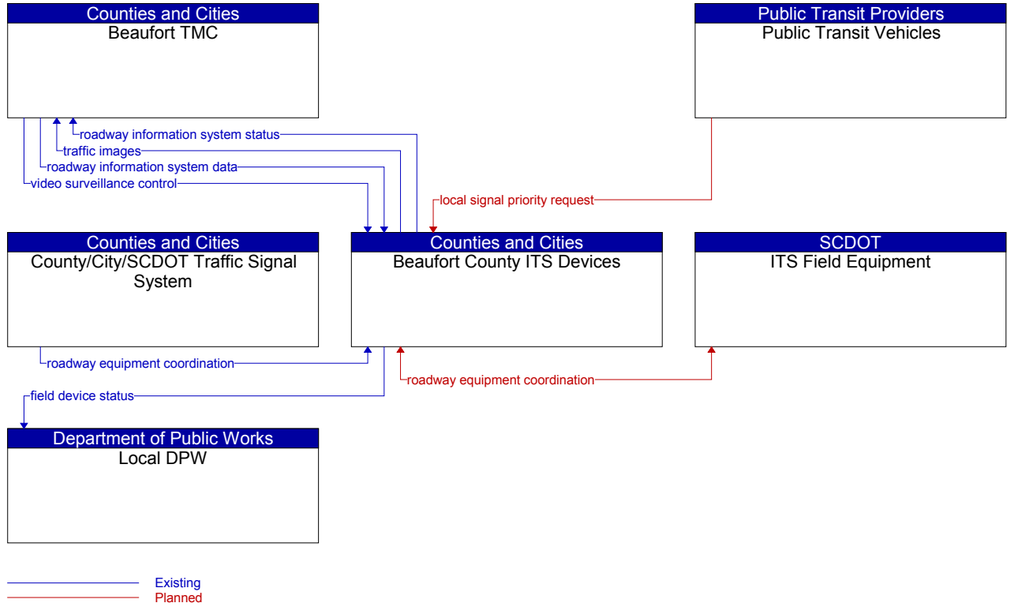

Figure 19: Beaufort County ITS Devices Flow Context Diagram

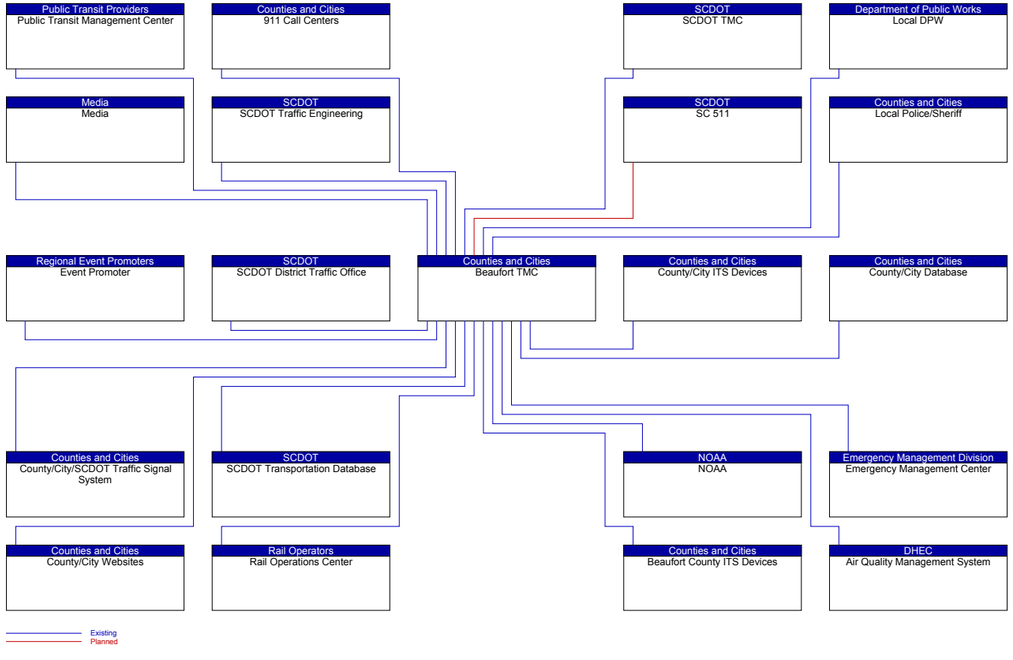

Figure 20: Beaufort TMC Interconnect Context Diagram

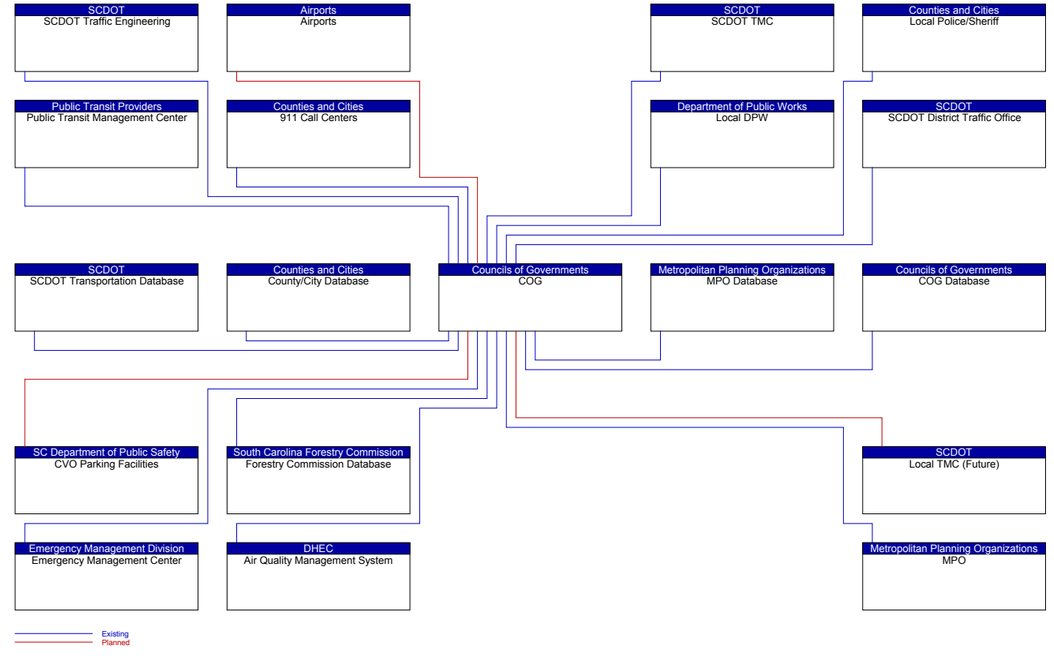

Figure 21: COG Interconnect Context Diagram

Figure 22: COG Database Flow Context Diagram

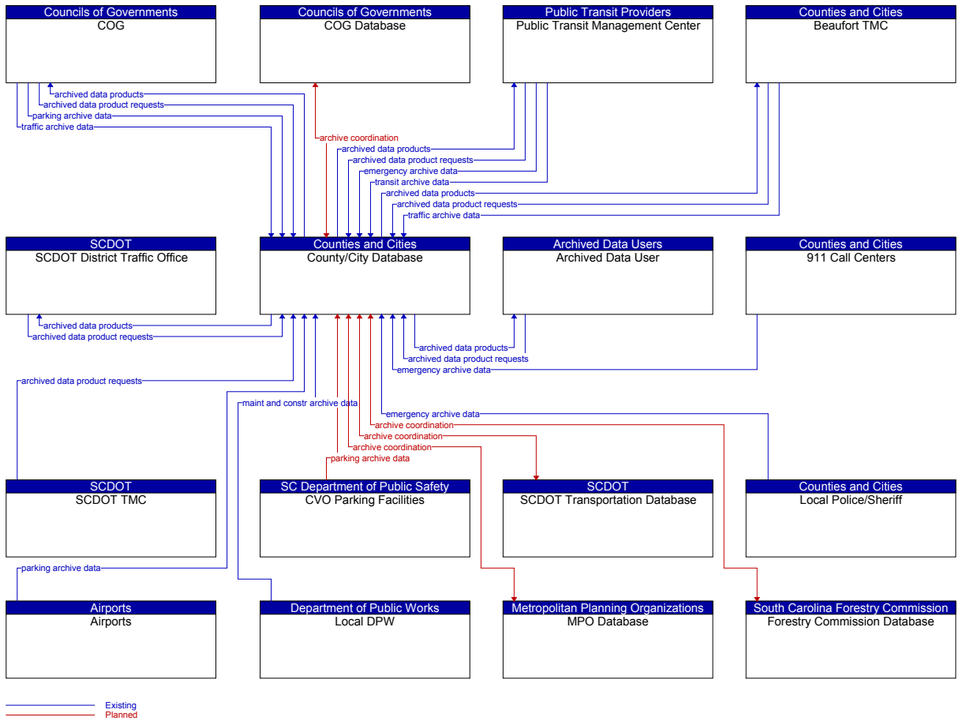

Figure 23: County/City Database Flow Context Diagram

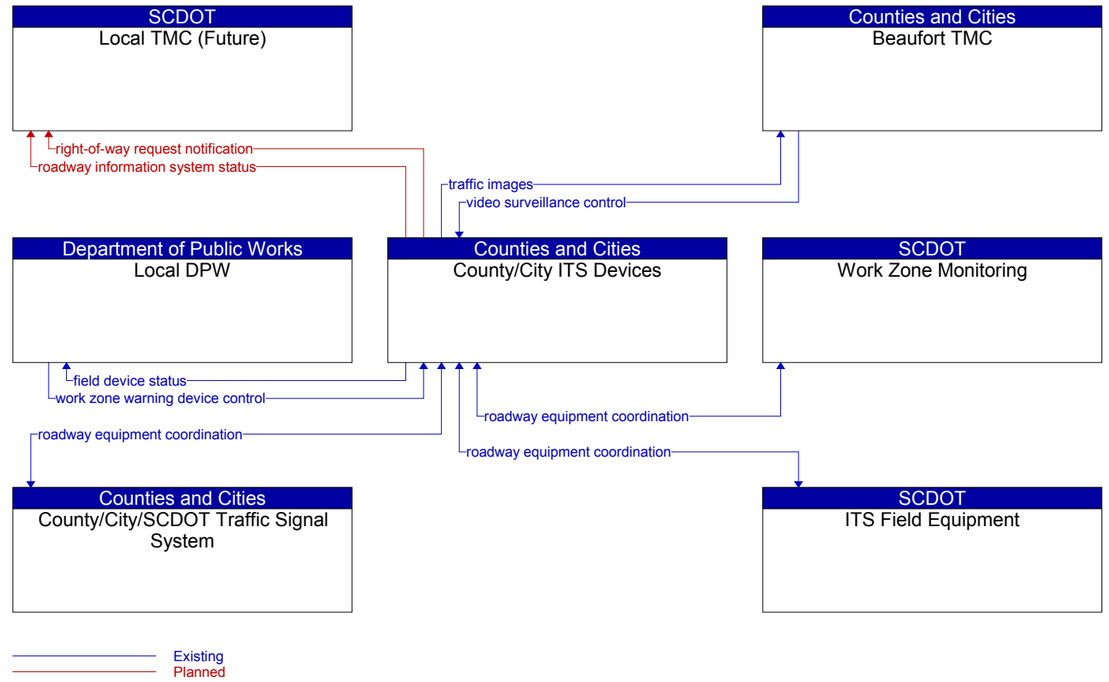

Figure 24: County/City ITS Devices Flow Context Diagram

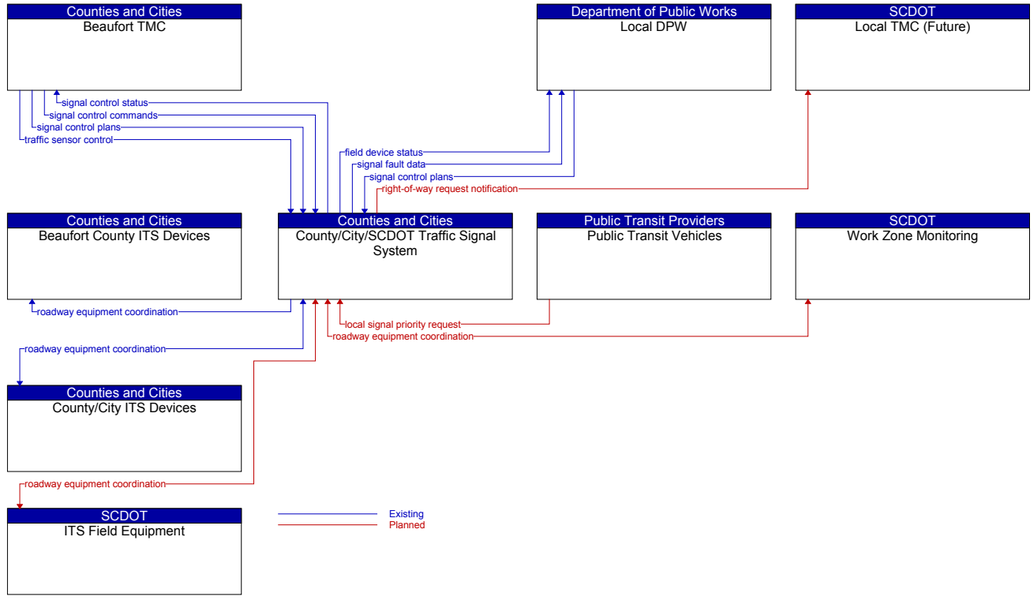

Figure 25: County/City/SCDOT Traffic Signal System Flow Context Diagram

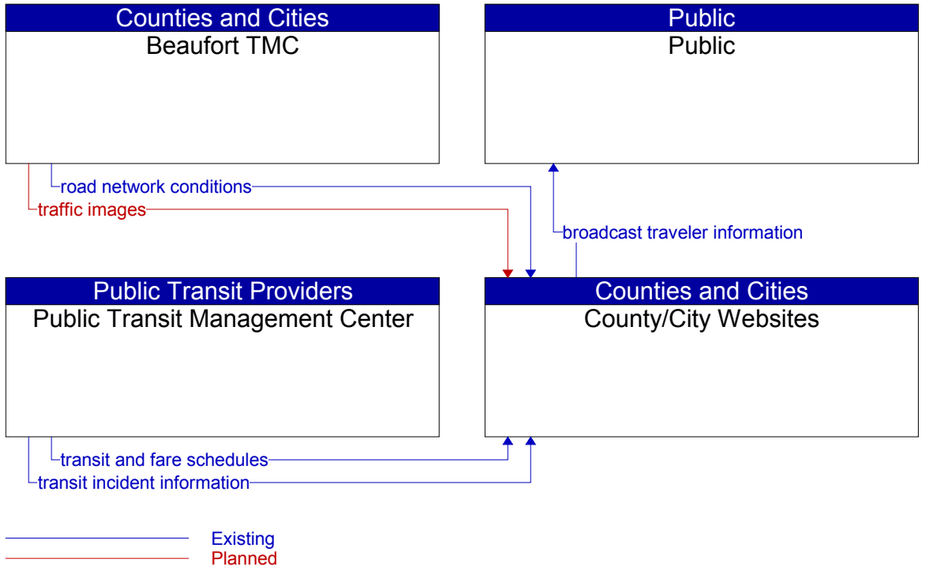

Figure 26: County/City Website Flow Context Diagram

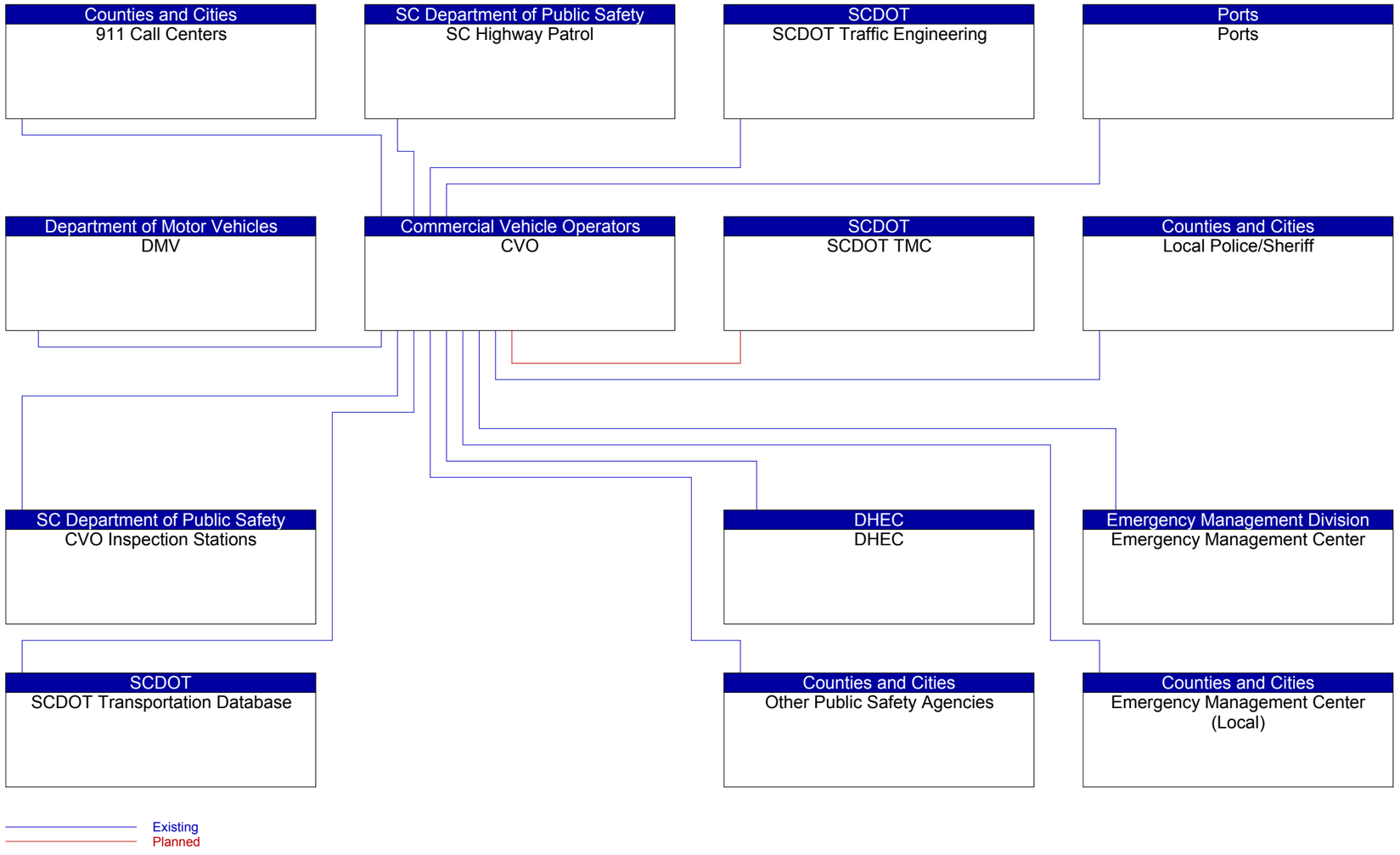

Figure 27: CVO Interconnect Context Diagram

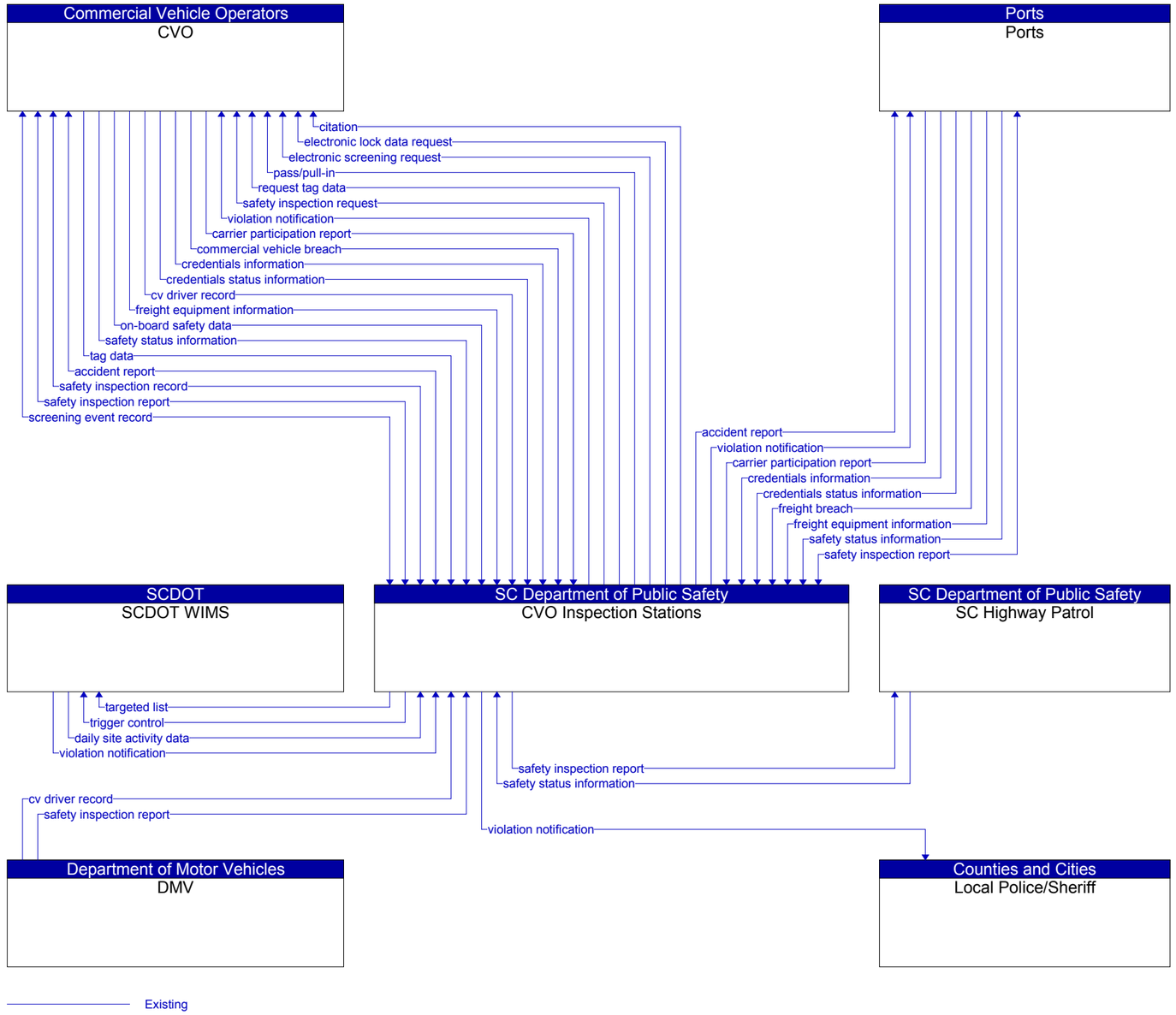

Figure 28: CVO Inspection Station Flow Context Diagram

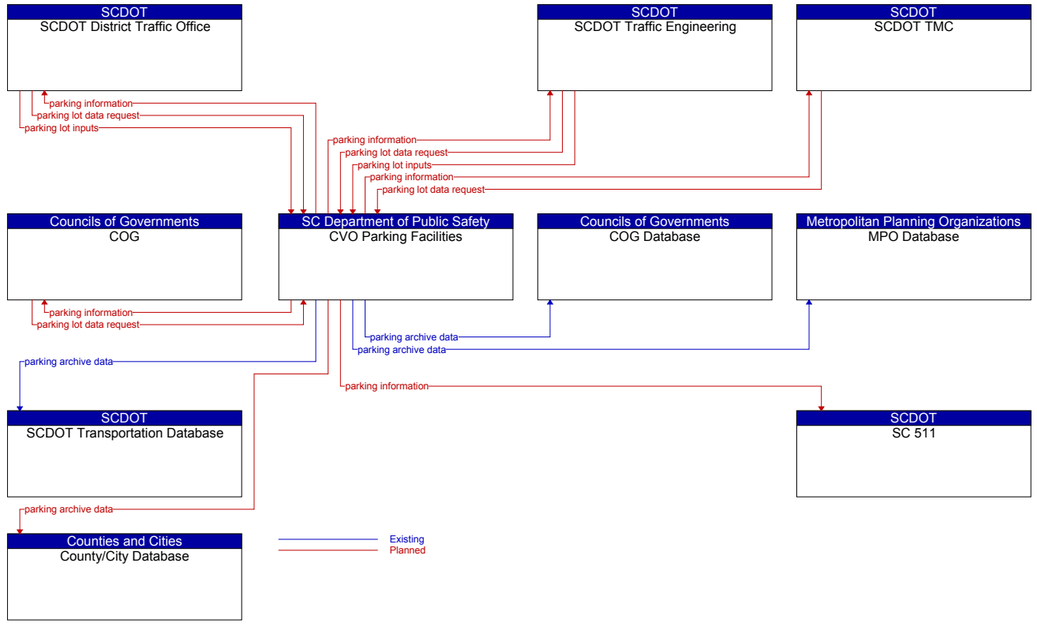

Figure 29: CVO Parking Facility Flow Context Diagram

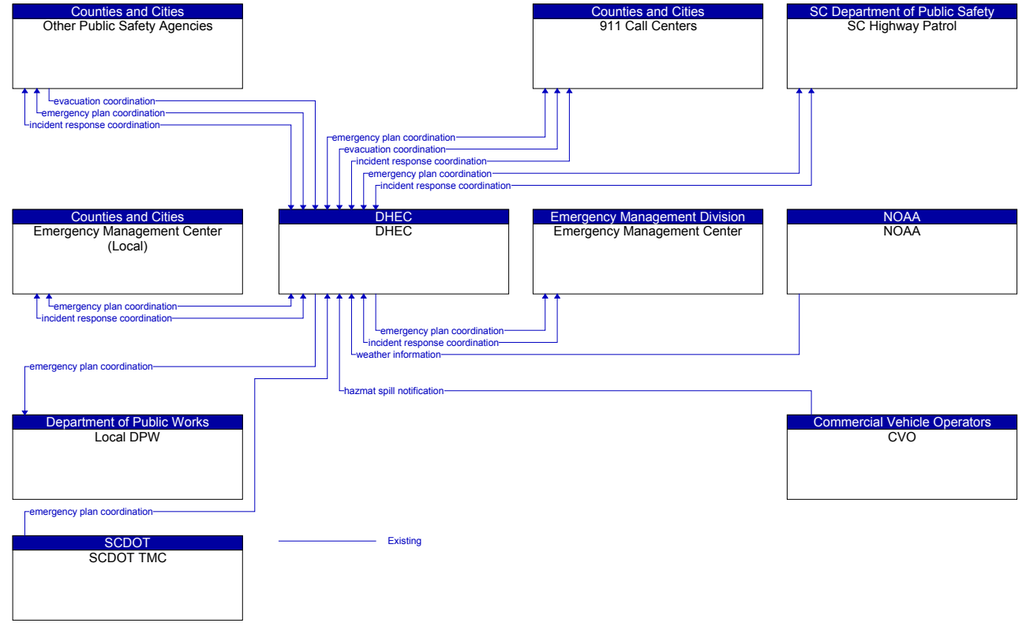

Figure 30: DHEC Flow Context Diagram

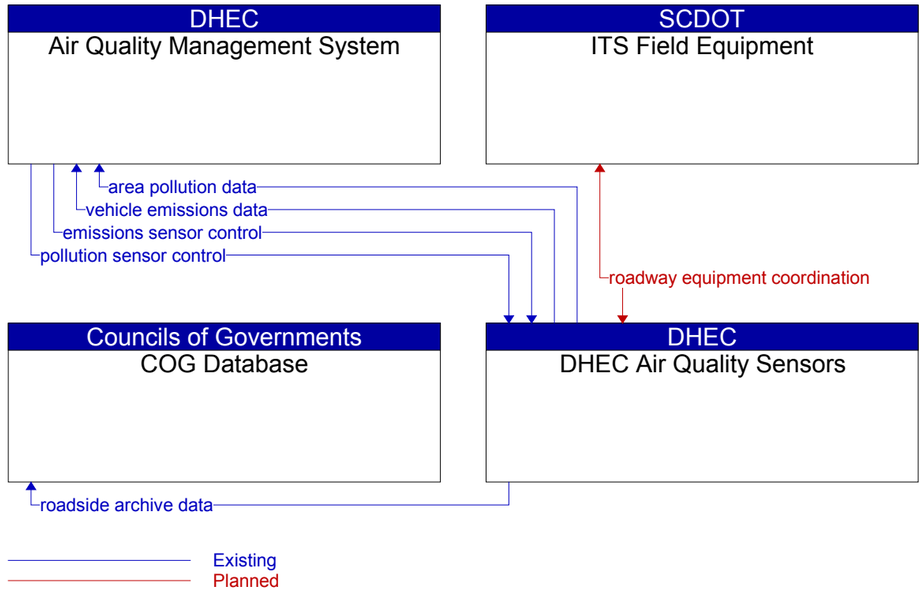

Figure 31: DHEC Air Quality Sensor Flow Context Diagram

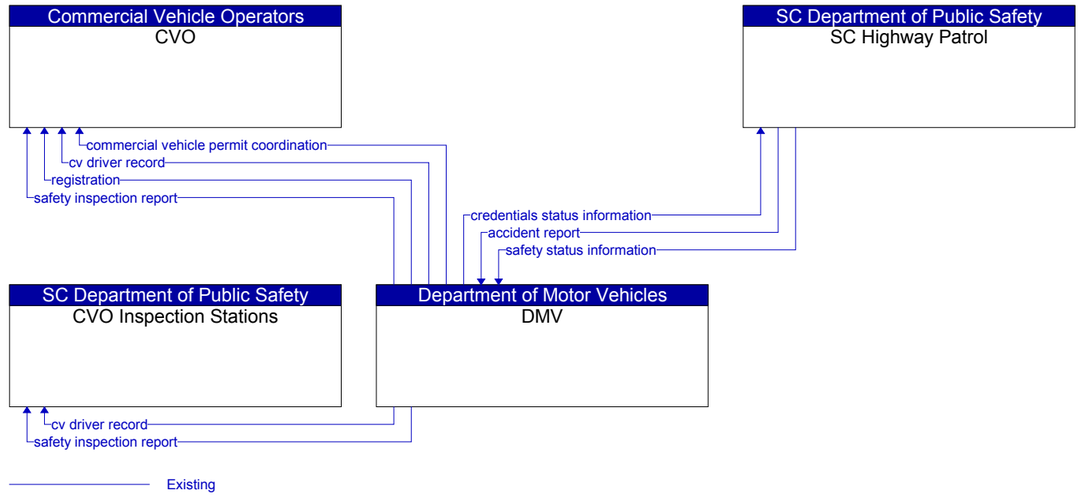

Figure 32: DMV Flow Context Diagram

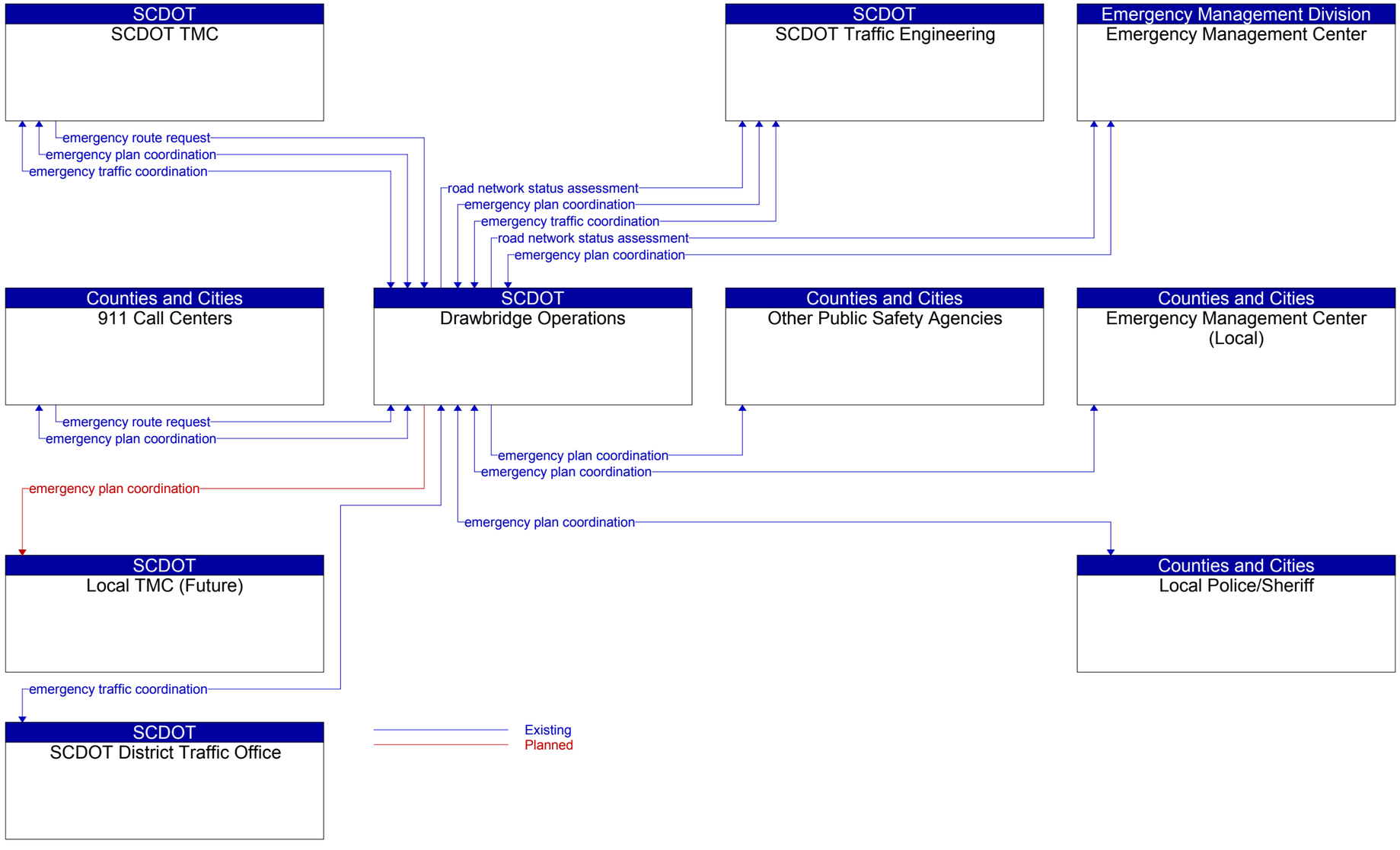

Figure 33: Drawbridge Operations Flow Context Diagram

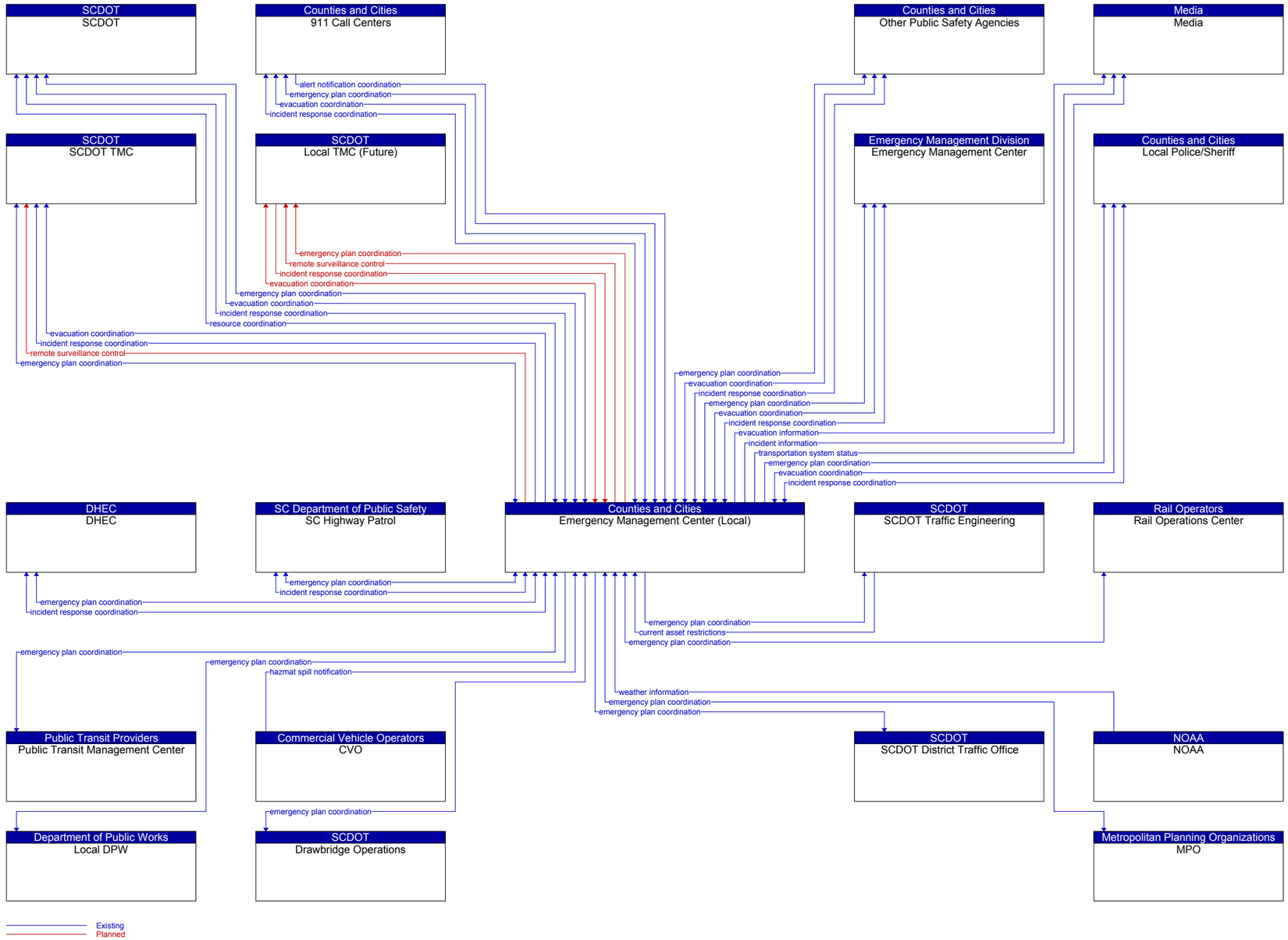

Figure 34: Emergency Management Center (Local) Flow Context Diagram

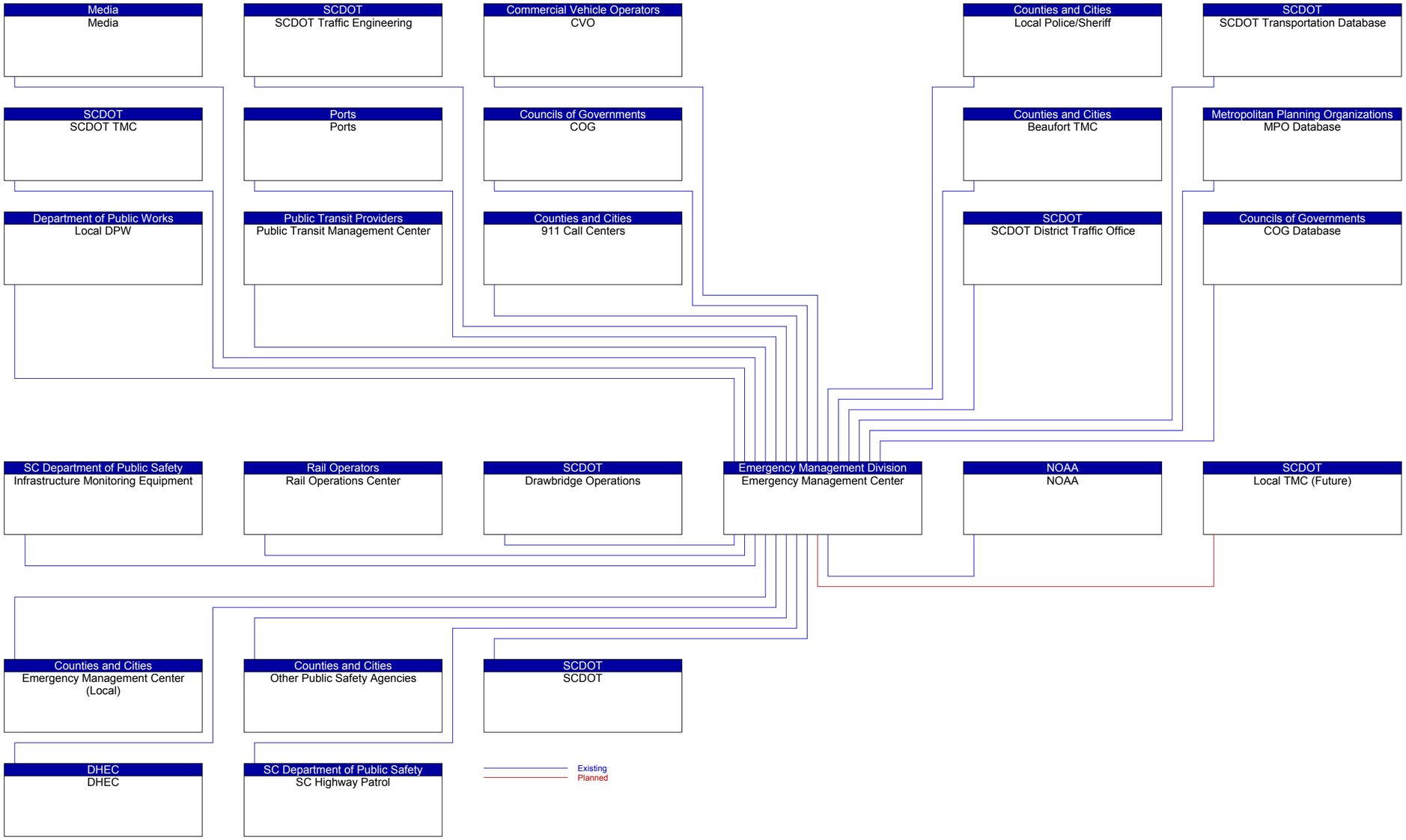

Figure 35: Emergency Management Center Interconnect Context Diagram

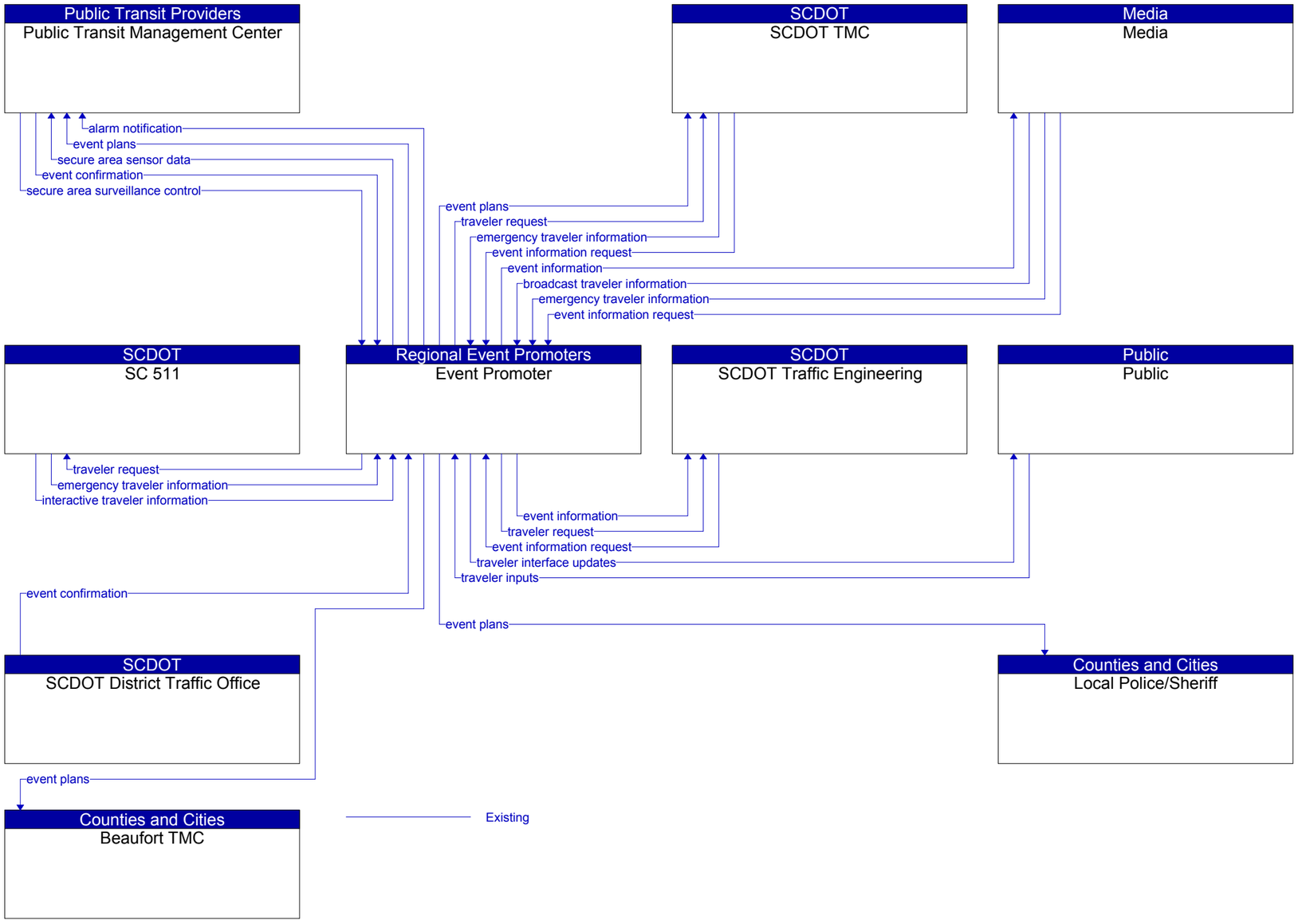

Figure 36: Event Promoter Flow Context Diagram

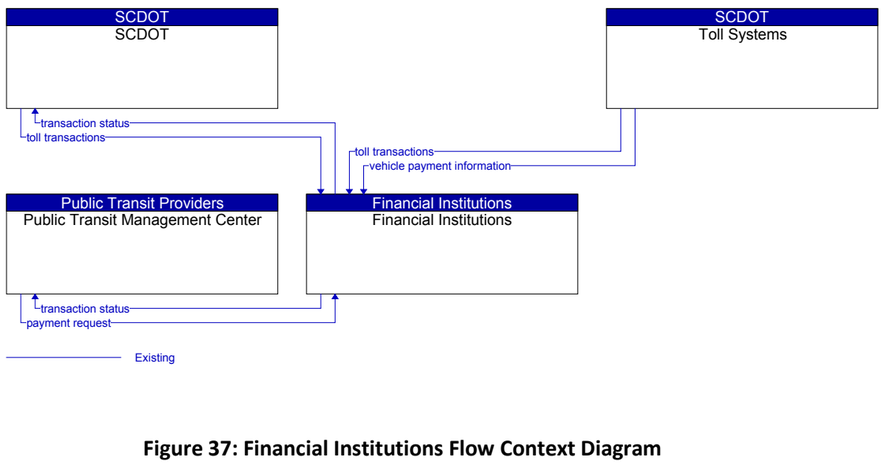

Figure 37: Financial Institutions Flow Context Diagram

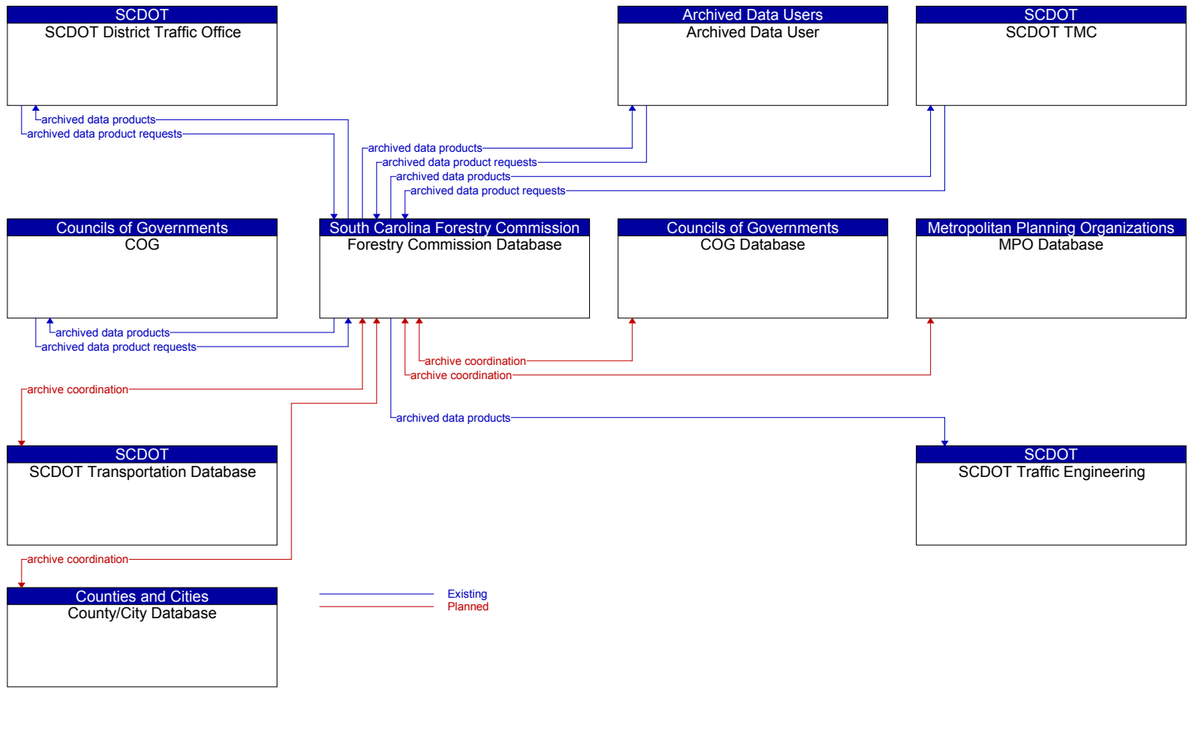

Figure 38: Forestry Commission Database Flow Context Diagram

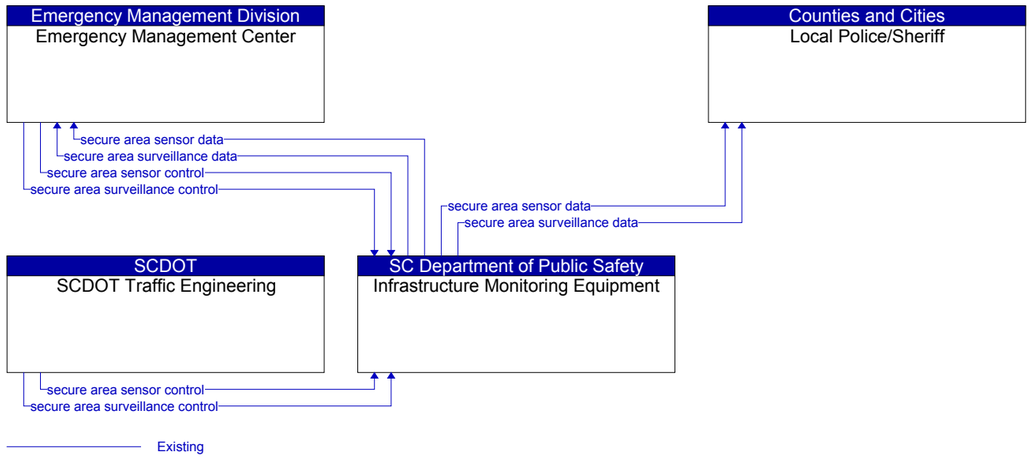

Figure 39: Infrastructure Monitoring Equipment Flow Context Diagram

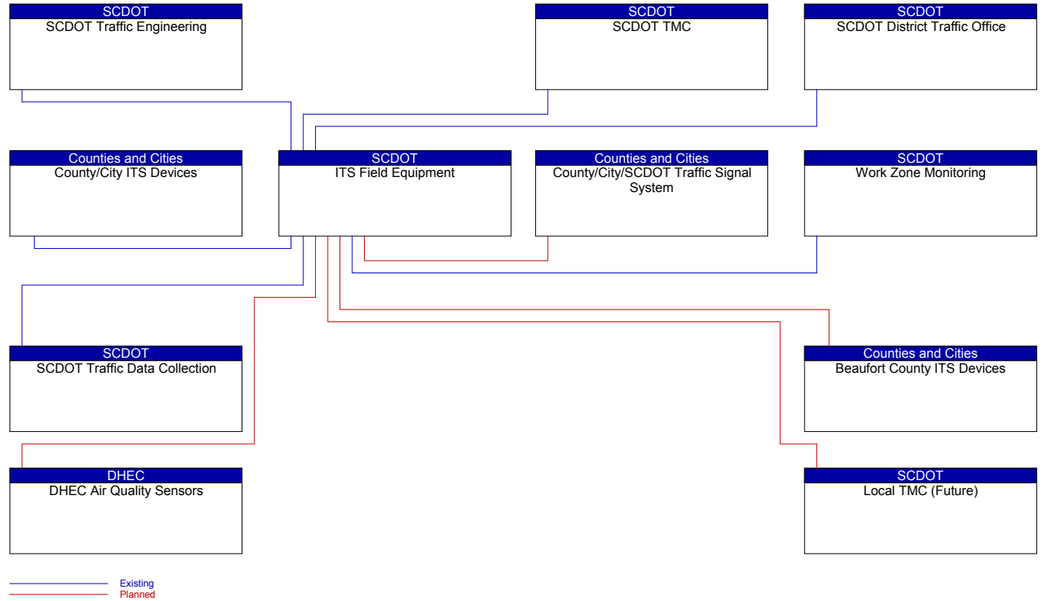

Figure 40: ITS Field Equipment Interconnect Context Diagram

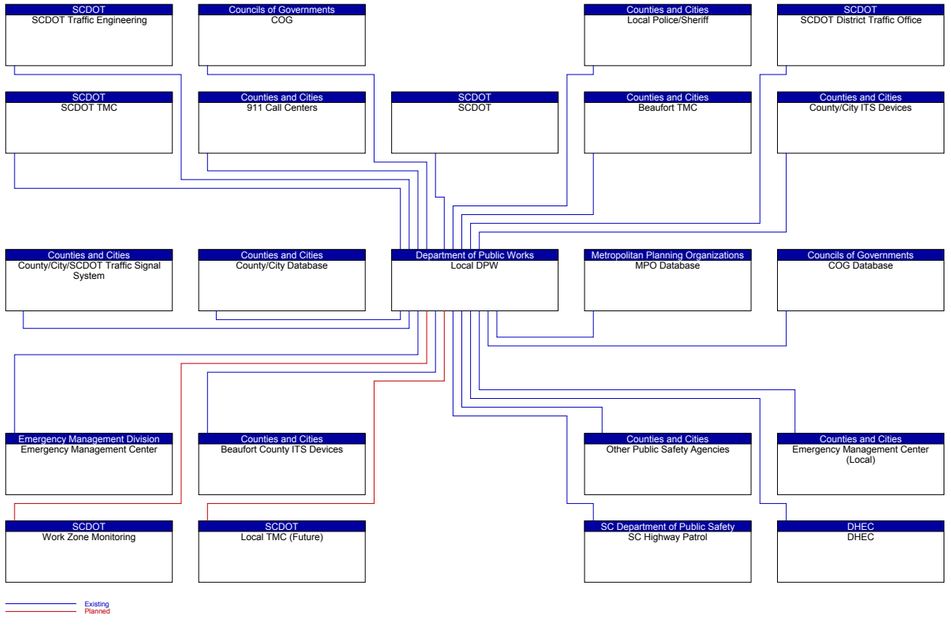

Figure 41: Local DPW Interconnect Context Diagram

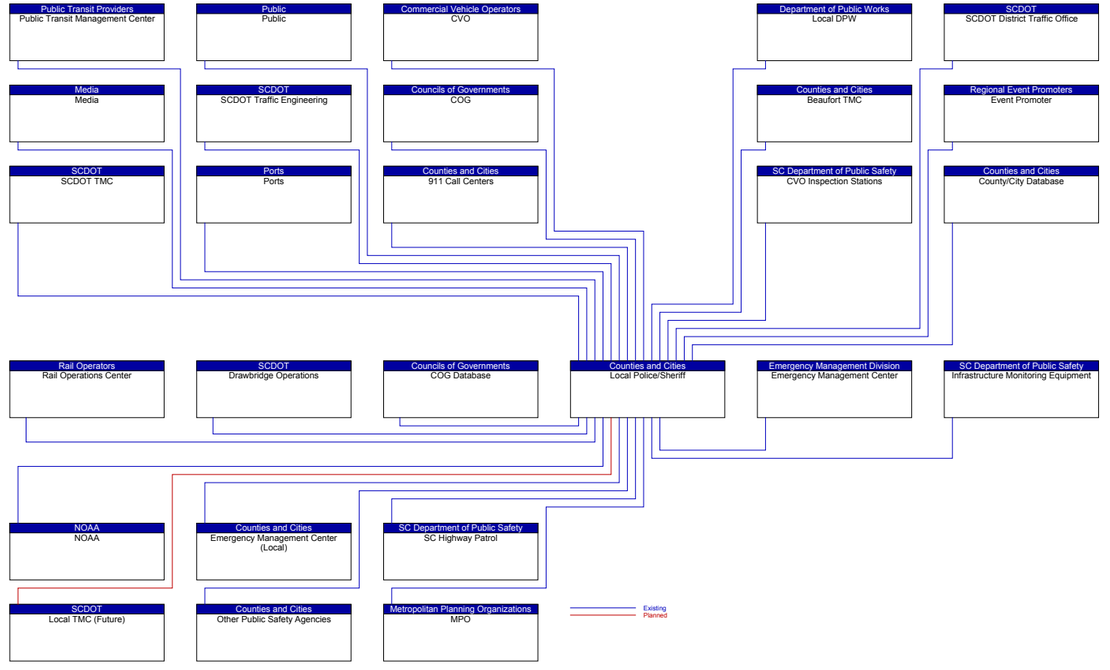

Figure 42: Local Police/Sherriff Interconnect Context Diagram

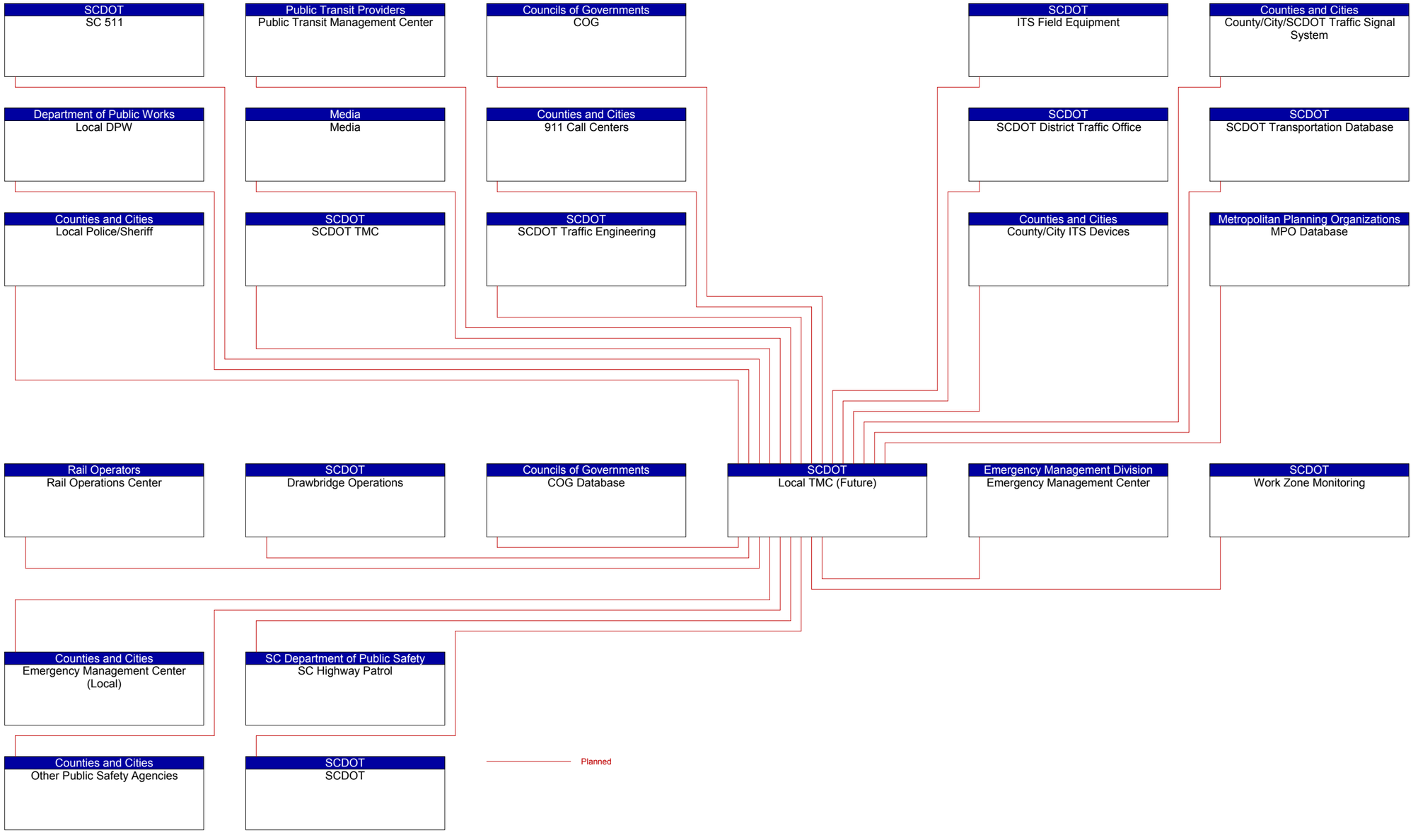

Figure 43: Local TMC (Future) Interconnect Context Diagram

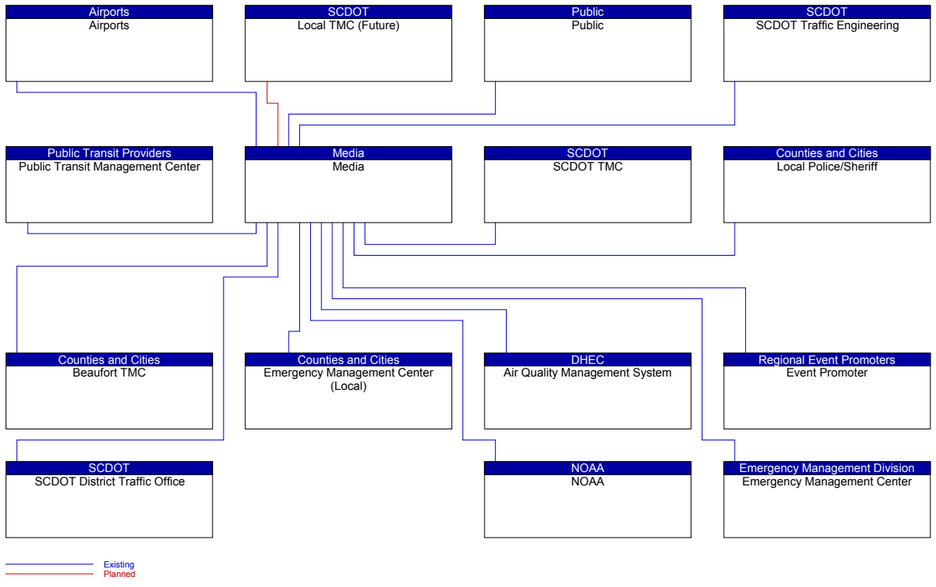

Figure 44: Media Interconnect Context Diagram

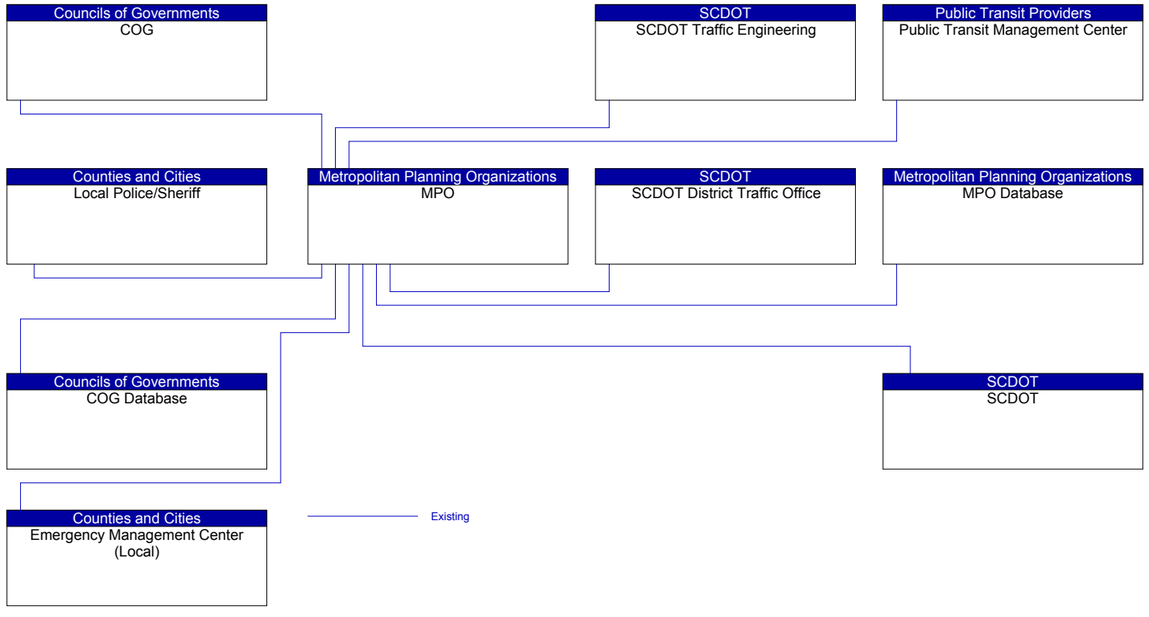

Figure 45: MPO Interconnect Context Diagram

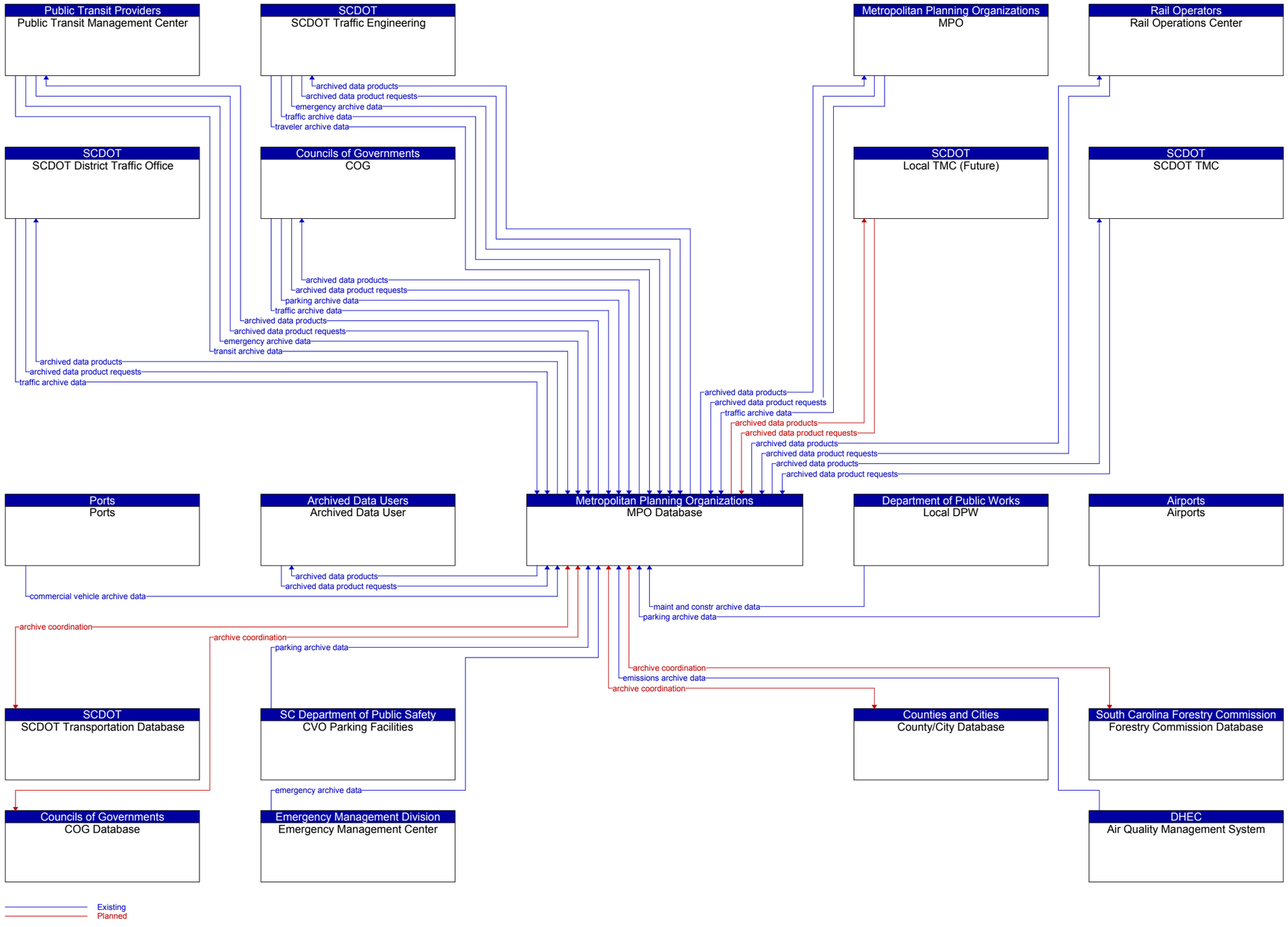

Figure 46: MPO Database Flow Context Diagram

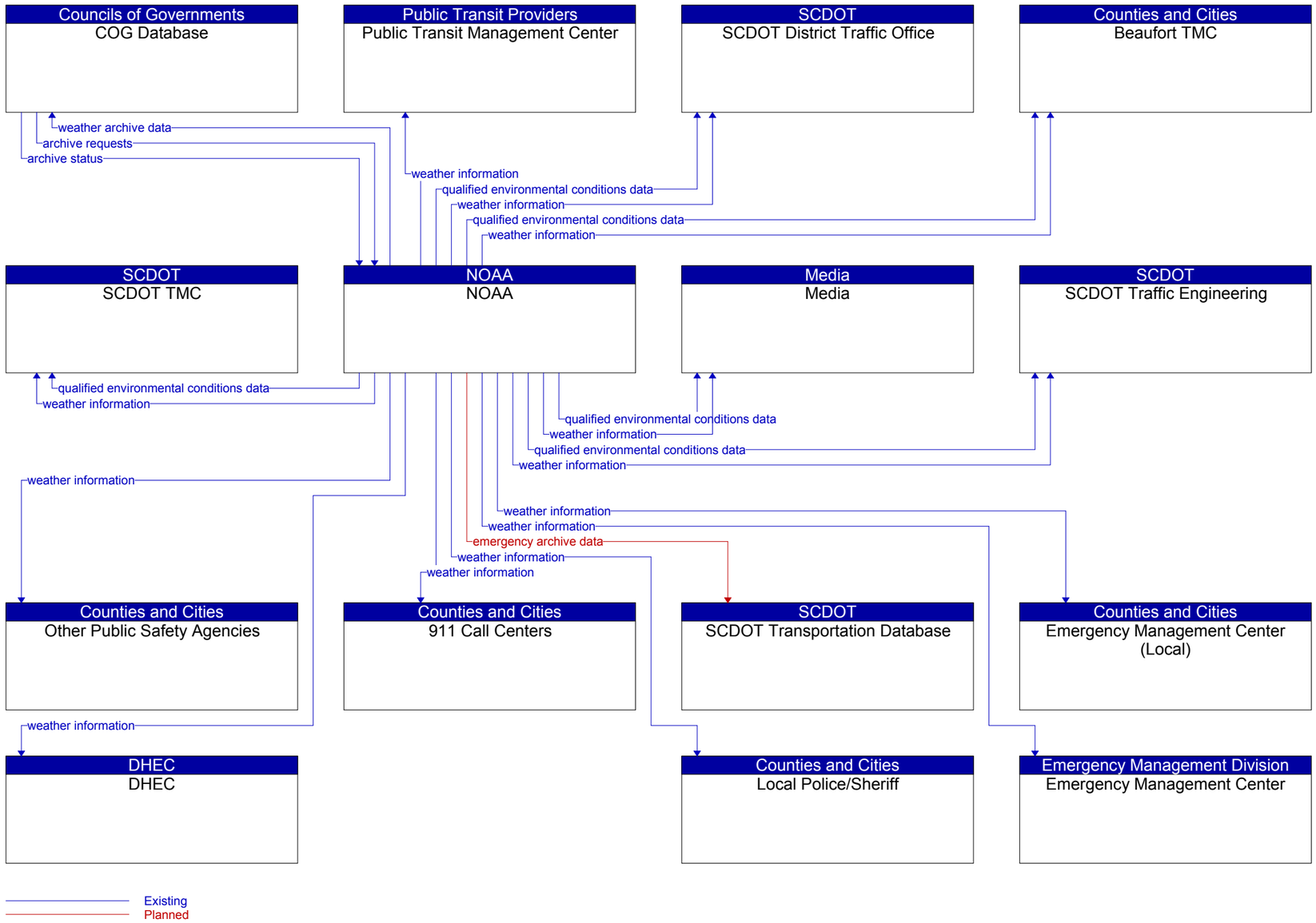

Figure 47: NOAA Flow Context Diagram

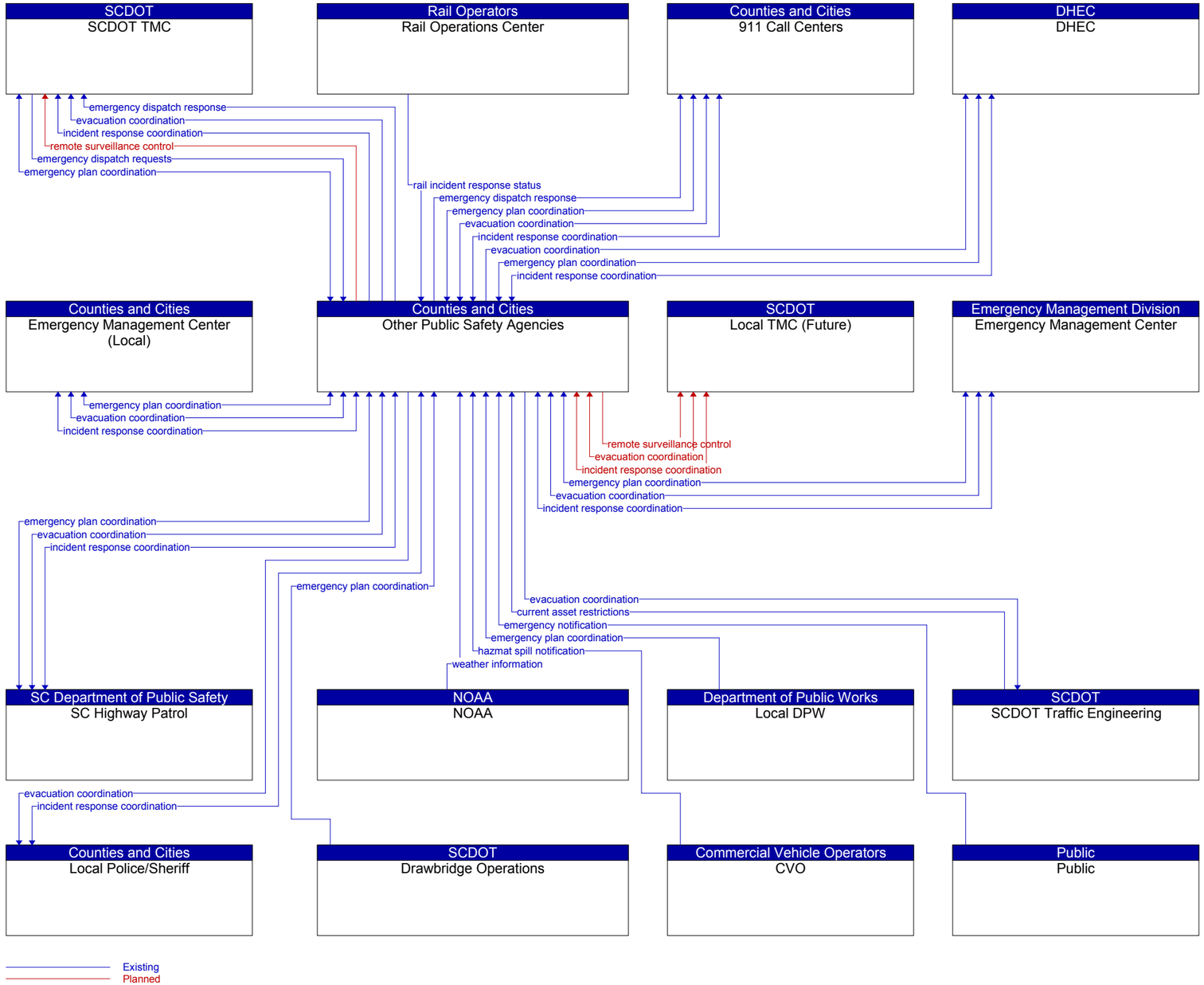

Figure 48: Other Public Safety Agencies Flow Context Diagram

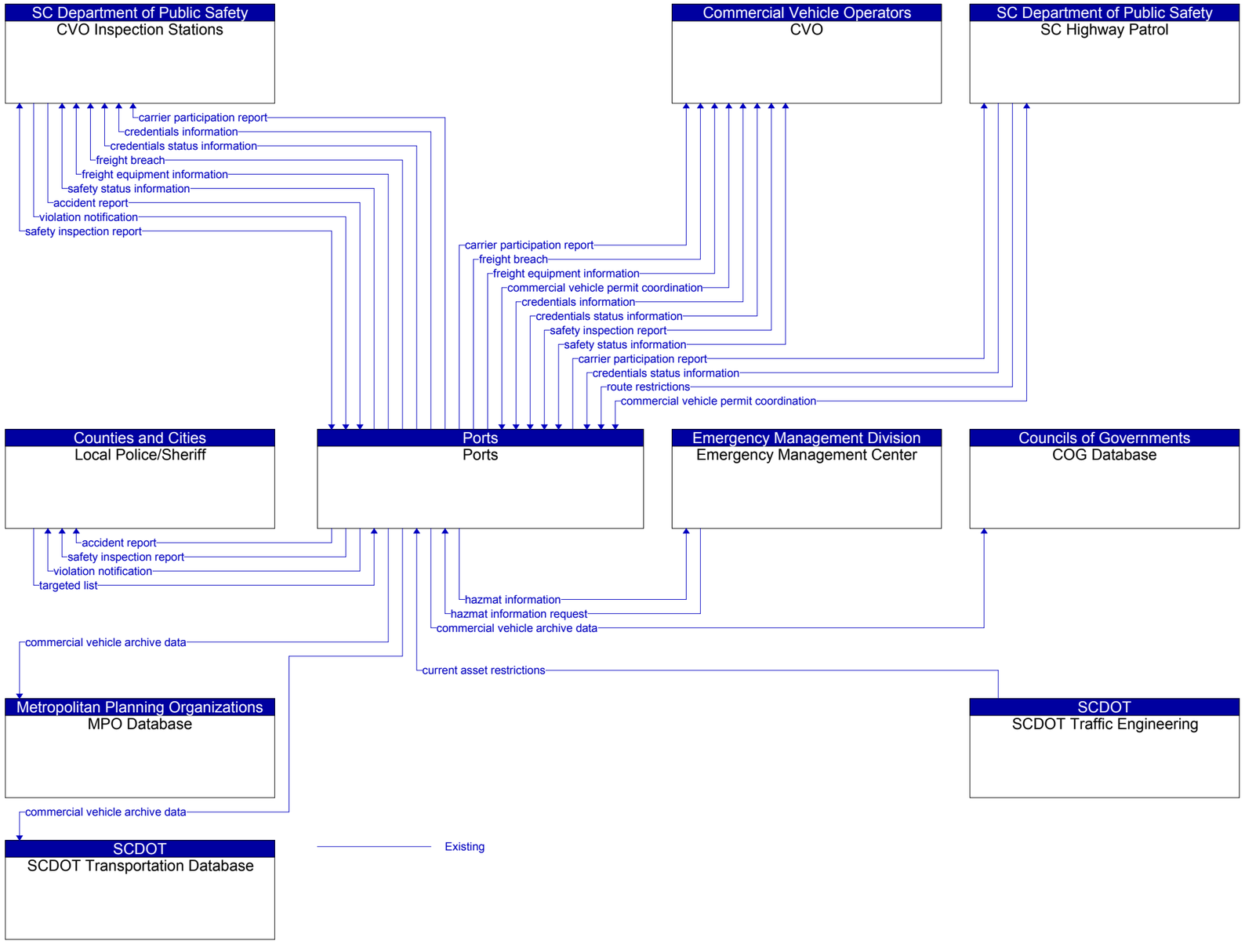

Figure 49: Ports Flow Context Diagram

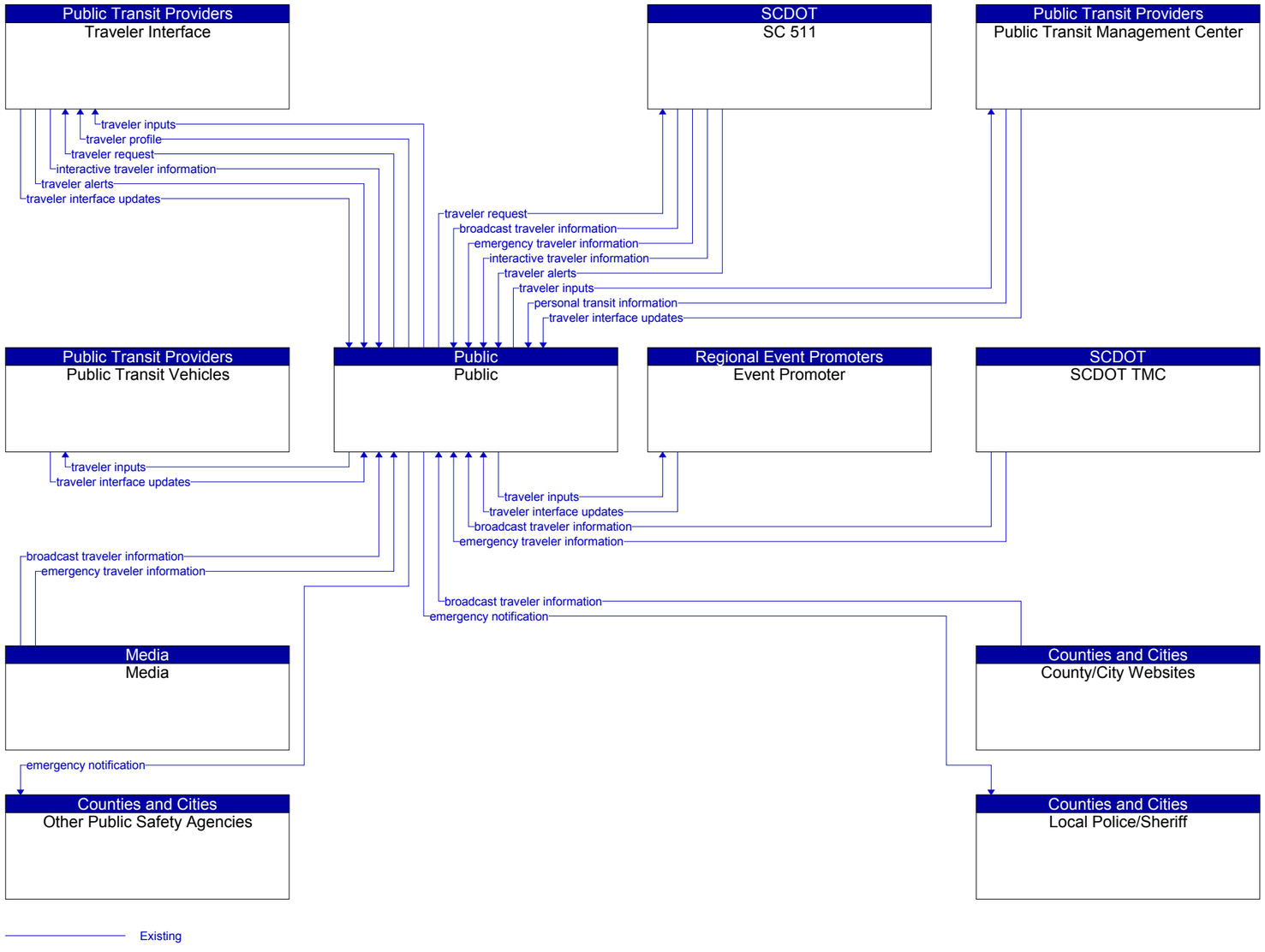

Figure 50: Public Flow Context Diagram

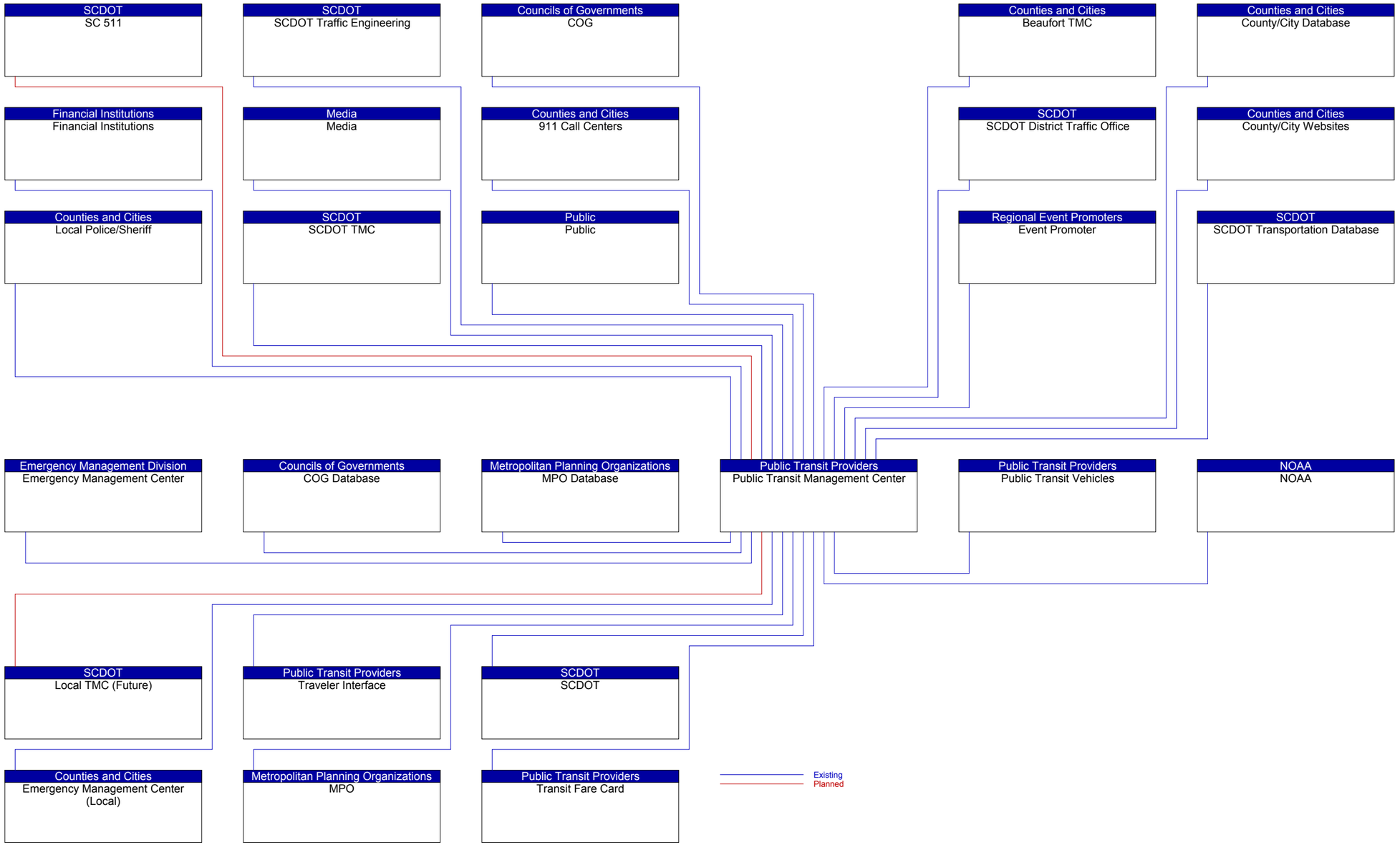

Figure 51: Public Transit Management System Interconnect Context Diagram

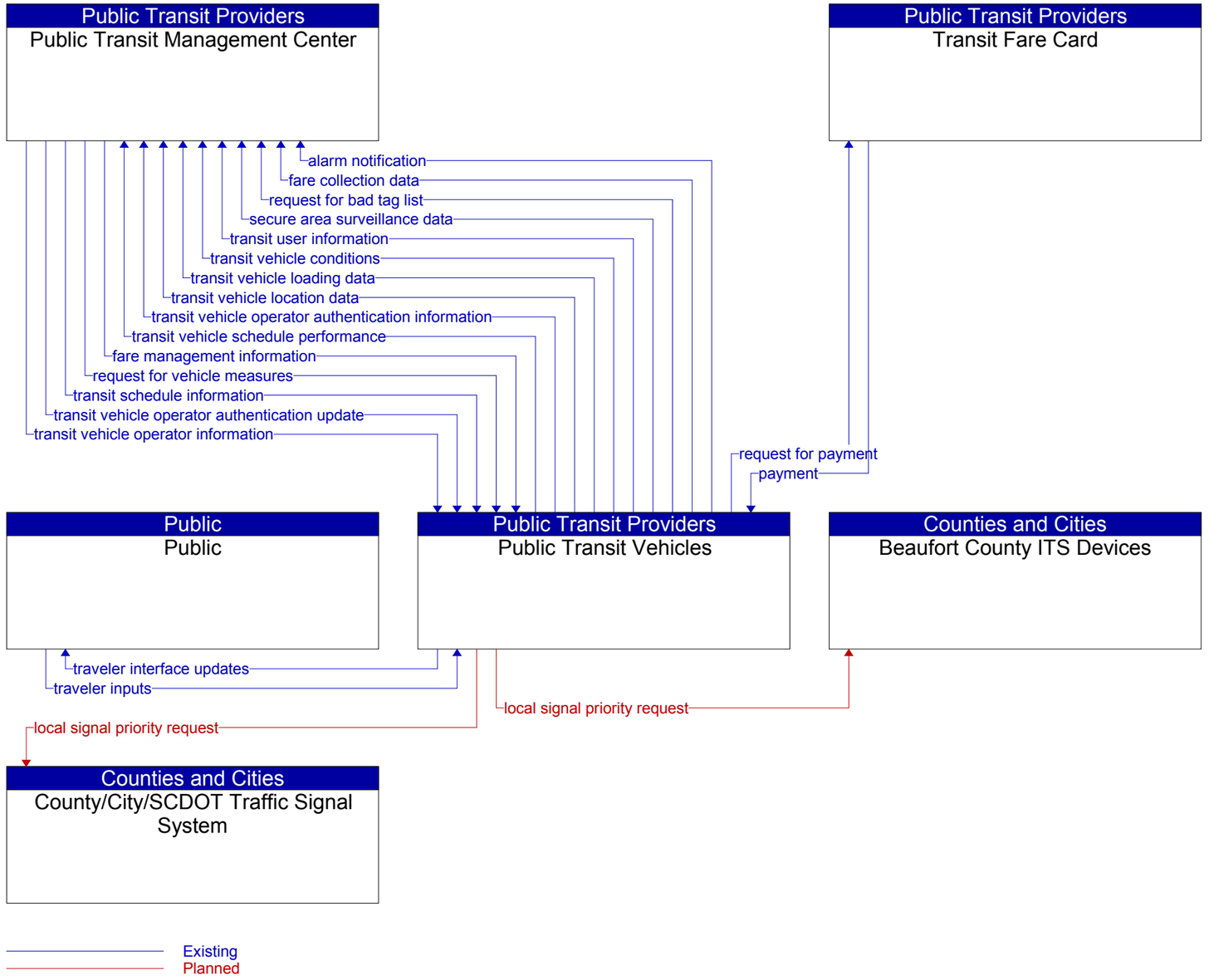

Figure 52: Public Transit Vehicles Flow Context Diagram

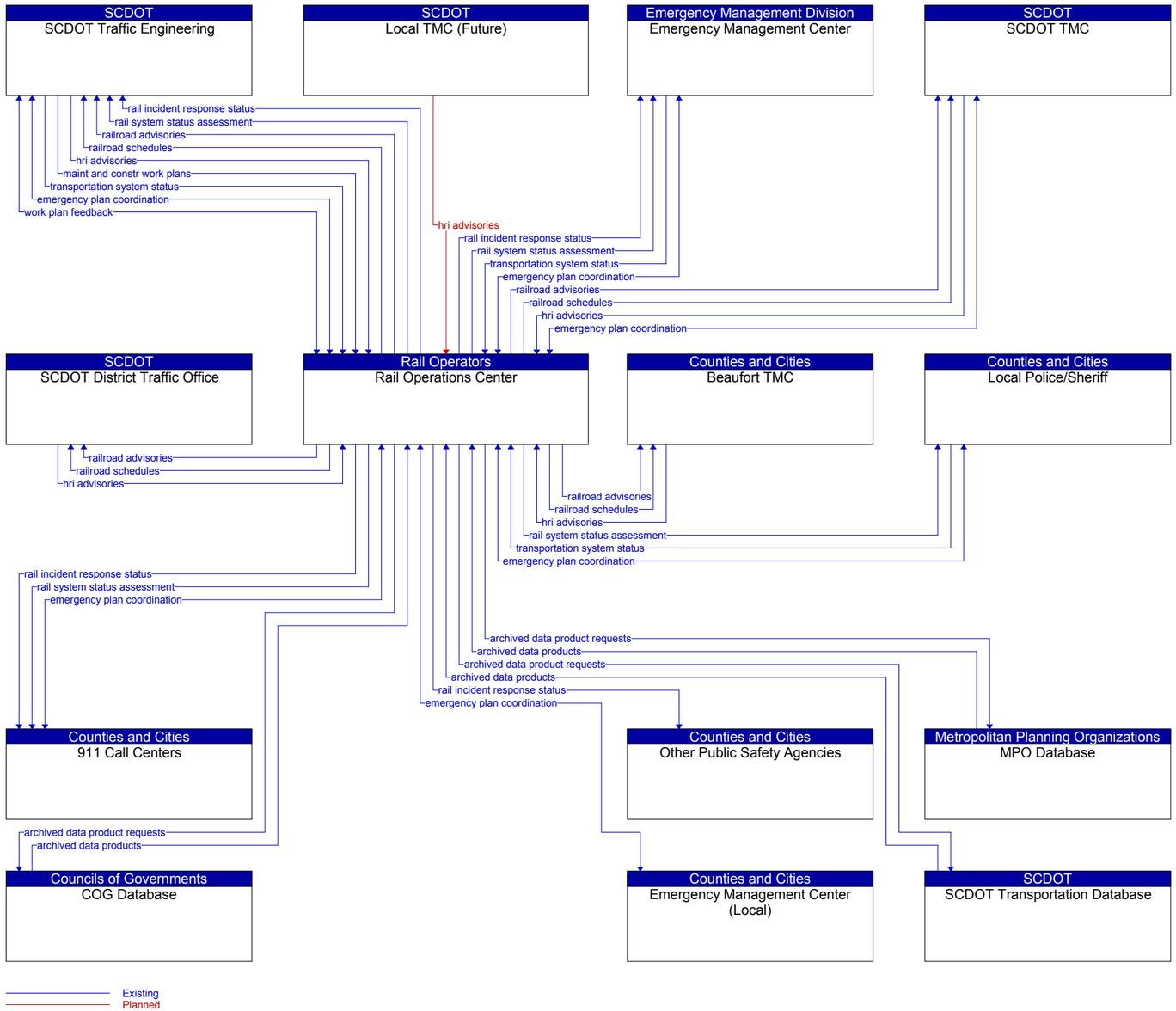

Figure 53: Rail Operations Center Flow Context Diagram

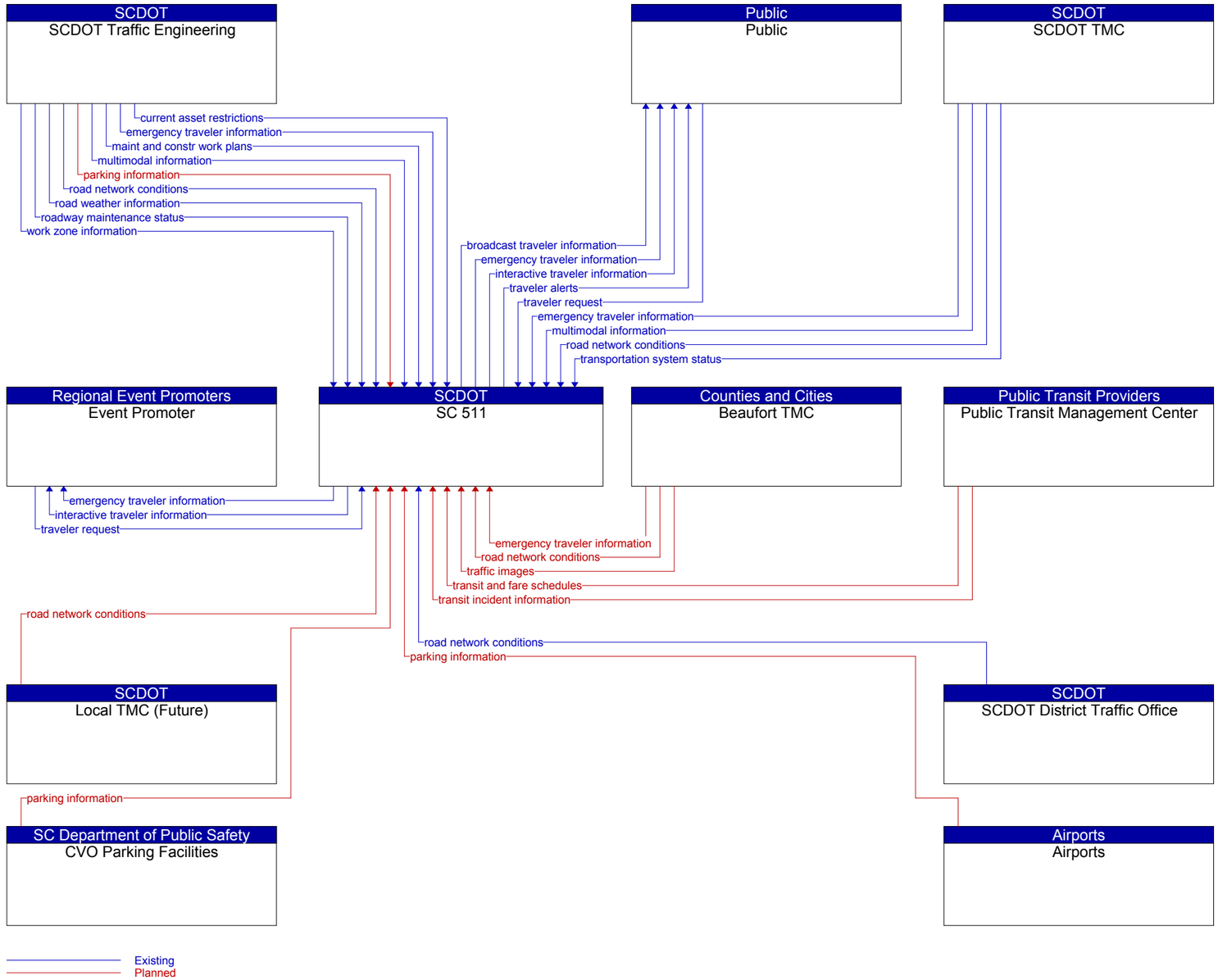

Figure 54: SC 511 Flow Context Diagram

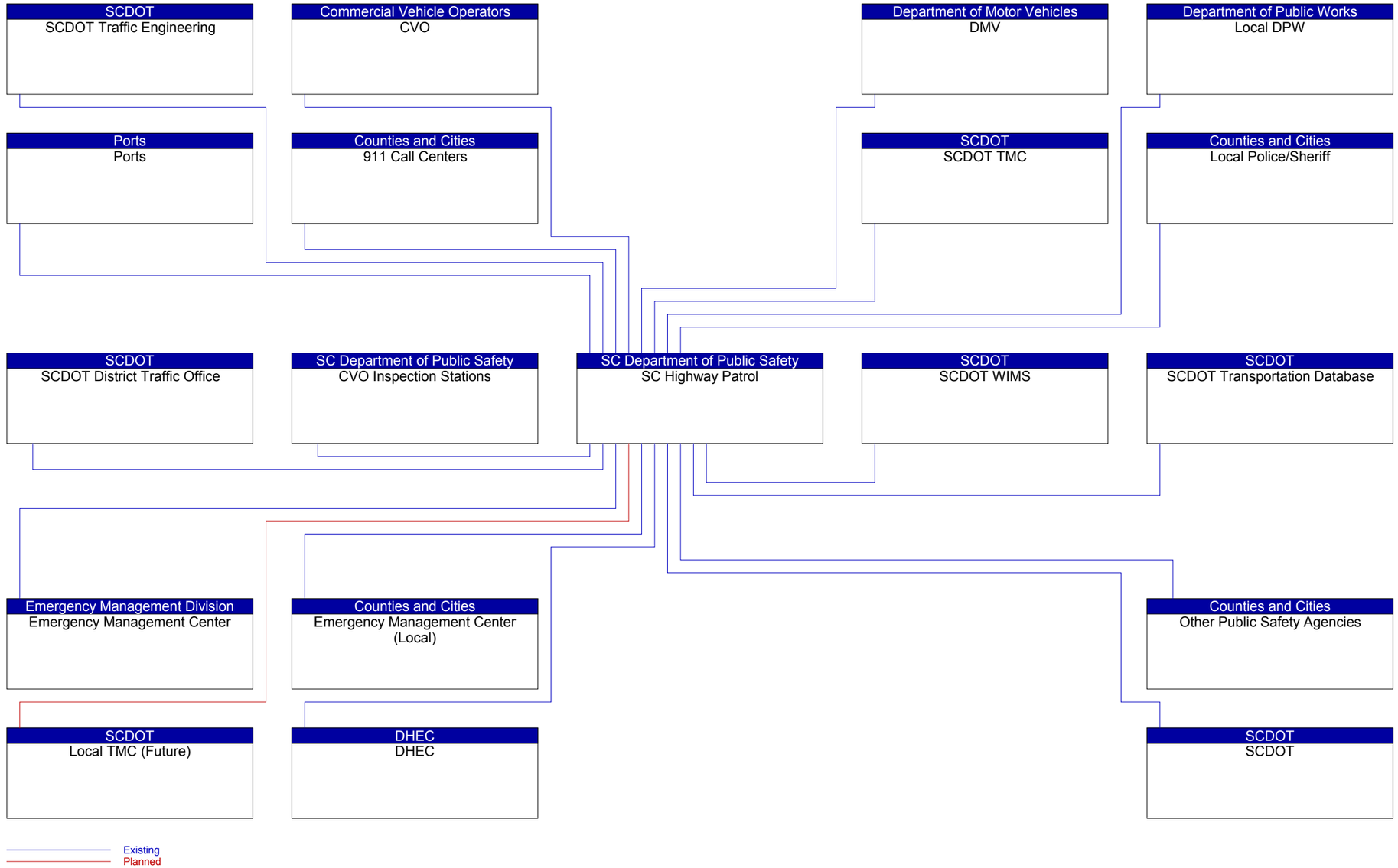

Figure 55: SC Highway Patrol Interconnect Context Diagram

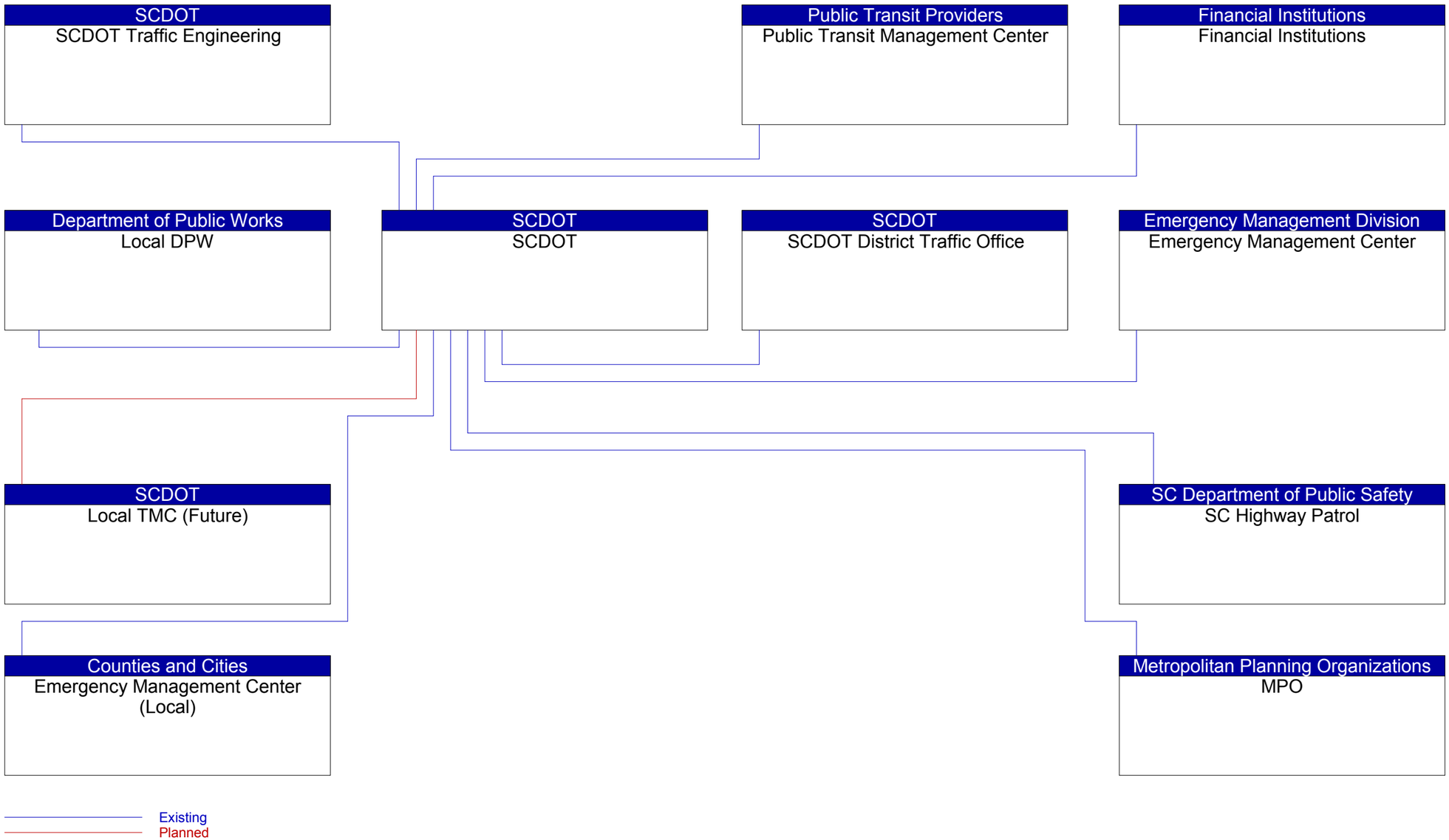

Figure 56: SCDOT Interconnect Context Diagram

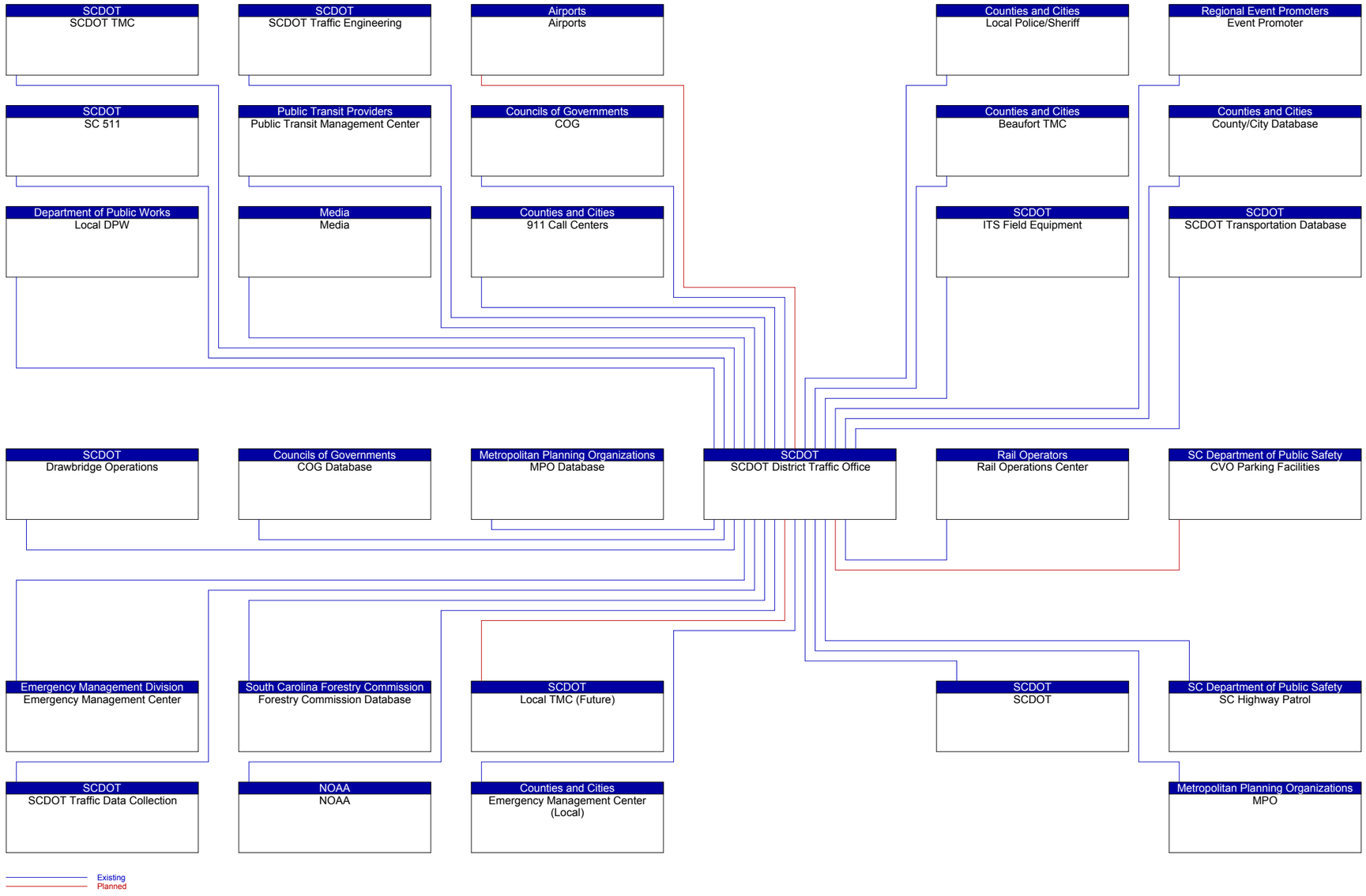

Figure 57: SCDOT District Traffic Office Interconnect Context Diagram

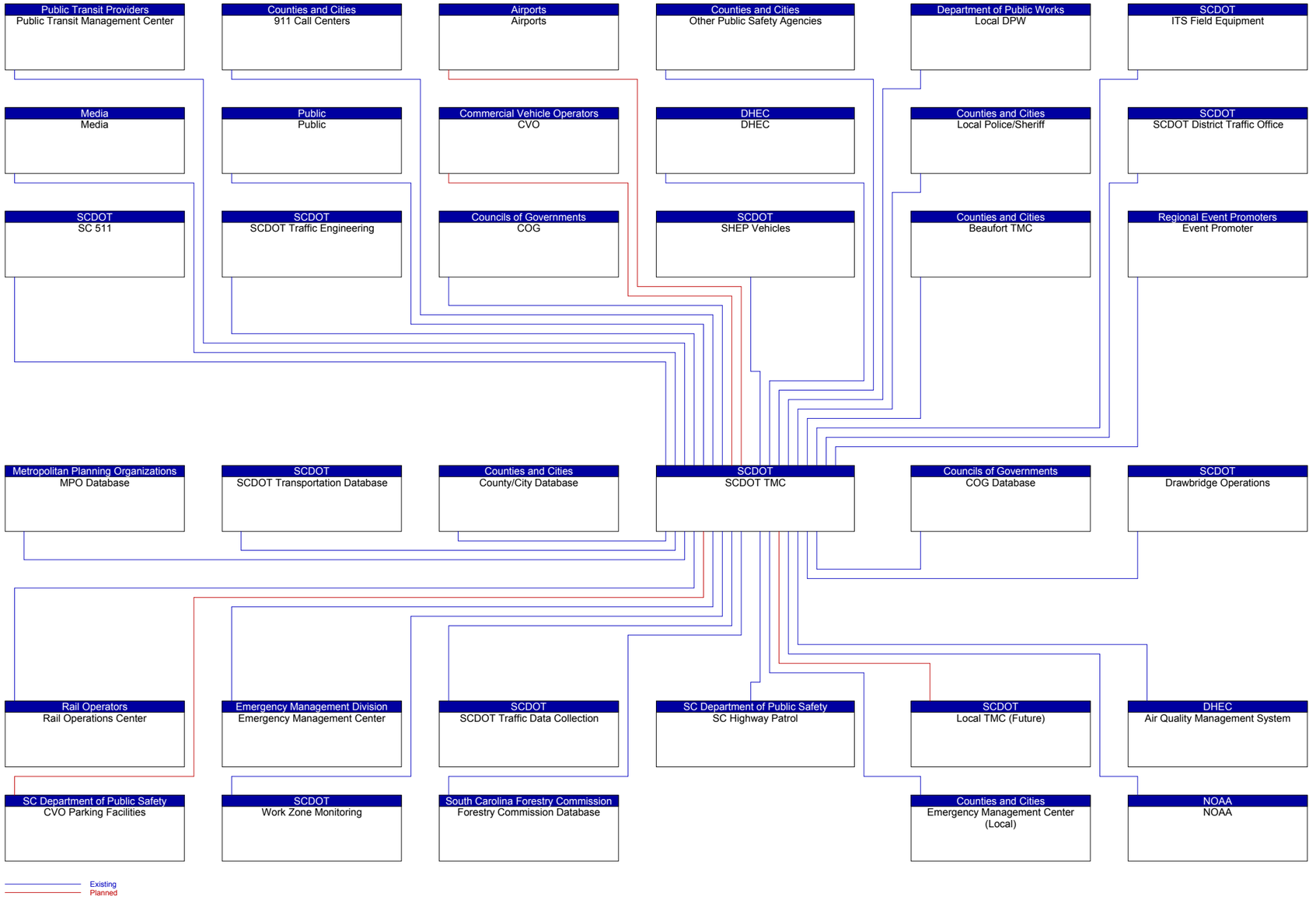

Figure 58: SCDOT TMC Interconnect Context Diagram

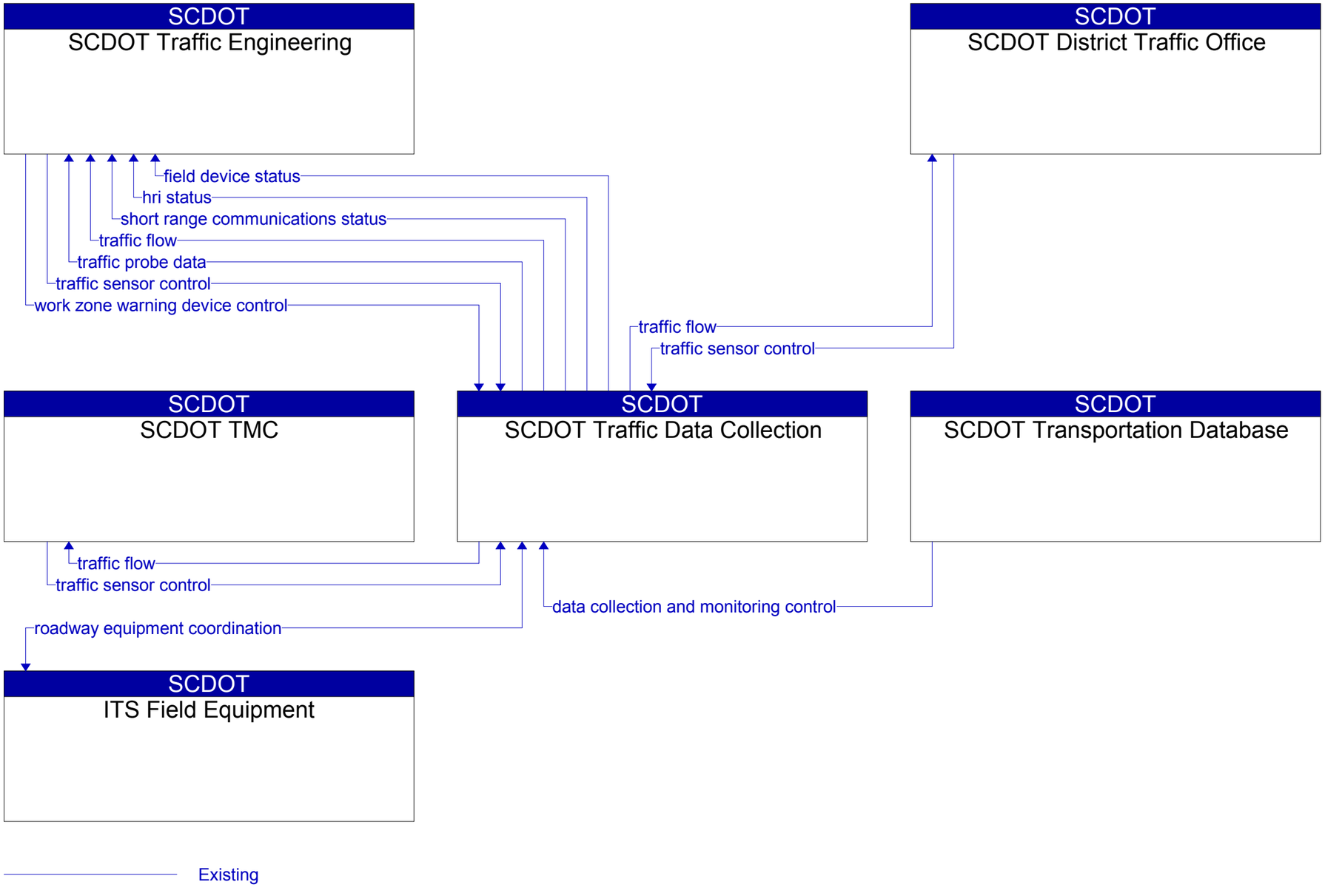

Figure 59: SCDOT Traffic Data Collection Flow Context Diagram

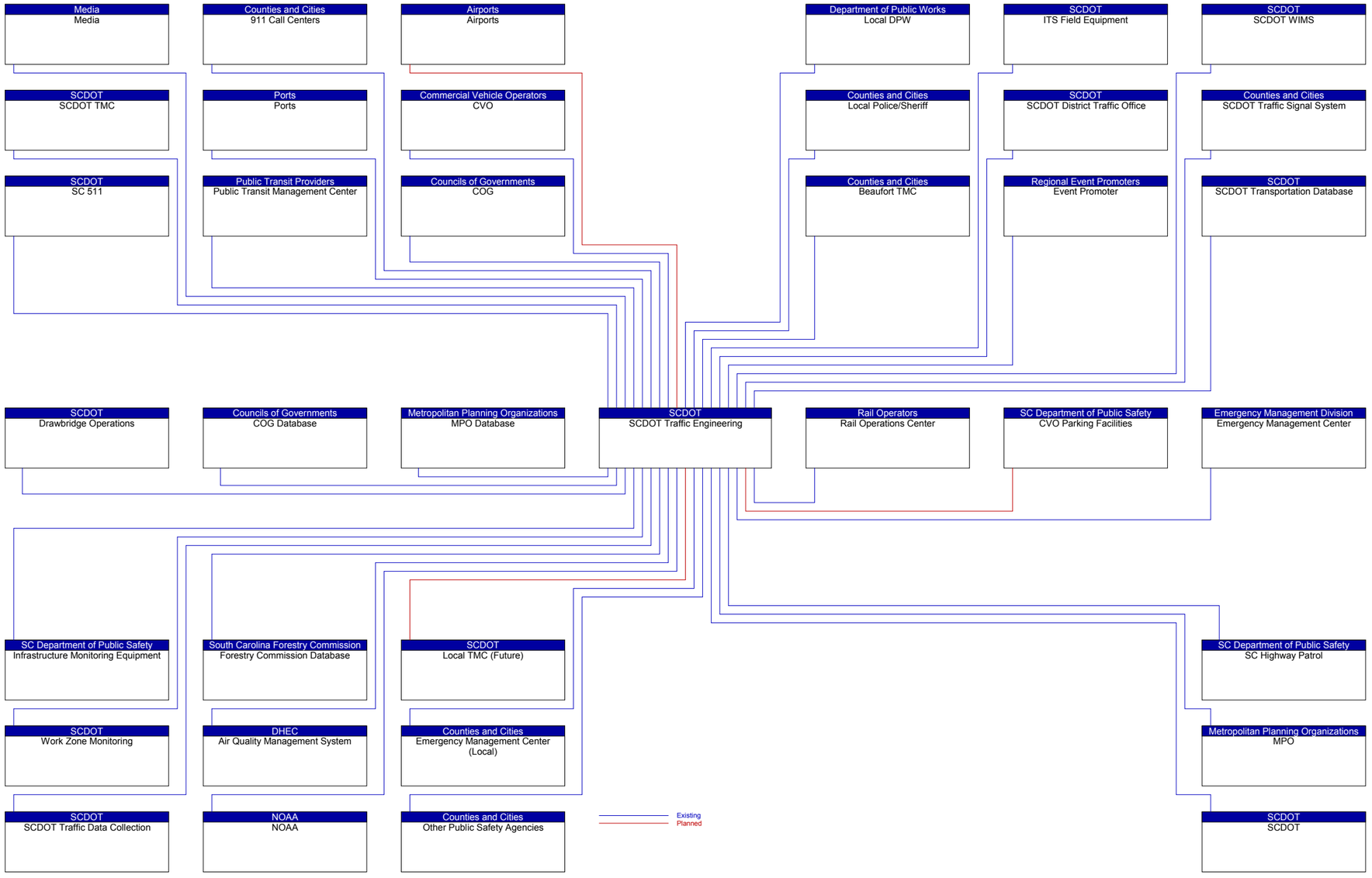

Figure 60: SCDOT Traffic Engineering Interconnect Context Diagram

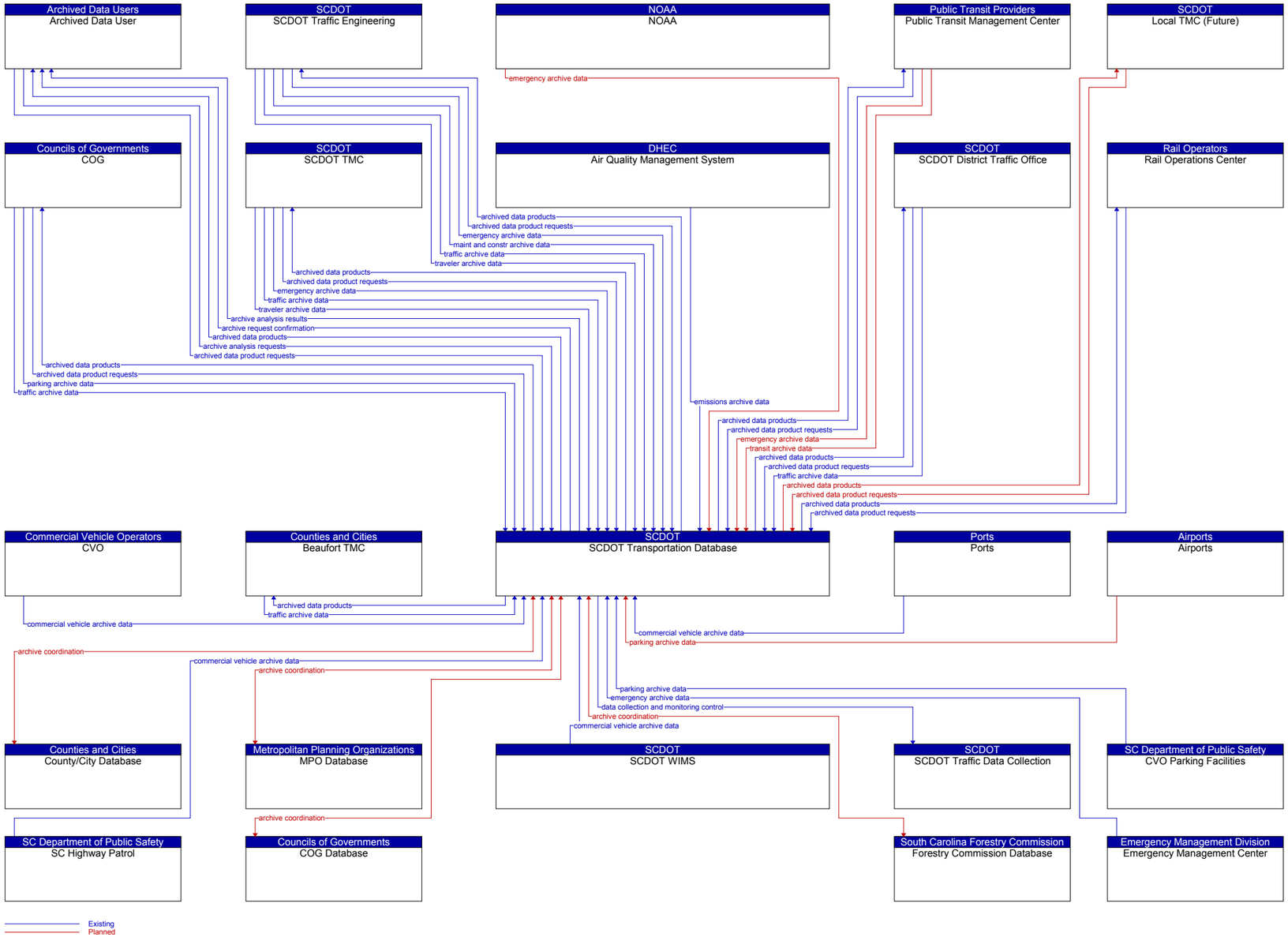

Figure 61: SCDOT Transportation Database Flow Context Diagram

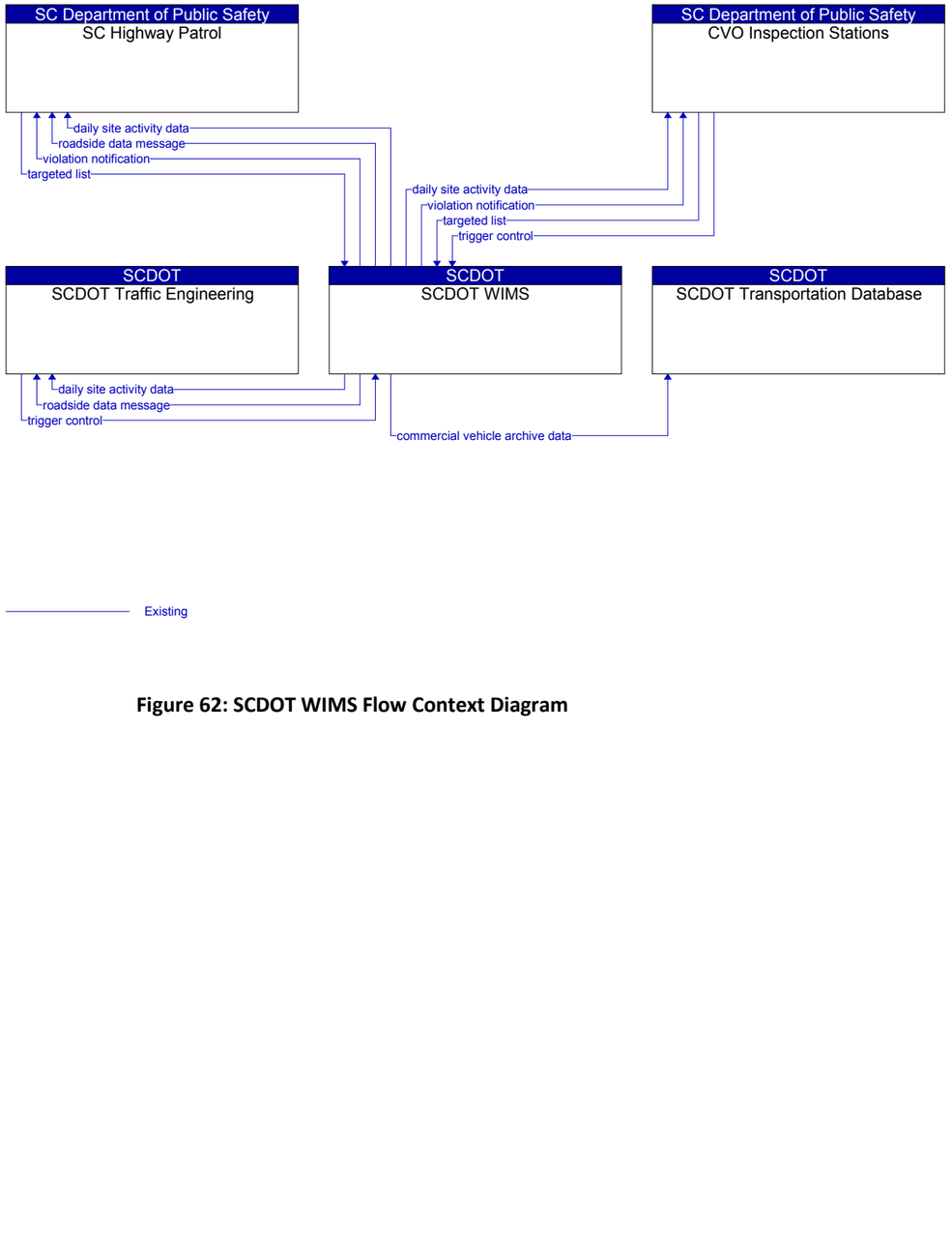

Figure 62: SCDOT WIMS Flow Context Diagram

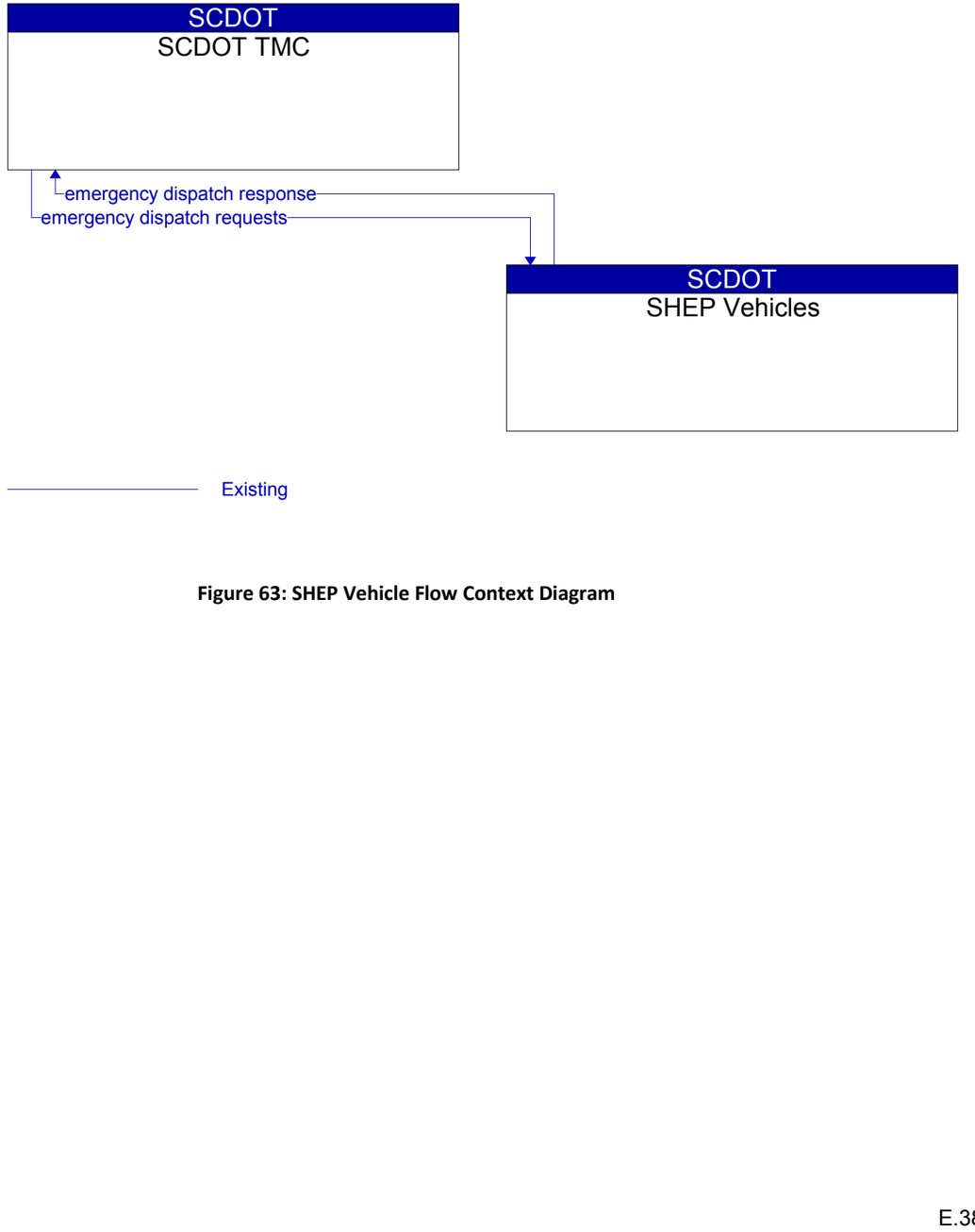

Figure 63: SHEP Vehicle Flow Context Diagram

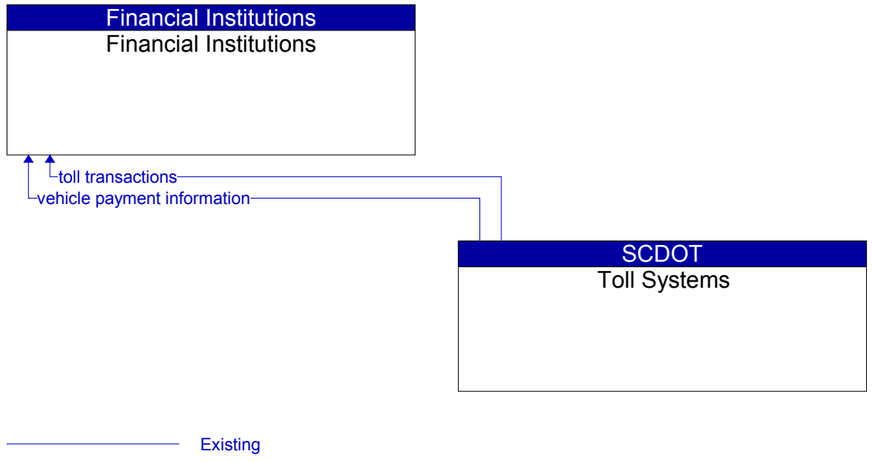

Figure 64: Toll System Flow Context Diagram

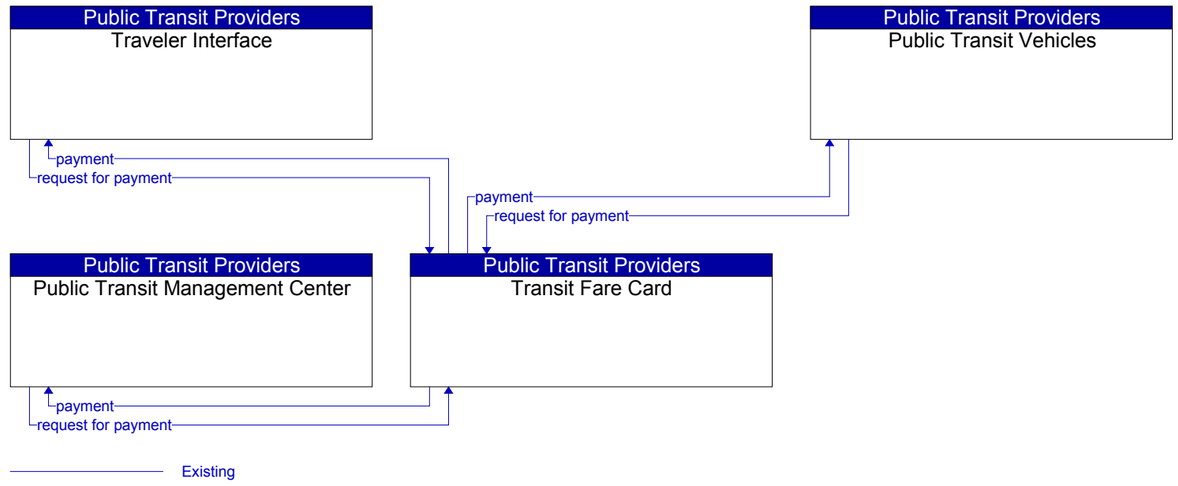

Figure 65: Transit Fare Card Flow Context Diagram

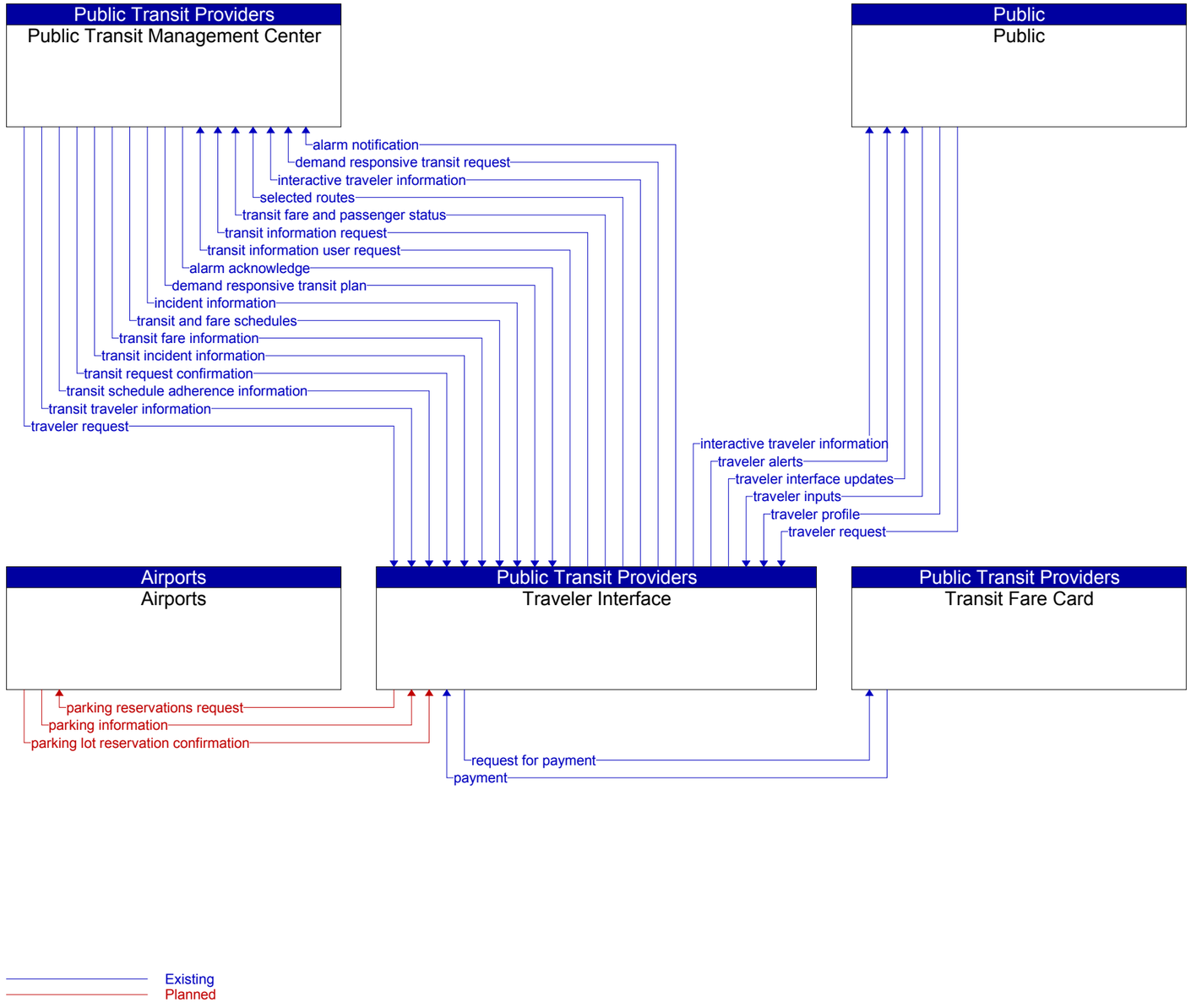

Figure 66: Traveler Interface Flow Context Diagram

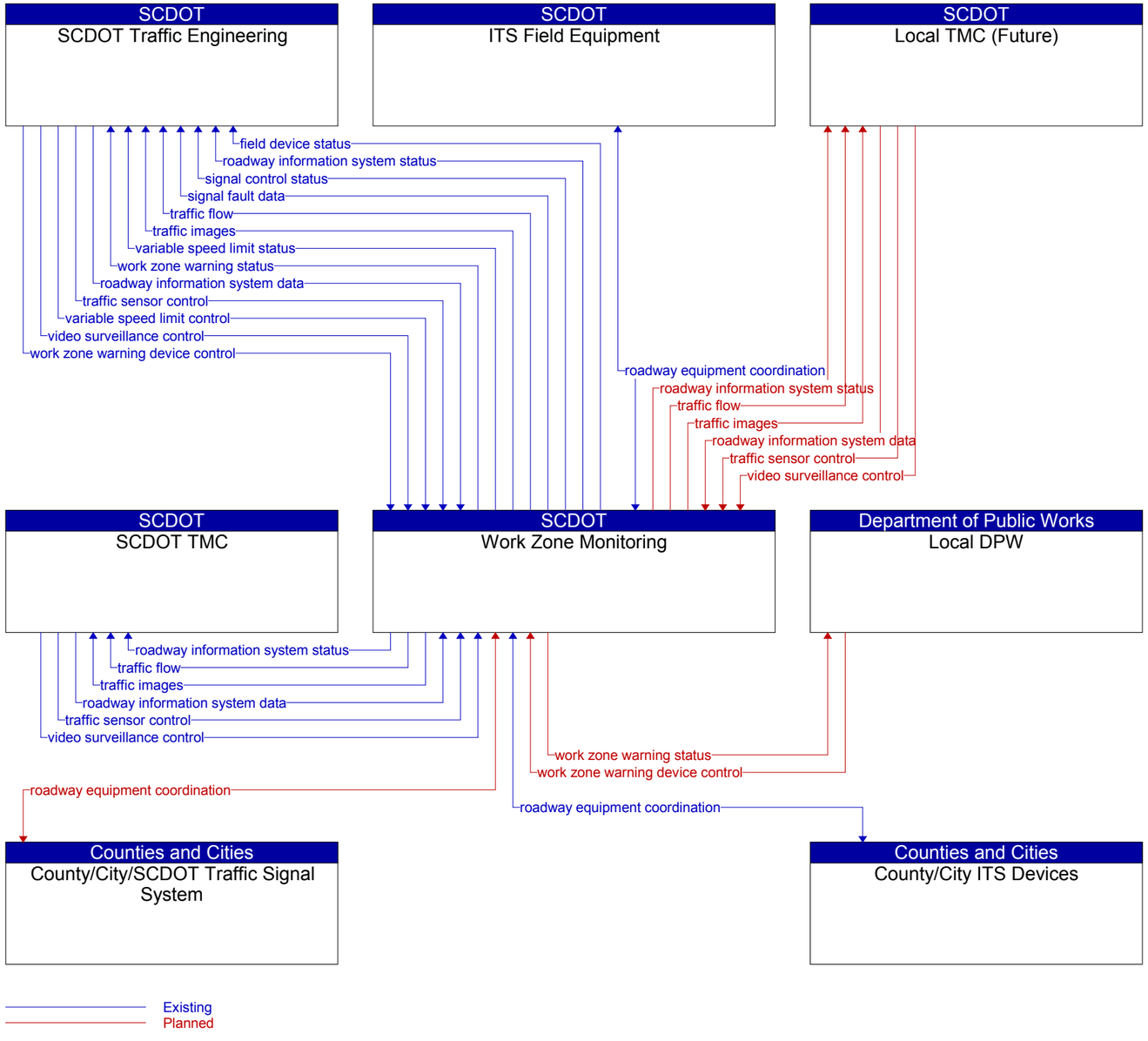

Figure 67: Work Zone Monitoring Flow Context Diagram

Appendix F STAKEHOLDER MEETING MINUTES

Meeting Minutes

Rock Hill Stakeholders Meeting

South Carolina Statewide ITS Architecture Updates / 201802495.200

Date/Time:	June 4, 2014 / 2:00 PM
Place:	Rock Hill, SC
Next Meeting:	TBD
Attendees:	J. Cronin, K. Drane, R. Moody, R. Bowyer, V. Harmon, D. Hooper, B. Shanahan, G. Shaw, V. Edwards, Phil Leazar, D. Campbell, R. Wertz, J. Fox, S. Mensah
Absentees:	See invitee list and sign-in sheets
Distribution:	All Stakeholders

The stakeholder meeting in Rock Hill started with a presentation by Jonathan Fox (Stantec) on the definition of intelligent transportation systems (ITS) and the Federal Highway Administration's requirement for regional architecture development and the eligibility for federal funds. Specific examples of ITS applications such as network monitoring, incident management, emergency management, commercial vehicle operations, etc. was highlighted. The process to complete the South Carolina Statewide ITS architecture updates including the required stakeholder inputs was laid out. The stakeholders were invited to discuss regional transportation needs that could be addressed using ITS. The stakeholders were provided with comment sheets and contact information to provide additional information by June 13, 2014 to enable Stantec to develop the South Carolina Statewide ITS Architecture. The following is a summary of the discussion and needs the stakeholders presented at the meeting.

Item:	Action:
Regional Needs • Dan stated that the statewide architecture being developed covers any region that has ITS needs addressed in the document to meet the federal requirements. • Traffic surveillance for traffic signal systems operation desired to check on loop failures, constant calls, left turn volume blocking through lanes etc. A camera hooked into the system will facilitate such observation and rapid mitigation. • Fiber optic exists along the interstate system and some signals have communication via the fiber optic. • Intersections with closed circuit television (CCTV) camera surveillance will facilitate traffic operations. • CCTV camera surveillance on arterial corridors desired to verify turning movement demand, spill over and through lane blockage. • South Carolina Department of Transportation (SCDOT) is currently working on video sharing program to make CCTV images available to stakeholders that need CCTV images even when the	• Stakeholders requested to submit any ITS needs and/or comments by June 13, 2014 • SCDOT to roll out new video access system to agencies through the TIM quarterly meetings. • Stakeholders requested to submit their inventory of ITS assets (i.e., DMS, CCTV cameras, portable VMS, traffic signals, fiber communications,

511 streaming is cut off on the website and the media. Response agencies will be given a special login to see streaming video and law enforcement agencies are welcome to the TMCs to use cameras as desired for incident/emergency response. The 511 page is currently not streaming live videos however new video sharing system will be in place and live streaming on 511 will start in August 2014. The features of the new video sharing system could not be demonstrated for all to see (was seen on iPad) unlike other locations. The new video distribution system will be made available to stakeholders who request access at no cost. • City of Rock Hill has benefited from money for congestion mitigation and air quality (CMAQ) to build traffic signal systems and tied to fiber optic communications. • Coordination between City of Rock Hill system with SCDOT is desired. The same traffic control systems / software exist but different networks. • City of Rock Hill system needs to be connected to SCDOT system to improve incident management on interstate when travelers are re-routed to the surface streets. Retiming intersection signals with routes controlled by separate entities (state vs. city routes) needs to be addressed. • Incidents on Celanese Road cause backups and the back of queue can be seen by SCDOT traffic management center (TMC) however there is no sufficient coverage to verify incidents and to inform travelers. • No consolidated dispatch center exists in the Rock Hill area. Dan stated that the new video distribution can be made available to every dispatch center because it is very useful for dispatchers. • City of Rock Hill desires to tie into SCDOT network. Dan stated that the newer software could permit SCDOT to do that coordination. • Rock Hill Police Department is on City's fiber optic network. • Need traveler information signs (511 is helpful) • Phil stated that road construction activities should be coordinated with ITS deployments during the construction phase to expand the ITS system. Dan stated that ITS is currently deployed as part of road construction projects. • SCDOT must deploy CCTV cameras at Gold Hill Interchange to monitor the corridor during construction and post-construction. Phil stated that they welcome the idea to deploy technology during construction to help mitigate incidents. • Fiber optic interconnection and coordination between City and SCDOT desired. Jonathan stated that some states specify fiber optic as the standard for communication but if the cost is too	wireless links, etc.)

high they would look at other options like wireless. Dan said if there are opportunities to interconnect fiber optic network for signal communication and general communication it should be explored.

- Fiber optic on Carowinds Blvd has been connected to the SCDOT network. This was done with special federal aid. Dan reiterated the need for emergency plans to be in place so signals can be retimed rapidly when needed. Emergency signal plans desired potentially starting with city signals.
- Dan reiterated the benefits of the Reach the Beach feature on the 511 website and the new mobile app being developed. This new feature will be expanded to include Charleston area. Jonathan stated it could be used for flood gate messaging for emergencies such as hurricane evacuation.
- Dan wanted to know if there is a federal requirement on how existing devices must be documented. Jonathan stated there is no stipulated requirement but as much detail as possible is desired.
- Emergency vehicle preemption systems are expensive and the State does not fund them. Jonathan stated that the Federal Highway Administration (FHWA) may reimburse States for such deployments and the municipalities may need to push for such deployments. City of Rock Hill does not have the emergency vehicle preemption system. City of Columbia has deployed a few.
- Jonathan reminded those present to submit ITS inventory as soon as possible. A follow up workshop may be held in the fall to wrap up the document after it has been reviewed by all stakeholders.

The meeting adjourned at 3:00 PM
The foregoing is considered to be a true and accurate record of all items discussed. If any discrepancies or inconsistencies are noted, please contact the writer immediately.

Stantec Consulting Services Inc.

Stephen Mensah
Traffic Engineer
Phone: 225-765-7400
stephen.mensah@stantec.com

Attachment: sign-in; invitee list; resource sites

Additional contacts:

Dan Campbell, SCDOT - ITS Coordinator
campbellde@scdot.org

Jonathan Fox, Stantec – Associate
Jonathan.fox@stantec.com

South Carolina Statewide ITS Architecture Update Meeting
Rock Hill Stakeholder Group
Wednesday June 4, 2014 at 2:00pm

Name	Agency	Email	Phone Number
Joe Cronin	Town of Fort Mill	jcronin@fortmillsc.gov	803-547-2116
Kara W. Drane	Catawba Regional	kdrane@catawbacog.org	803.327.9041
Robby Moody	CATAWBA COG	RMOODY@CATAWBACOG.ORG	803.327.9041
Rebecca Bowyer	York County Gait	rebecca.bowyer@yorkcountygov.com	803-684-8571
Vernon Harmon	Rock Hill PD	vharmon@cityofrockhill.com	803-417-0593
David Hooper	RFATS	dhooper@rfatsmpo.org	803-324-3897
Bill Shanahan	County	bill.shanahan@yorkcountygov.com	803-627-3350

SCDOT

South Carolina Statewide ITS Architecture Update Meeting
Rock Hill Stakeholder Group
Wednesday June 4, 2014 at 2:00pm

Name	Agency	Email	Phone Number
Greg Shaw	SCDOT	ShawMG@scdot.org	803 377 4155
Vic Edwards	SCDOT	EdwardsVM@SCDOT.org	803-377-4155
Phil Leazer	York County	phil.leazer@yorkcountygov.com	803-818-5763
Jonathan Fox			
Dan Campbell			
Rick Wertz			
Stephen Mensah			

SCDOT

ROCK HILL MEETING STAKEHOLDER INVITATION LIST

Name	Agency
Fox, Jonathan	Stantec
Dan Campbell	SCDOT
Diane Lackey	SCDOT
Scott Donahue	SCDOT
Dan Hinton	FHWA
Robert Woods	SCDPS
David Vehaun	City of Rock Hill
Mike Blackmon	City of Rock Hill
Chris Watts	City of Rock Hill
Rebecca Bowyer	York County
Bruce M. Bryant	York County
Greg Shaw	SCDOT
David Hooper	RFATS MPO
Randy Imler	Catawba COG
Rick Day	Stantec
Rick Werts	Stantec
Rick Reiff	Stantec
Stephen Mensah	Stantec
David Larson	
Scott Long	
Robert Moody	Catawba COG
Allen Brandon	
Phill Leazer	York County

Meeting Minutes

Myrtle Beach Stakeholders Meeting

South Carolina Statewide ITS Architecture Updates / 201802495.200

Date/Time:	June 3, 2014 / 2:00 PM
Place:	Myrtle Beach, SC
Next Meeting:	TBD
Attendees:	C. Clark, A. Markunas, D. Schwerd, J. Thomas, M. Bethea, D. Campbell, R. Werts, J. Fox, S. Mensah
Absentees:	See invitee list and sign-in sheets
Distribution:	All Stakeholders

The stakeholder meeting in Myrtle Beach started with a presentation by Jonathan Fox (Stantec) on the definition of intelligent transportation systems (ITS) and the Federal Highway Administration's requirement for regional architecture development and the eligibility for federal funds. Specific examples of ITS applications such as network monitoring, incident management, emergency management, commercial vehicle operations, etc. was highlighted. The process to complete the South Carolina Statewide ITS architecture updates including the required stakeholder inputs was laid out. The stakeholders were invited to discuss regional transportation needs that could be addressed using ITS. The stakeholders were provided with comment sheets and contact information to provide additional information by June 13, 2014 to enable Stantec to develop the South Carolina Statewide ITS Architecture. The following is a summary of the discussion and needs the stakeholders presented at the meeting.

Item:	Action:
Regional Needs • The metropolitan planning organization (MPO) boundaries have been updated. Information on the new boundaries is available at South Carolina Department of Transportation (SCDOT) who can produce maps from shapefiles. • Better signal coordination is desired. • State multimodal plan for 100 most congested segments (using INRIX impact factor) shows 20 of these 100 segments in the Myrtle Beach area. A more data driven approach to signal timing is useful. Garden City Connector recently had intersection improvements done however it is congested and the intersection at route 544 and US 17 is not functioning as expected. Closed circuit television (CCTV) and state highway emergency patrol (SHEP) coverage on Route 544 desired. • Routes with annual average daily traffic (AADT) in ~30,000 - ~40,000 range need to be mapped. I-95 Coalition has rebid and been awarded a contract and part of the requirement is to reduce the sub TMC code and address data latency. INRIX data is used to show condition on the	• Stakeholders requested to submit any ITS needs and/or comments by June 13, 2014 • SCDOT to roll out new video access system to agencies through the TIM quarterly meetings. • Stakeholders requested to

traveler information system for South Carolina (511). The sub TMC • codes are required to show better congestion information. Current codes have up to 7 mile long segments but shorter segments which will be used in the new 511 that will be launched in August will provide more accurate information along a segment. • Travel time information on dynamic message signs (DMS) and Way finding project within Myrtle Beach to provide information via mobile 511 app are desirable. • Department of Public Safety (DPS) requires SCDOT to run safety campaigns and these are tied to local DPS campaigns. • SCDOT should use the same terminology as the Grand Strand Area Transportation Study (GSATS) for travel time information to beaches • SCDOT wants feedback on system performance. • Quality of some CCTV images need to improve. New CCTV cameras with lens cleansing capability and pan-tilt-zoom (PTZ) is also desirable. SCDOT is currently working on video sharing program to make CCTV images available to stakeholders that need CCTV images even when the 511 streaming is cut off on the website and the media. Response agencies will be given a special login to see streaming video and law enforcement agencies are welcome to the TMCs to use cameras as desired for incident/emergency response. The 511 page is currently not streaming live videos however new video sharing system will be in place and live streaming on 511 will start in August 2014. The features of the new video sharing system were demonstrated. The new video distribution system will be made available to stakeholders who request access at no cost. Dan requested a list of all personnel that will require access to the live streaming video for work. • The City has plans to deploy many CCTV cameras in a few years and the question was raised about how the agency can share video with SCDOT to facilitate operations as needed. Dan stated it is possible to connect systems via a firewall and such video can be shared with SCDOT. • Dan reiterated the goal of making the 511 website the go-to place for everything that is traffic related. The 511 mobile app is currently being enhanced. • There are many gaps in CCTV coverage. The reason for the limited coverage is because CCTV are typically deployed where fiber optic exists. There is a project to upgrade signal communications to ethernet and once that is complete CCTV cameras will be easily deployed to extend coverage. There are also wireless communication options being	submit their inventory of ITS assets (i.e., DMS, CCTV cameras, portable VMS, traffic signals, fiber communications, wireless links, etc.)

explored. Jonathan stated the need to capture ITS needs in this statewide ITS architecture document for consideration.

- The Charleston Consolidated 911 currently has live video streaming from SCDOT.
- Traffic management tools must be tailored to needs of surface streets since interstate management tools will not apply to surface street management.
- The public rail line between Conway and Myrtle Beach is not being used.
- Highway Patrol web CAD needs to improve. Information does not reflect current conditions on network.
- US 501 has high incidents. Surveillance/detection is desired on all roads on the national highway system. Current coverage locations are limited. Detection on Kings Highway is important for congestion. Once at the beach many trips are in the north-south direction along Kings Highway. Parallel corridors (north-south) must be included in 511. Generally more areas must be covered than shown in the 511 webpage and live CCTV feed is desirable.
- City of Myrtle Beach can create maps from ATMS now to help develop congestion maps as needed.
- County has its own fiber optic and conduits are available for more fiber. Connection to SCDOT may be advantageous for information sharing.
- Highway 90 parallels unpaved road and VMS (portable) with remote communication desired to help inform public about controlled burns.
- Emergency evacuation is critical for this region. DOT has two projects being developed to enhance the 511 mobile app: Phase I will develop evacuation route information. Phase II will develop an interactive map to help with best evacuation routes based on global positioning system (GPS) location.

The meeting adjourned at 3:30 PM
The foregoing is considered to be a true and accurate record of all items discussed. If any discrepancies or inconsistencies are noted, please contact the writer immediately.

Stantec Consulting Services Inc.

Stephen Mensah
Traffic Engineer
Phone: 225-765-7400
stephen.mensah@stantec.com

Attachment: sign-in; invitee list; resource sites

Additional contacts:

Dan Campbell, SCDOT - ITS Coordinator
campbellde@scdot.org

Jonathan Fox, Stantec – Associate
Jonathan.fox@stantec.com

South Carolina Statewide ITS Architecture Update Meeting
Myrtle Beach Stakeholder Group
Tuesday June 3, 2014 at 2:00pm

Name	Agency	Email	Phone Number
Chris Clark	WRCOG/GSATS	cclark@wrcog.org	843 546 8503
ANDY MARKUNAS	HORRY CO.	markunaa@horrycounty.org	843 915-5760
DAVID SCHWERD	" "	schwerdd@horrycounty.org	" 915-5340
JEFF THOMAS	CITY OF MB	JTHOMAS@CITYOFMYRTLEBEACH.COM	843-918-2028
Michael Bethea	SCDOT	betheame@scdot.org	843-661-4710
Rick Werts	Stantec		
Jonathan Fox	Stantec		
Stephen Mensah	Stantec		
Dan Campbell	SCDOT		

MYRTLE BEACH MEETING STAKEHOLDER INVITATION LIST

Name	Agency
Fox, Jonathan	Stantec
Dan Campbell	SCDOT
Diane Lackey	SCDOT
Scott Donahue	SCDOT
Dan Hinton	FHWA
Robert Woods	SCDPS
Patrick Sadek	City of Myrtle Beach
Alvin Payne	City of Myrtle Beach
Warren Gall	City of Myrtle Beach
Andy Markunas	Horry County
Phillip Thompson	Horry County
Saundra Rhodes	Horry County
Forrest Whittington	City of Florence
Randall Osterman	City of Florence
Allen Heidler	City of Florence
Arthur C. Gregg, Jr.	Florence County
Kenney Boone	Florence County
Michael Bethea	SCDOT
Jay Graham	FLATS MPO
Ms. Sarah Smith	GSATS MPO
Christopher R. Clark	GSATS MPO
Mark Hoeweler	GSATS MPO
Johnny M. Brown	Pee Dee COG
Werts, Rick	Stantec
Day, Rick	Stantec
Reiff, Rick	Stantec
Mensah, Stephen	Stantec
Kevin Heins	
Edward Starks	GSATS MPO
Jeff Thomas	
Jack Walker	
Sandee Garigen	

Meeting Minutes

Greenville-Spartanburg Stakeholders Meeting

South Carolina Statewide ITS Architecture Updates / 201802495.200

Date/Time:	June 5, 2014 / 9:00 AM
Place:	Greenville, SC
Next Meeting:	TBD
Attendees:	A. McElrath, V. Holmes, T. Carroll, D. Campbell, J. Fox, R. Wertz, S. Mensah
Absentees:	See invitee list and sign-in sheets
Distribution:	All Stakeholders

The stakeholder meeting in Greenville started with a presentation by Jonathan Fox (Stantec) on the definition of intelligent transportation systems (ITS) and the Federal Highway Administration's requirement for regional architecture development and the eligibility for federal funds. Specific examples of ITS applications such as network monitoring, incident management, emergency management, commercial vehicle operations, etc. was highlighted. The process to complete the South Carolina Statewide ITS architecture updates including the required stakeholder inputs was laid out. The stakeholders were invited to discuss regional transportation needs that could be addressed using ITS. The stakeholders were provided with comment sheets and contact information to provide additional information by June 13, 2014 to enable Stantec to develop the South Carolina Statewide ITS Architecture. The following is a summary of the discussion and needs the stakeholders presented at the meeting.

Item:	Action:
Regional Needs • Dan stated that much as the updates to the Statewide architecture is a federal requirement, it is also an opportunity for the stakeholders to make their regional needs from South Carolina Department of Transportation (SCDOT) known such as signal upgrades, signal coordination etc. Dan commended Spartanburg Area Transportation Study (SPATS) for being very proactive with signal upgrades and ITS projects. • The regulatory dynamic speed limit signs on US 25 in Greenville County are used for pavement related issues due to wet pavement. The fog system signs on I-526 in Charleston are advisory signs. • SCDOT does not record video since the initial deployment agreement did not permit this. Moreover it will take significant resources to record video 24/7 from over 400 closed circuit television (CCTV) cameras. There has been some push from the legislature to make SCDOT record videos to help with investigation of some incidents on the interstate system however, thus far SCDOT has not been compelled to do so.	• Stakeholders requested to submit any ITS needs and/or comments by June 13, 2014 • SCDOT to roll out new video access system to agencies through the TIM quarterly meetings. • Stakeholders requested to submit their inventory of ITS assets (i.e., DMS, CCTV cameras, portable VMS, traffic signals, fiber communications, wireless links, etc.)

- Dan highlighted the Reach the Beach feature on the South Carolina Traveler Information System (511) which shows travel time to and from the beach. This will be available also on the mobile app. Currently, this covers Myrtle Beach and Hilton Head. Charleston may be added.
- The 511 system has about 200 calls and the web hits are into the 1000s each day.
- SCDOT currently working on video sharing program to make CCTV images available to stakeholders that need CCTV images even when the 511 streaming is cut off on the website and the media. Response agencies will be given a special login to see streaming video and law enforcement agencies are welcome to the TMCs to use cameras as desired for incident/emergency response. The 511 page is currently not streaming live videos however new video sharing system will be in place and live streaming on 511 will start in August 2014. The features of the new video sharing system were demonstrated. The new video distribution system will be made available to stakeholders who request access at no cost. SCDOT will charge TV stations for use of live video to help recoup some of the cost. SCDOT is paying about $3000-$4000 a month for the service.
- The City of Greenville and county has consolidated 911 dispatch. Dan recommended that the dispatchers can use streaming video that will be made available soon. Dan stated that any agency that desires the video should send names of personnel that require access to be given the credentials to access live stream when it is rolled out.
- Railroad signal preemption is available but none for emergency vehicles. Need to coordinate signals on major arterials to handle emergency detours and associated signals plans must be developed. There might be connection between signal systems with Pleasantburg Drive. East Stone Avenue and Laurens Road have two separate systems. There is a need to coordinate with any agencies that maintain signals other than SCDOT in order to get the necessary MOUs and agreements to help manage incidents. Dan stated the need to look into who should be notified in order to implement emergency timing plans on signalized corridors. Currently incidents are usually cleared before emergency signal response plans take effect. The City of Spartanburg traffic signal system is not connected to the SCDOT TMC. Most signals are on state roads but maintained by the City of Spartanburg.
- City of Spartanburg traffic signal is connected via twisted pair

wires for interconnect and fiber optic is desirable. SPATS is working on US 29 and US 176 to link signal systems together. • SCDOT TMC monitors dispatch in Columbia area to get heads up on any incidents called in since it could take up to 10 minutes for the TMC to receive notification otherwise. Monitoring the fire channel helps with incident notification. Incident verification from the general public is not reliable. • Major traffic generators such as sporting facilities should be included on maps. • About 52 miles of fiber optic for a secure connection between Columbia and Charleston is being constructed. 13 miles of direct bury fiber optic in Greenville needs to be replaced. Direct bury was the state of the practice at the time. Dan stated his goal is to replace the direct bury fiber. • Valerie stated that reliable communication using fiber optics is desirable including upgrades controller systems (IP addressable controllers). Dan stated that Spartanburg may find it easier to replace the twisted pair wiring with aerial run fiber since they already have space on the overhead poles. • Video detection is preferred to loops. It can be leverage for traffic counts. Jonathan highlighted other detection options including radar devices. • On the question of the use of adaptive signal systems Dan stated that should be a last resort when all other options have been explored especially because of the cost involved in implementation and maintenance and reliable communications to make the system work. • Woodruff Road has congestion issues and parallel routes may need to be developed. Rick stated that a “super street” concept may work for this corridor. • ITS projects must be included in long-range transportation plan (LRTP). • SPATS wants to connect US 29 corridor signals with Greenville-Pickens Area Transportation Study (GPATS) for signal coordination. If not funded yet it may be close to getting funded.	

The meeting adjourned at 10:30 AM

The foregoing is considered to be a true and accurate record of all items discussed. If any discrepancies or inconsistencies are noted, please contact the writer immediately.

Stantec Consulting Services Inc.

Stephen Mensah
Traffic Engineer
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Attachment: sign-in; invitee list; resource sites

Additional contacts:

Dan Campbell, SCDOT - ITS Coordinator
campbellde@scdot.org

Jonathan Fox, Stantec – Associate
Jonathan.fox@stantec.com

South Carolina Statewide ITS Architecture Update Meeting
Greenville/Spartanburg Stakeholder Group
Thursday June 5, 2014 at 9:00am

Name	Agency	Email	Phone Number
Alfred McGlamm	Greenville City Fire Dept	AMcGlamm@Greenvillesc.gov	288-5431
Valerie Holmes	City of GVL - TE	vholmes@greenvillesc.gov	467-4360
Todd Carroll	Spartanburg County CTC	tcarroll@spartanburgcounty.org	595-5332
Dan Campbell	SCDOT		
Rick Wertz	Stantec		
Jonathan Fox	Stantec		
Stephen Mensah	Stantec		

SCDOT

GREENVILLE MEETING STAKEHOLDER INVITATION LIST

Name	Agency
Fox, Jonathan	Stantec
Dan Campbell	SCDOT
Diane Lackey	SCDOT
Scott Donahue	SCDOT
Dan Hinton	FHWA
Robert Woods	SCDPS
Kerry Stalnaker	City of Anderson
R. Dale Horn	City of Anderson
James S. Stewart	City of Anderson
Rusty Burns	Anderson County
John Skipper	Anderson County
Wilbur Ravenhorst, P.E.	City of Greenville
Stephen Kovalcik	City of Greenville
Brandy Rector, Asst.	City of Greenville
Hesha Gamble	Greenville County
Steven D. Loftis	Greenville County
Les Foster	City of Spartanburg
Marion Fred Blackwell, Jr.	City of Spartanburg
Alonzo Thompson	City of Spartanburg
Steve Belue	Spartanburg County
Chuck Wright	Spartanburg County
Eric Dillon, P.E.	SCDOT
Nicholas Rebovich	SCDOT
Maurice McKenzie	ANATS MPO
Steve Pelissier	Appalachian COG
Lance Estep	GPATS MPO
James D'Amato	SPATS MPO
David N. Edwards, Jr.	GSP International Airport
David Vehaun	City of Rock Hill
Mike Blackmon	City of Rock Hill
Chris Watts	City of Rock Hill
Rebecca Bowyer	York County
Bruce M. Bryant	York County
Greg Shaw	SCDOT
David Hooper	RFATS MPO
Randy Imler	Catawba COG
Rick Day	Stantec
Rick Werts	Stantec
Rick Reiff	Stantec
Stephen Mensah	Stantec
Phyllis White	

Meeting Minutes

Columbia Stakeholder Meeting

South Carolina Statewide ITS Architecture Updates / 201802495.200

Date/Time:	June 4, 2014 / 9:00 AM
Place:	Columbia, SC
Next Meeting:	TBD
Attendees:	See List
Absentees:	See sign-in and invitee lists
Distribution:	All Stakeholders

The stakeholder meeting in Columbia started with a presentation by Jonathan Fox (Stantec) on the definition of intelligent transportation systems (ITS) and the Federal Highway Administration's requirement for regional architecture development and the eligibility for federal funds. Specific examples of ITS applications such as network monitoring, incident management, emergency management, commercial vehicle operations, etc. was highlighted. The process to complete the South Carolina Statewide ITS architecture updates including the required stakeholder inputs was laid out. The stakeholders were invited to discuss regional transportation needs that could be addressed using ITS. The stakeholders were provided with comment sheets and contact information to provide additional information by June 13, 2014 to enable Stantec to develop the South Carolina Statewide ITS Architecture. The following is a summary of the discussion and needs the stakeholders presented at the meeting.

Item:	Action:
Regional Needs • SCDOT currently working on video sharing program to make CCTV images available to stakeholders that need CCTV images even when the 511 streaming is cut off on the website and the media. Response agencies will be given a special login to see streaming video and law enforcement agencies are welcome to the TMCs to use cameras as desired for incident/emergency response. The 511 page is currently not streaming live videos however new video sharing system will be in place and live streaming on 511 will start in August 2014. The features of the new video sharing system were demonstrated. The new video distribution system will be made available to stakeholders who request access at no cost. • The 511 speed maps appear to cover interstates and beach area but need to be extended to other arterials (US 378 & US 1 between Columbia and Lexington). • Credible incident data is required and system must reflect accurate roadway status. Surveillance required for incident management on	• Stakeholders requested to submit any ITS needs and/or comments by June 13, 2014 • SCDOT to roll out new video access system to agencies through the TIM quarterly meetings. • Stakeholders requested to submit their inventory of ITS assets (i.e., DMS, CCTV cameras, portable VMS, traffic signals, fiber communications, wireless links, etc.)

critical corridors and other incident locations especially areas outside of urbanized areas but affect travel to and from urban areas. • Alternate routing is critical to lessen queues and backups and make is safe for first responders. Formal detour routes are available but need to improve communication and signal timing. • Reach the Beach feature in 511 webpage currently shows information on signed routes from I-95 to Myrtle Beach. • Way finding app and website is yet to be developed for 511. • The 511 website only shows devices that are active. • Older CCTV cameras in downtown Columbia have been proposed to be replaced with IP cameras and should be tied into SCDOT system. • Transportation demand management is required in the Columbia area • The minimum standards for transit related ITS set by FTA should be met as part of Statewide ITS Architecture. • FTA requires transit needs to be captured in ITS architecture or in a supplement document in order to be eligible for funds. Minimum standards for transit including AVL and travel time will improve public ridership. All transit agency needs should be included. • 911 uses CCTV stream to verify incidents before dispatch. • Improvements to commercial vehicle operations desired eg. Weigh in Motion (WIM) Pre-pass is desired to help Ports pre-clear commercial vehicles for faster deliveries. • Truck parking availability will be provided in future and managing system to ensure accurate information is communicated to truck drivers. • Highway Patrol web CAD is not up-to-date. • The 511 mobile app will send messages when incidents are cleared.	• Desired that the Statewide ITS architecture capture transit needs

The meeting adjourned at 10:30 AM
The foregoing is considered to be a true and accurate record of all items discussed. If any discrepancies or inconsistencies are noted, please contact the writer immediately.

Stantec Consulting Services Inc.

Stephen Mensah
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Attachment: sign-in; invitee list; resource sites

Additional contacts:

Dan Campbell, SCDOT - ITS Coordinator
campbellde@scdot.org

Jonathan Fox, Stantec – Associate
Jonathan.fox@stantec.com

South Carolina Statewide ITS Architecture Update Meeting
Columbia Stakeholder Group
Wednesday June 4, 2014 at 9:00am

Name	Agency	Email	Phone Number
JoAnn Woodrum	SCDOT	WoodrumJH@SCDOT.org	803 531-6850
Mike Bowman	SCDOT	bowmanmc@SCDOT.org	803-737-9942
Steve Hair	RCSD	shair@rcsd.net	309 3445
Michael Pearson	RCSD	M.Pealson@rcsd.net	545-0740
Reginald Simmons	CMCOG/COATS	rsimmons@cmcog.org	744-5133
Dan Hinton	FHWA	daniel.hinton@dot.gov	803-765-3887

South Carolina Statewide ITS Architecture Update Meeting
Columbia Stakeholder Group
Wednesday June 4, 2014 at 9:00am

Name	Agency	Email	Phone Number
Diane Lackey	SCDOT	LackeyDM@scdot.org	803 737-0146
Virginia Goodson	The COMET	virginia.goodson@catchTheCOMET.org	803 255 7137
Barry Mattox	SCDOT - D1	mattoxb@scdot.org	737-6660
Ed Sawyer	"	Sawyer eg	"

SCDOT

South Carolina Statewide ITS Architecture Update Meeting
Columbia Stakeholder Group
Wednesday June 4, 2014 at 9:00am

Name	Agency	Email	Phone Number
David Brewer	City of Columbia	ddbrewer@columbiasc.net	545-3850
Ron Armstead	City of Columbia	Rearmstead@columbiasc.net	545-3852
Jeff McNesby	Lexington County	jmcnesby@lex-co.com	360-0099
Dan Campbell	SCDOT		
Rick Werts	Stantec		
Jonathan Fox	Stantec		
Stephen Mensah	Stantec.		

COLUMBIA MEETING STAKEHOLDER INVITATION LIST

Name	Agency
Fox, Jonathan	Stantec
Dan Campbell	SCDOT
Diane Lackey	SCDOT
Scott Donahue	SCDOT
Dan Hinton	FHWA
Robert Woods	SCDPS
Ted Jones	City of Aiken
Charles D. Barranco	City of Aiken
B. Todd Glover	City of N. Augusta
John C. Thomas	City of N. Augusta
Joe Berry	Aiken County
Michael E. Hunt	Aiken County
David Brewer	City of Columbia
Aubrey Jenkins	City of Columbia
William Holbrook	City of Columbia
E. Wrenn Barrett	Lexington County
James R. Metts	Lexington County
Ismail Ozbek, PE	Richland County
Leon Lott	Richland County
Bill Rozier, P.E.	City of Sumter
C. Karl Ford	City of Sumter
Russell F. Roark III	City of Sumter
Michael Weatherly	Sumter County
Anthony Dennis	Sumter County
Rick Todd	SC Trucking Association
Ed Sawyer	SCDOT
Ems Baskin	SCDOT
Nick Boozer	SCDOT
Tony Sheppard	SCDOT
Carol Jones	SCDOT
Steven Strohminger	ARTS-SC MPO
Ben Mauldin	COATS MPO
George McGregor	SUATS MPO
Ms. Connie Shade	Lower Savannah COG
G. Michael Mikota, Ph.D.	Santee-Lynches COG
Patricia Hartung	Upper Savannah COG
Dan Mann	Columbia Metropolitan Airport
Day, Rick	Stantec
Werts, Rick	Stantec
Reiff, Rick	Stantec
Mensah, Stephen	Stantec
Edwards, Randy	
McNesby, Jeff	
Armstead, Ron	

Meeting Minutes

Charleston Stakeholders Meeting

South Carolina Statewide ITS Architecture Updates / 201802495.200

Date/Time:	June 3, 2014 / 9:00 AM
Place:	Charleston, SC
Next Meeting:	TBD
Attendees:	N. Baxley, J. Burns, R. Dangerfield, C. Ronnion, T. Gilfillan, T. Greene, H. Rashid, A. Cannon, D. Singletary, T. Morgan, D. Frazier, V. Gilreath, D. Campbell, R. Wertz, J. Fox, S. Mensah
Absentees:	See invitee list and sign-in sheets
Distribution:	All Stakeholders

The stakeholder meeting in Charleston started with a presentation by Jonathan Fox (Stantec) on the definition of intelligent transportation systems (ITS) and the Federal Highway Administration's requirement for regional architecture development and the eligibility for federal funds. Specific examples of ITS applications such as network monitoring, incident management, emergency management, commercial vehicle operations, etc. was highlighted. The process to complete the South Carolina Statewide ITS architecture updates including the required stakeholder inputs was laid out. The stakeholders were invited to discuss regional transportation needs that could be addressed using ITS. The stakeholders were provided with comment sheets and contact information to provide additional information by June 13, 2014 to enable Stantec to develop the South Carolina Statewide ITS Architecture. The following is a summary of the discussion and needs the stakeholders presented at the meeting.

Item:	Action:
Regional Needs • The traveler information system for South Carolina (511) marketing campaign/public awareness desired. Dan Campbell stated that SCDOT has done press releases but people still don't know about 511 and its benefits. Law enforcement can incorporate 511 public awareness into public outreach programs and SCDOT has developed Youtube videos on how to use 511. • 911 in adjacent counties conflict and therefore a consolidated 911 will help eliminate conflicts. • State Highway Emergency Patrol (SHEP) is an excellent program and should be expanded. SHEP is currently limited to interstate system but is needed in other areas. • A better estimate of incident clearance time is desirable and live feed from closed circuit television (CCTV) cameras to first responders should help "size incidents" and improve response and clearance time. • Detour plans must be established and resources allocated in	• Stakeholders requested to submit any ITS needs and/or comments by June 13, 2014 • SCDOT to roll out new video access system to agencies through the TIM quarterly meetings. • Stakeholders requested to submit their inventory of ITS assets (i.e., DMS, CCTV cameras, portable VMS, traffic signals, fiber communications,

counties that will be affected by additional traffic re-routed through the counties. Staffing and training is required to make this successful. • Local incident management meetings are held quarterly and the intent is to assess performance and focus on improving incident management. It is undesirable to use these meetings to blame agencies for any shortcomings. • Coordinated signals exist but no emergency signal plans have been developed. Emergency signal plans are desired in all major corridors. No emergency signal plans exist in the Charleston area. A protocol needs to be established for when emergency systems are activated. For instance whether the area traffic engineer or the traffic management center (TMC) will activate the emergency signal plans. South Carolina Department of Transportation (SCDOT) is working to develop emergency plans. Had one been in place it would have made it easier to manage the ice storms that shut down I-26. Technology and people are required to make these systems work along with the requisite training. • Fiber communications for traffic signals are desirable, field-to-field and center-to-center. • Beaufort County is the only entity in the state outside of SCDOT that has a TMC, highway advisory radios (HAR), CCTV cameras and dynamic message signs (DMS). There are 10 fixed and 2 portable HAR systems and 85 CCTV cameras. Beaufort has emergency coordination plans on US 278 and downtown Beaufort and have buttons to activate system when bridges are open. • Better communication is required between bridge operators and other stakeholders. A SCDOT employee is present at movable bridge and a plan to improve communications has yet to be implemented. A reliable system to inform key stakeholders of bridge status is desired. • Beaufort has center to center communications with SCDOT Charleston TMC but the system is not fully functional. Connectors work but data exchanges need to match up. • The transit agency has GPS tracking on all vehicles and desires to integrate bus schedule and expected arrival times with 511. Dan stated that standard will be key so systems can be merged without issues. Mobile app to push transit information to the public is also desirable. Two transit kiosks with bus arrival times will be deployed soon. • SCDOT developing a feature within the mobile 511 app to assist	wireless links, etc.) •

with hurricane evacuation based on global positioning system (GPS) location • SCDOT CCTV images are not recorded; sensitive images (fatalities, personal injury, bridge jumpers, etc.) are not made available on 511. • SCDOT currently working on video sharing program to make CCTV images available to stakeholders that need CCTV images even when the 511 streaming is cut off on the website and the media. Response agencies will be given a special login to see streaming video and law enforcement agencies are welcome to the TMCs to use cameras as desired for incident/emergency response. The 511 page is currently not streaming live videos however new video sharing system will be in place and live streaming on 511 will start in August 2014. The features of the new video sharing system were demonstrated. The new video distribution system will be made available to stakeholders who request access at no cost. Dan stated that the goal is to make the 511 website the go-to place for everything that is traffic related. The 511 mobile app is currently being enhanced. • There are some shared resources between SCDOT, City of Mount Pleasant and City of Charleston and Coast Guard (SEAHAWK project). SCDOT also has leased fiber from SC Electric and Gas and share CCTV images. • CARTA uses the county's system for radio communications and an expansion of public safety 800 megahertz radio system is desirable. • Way finding is an issue and SCDOT will try to incorporate project done on way finding into new app to push travel time. Currently the Reach the Beach feature on the 511 website shows travel times from Columbia to Myrtle Beach which was an existing product provided by the vendor. There was a desire for something more local and three different routes and travel times from North Myrtle to Myrtle Beach has been developed. • Other needs in the area include parking management system / mobile application, ride share during emergencies, and archived data management system to share data. The long range transportation plans for each region typically has transportation needs listed.	

The meeting adjourned at 10:30 AM

The foregoing is considered to be a true and accurate record of all items discussed. If any discrepancies or inconsistencies are noted, please contact the writer immediately.

Stantec Consulting Services Inc.

Stephen Mensah
Traffic Engineer
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Attachment: sign-in; invitee list; resource sites

Additional contacts:

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campbellde@scdot.org

Jonathan Fox, Stantec – Associate

Jonathan.fox@stantec.com

South Carolina Statewide ITS Architecture Update Meeting
Charleston Stakeholder Group
Tuesday June 3, 2014 at 9:00am

Name	Agency	Email	Phone Number
NEIL BAXLEY	BEAUFORT CO SHERIFF'S OFFICE	NEILB@BCGOV.NET	843 255.4000
Jeff Burns	CARTA	jburns@ridecarta.com	724.7195
Rick Danyer Reid	North Charleston Fire Dept	rdanyerreid@northcharleston.org	843 297-0980
CHUCK RONNIE	BEAUFORT CO SHERIFFS OFFICE	cronnie@bcgov.net	843 255.4000
Tom GILFILLAN	city of N. CHAS.	Tgilfille NorthCharleston.org	209 7535
Trey Greene	City of N. Chas	Tgreen@NorthCharleston.org	(843) 614-7294
Harun Rashid	BCDCOG		529.0400
AL CANNON	CHAS CO SHERIFF	alcannon@charlestoncounty.org	554-2485
DAVID SINGLETARY	N. CHAS. POLICE	dsingle@northcharleston.org	745-1077
TODD MORGAN	NORTH CHARLESTON PD	tmorgan@northcharleston.org	843-608-1055
DAN FRAZIER	BCDCOG	DANF@BCDCOG.com	843-529-0400

SCDOT

South Carolina Statewide ITS Architecture Update Meeting
Charleston Stakeholder Group
Tuesday June 3, 2014 at 9:00am

Name	Agency	Email	Phone Number
[illegible]	SCDOT	voms@scdot.org	
[illegible]	Bft County	ckinton@bcgov.net	
Jonathan Fox	Stantec		
Stephen Mensah	Stantec		
Rick Day	Stantec		
Dan Campbell	SCDOT		

SCDOT

CHARLESTON MEETING STAKEHOLDER INVITATION LIST

Name	Agency
Fox, Jonathan	Stantec
Dan Campbell	SCDOT
Diane Lackey	SCDOT
Scott Donahue	SCDOT
Dan Hinton	FHWA
Robert Woods	SCDPS
Isiah Smalls	City of Beaufort
Sammy Negron	City of Beaufort
Matthew James Clancy	City of Beaufort
Darrin Shoemaker	City of Beaufort
Lavarn Lucas	Town of Hilton Head
Robert McFee	Beaufort County
Colin Kinton	Beaufort County
P. J. Tanner	Beaufort County
Karen Brack	City of Charleston
Gregg Mullen	City of Charleston
Brad Morrison	City of Mount Pleasant
Herbert Williams	City of Mount Pleasant
Carl Ritchie	City of Mount Pleasant
Jim Hutto	City of N. Charleston
Gregory A. Bulanow	City of N. Charleston
Eddie Driggers	City of N. Charleston
Russ Cornette	Town of Summerville
Richard George Waring IV	Town of Summerville
Bruce Owens	Town of Summerville
Frank Carson	Berkeley County
Mr. Rollic	Berkeley County
Jim Armstrong	Charleston County
J. Al Cannon, Jr.	Charleston County
Mike Goldston	Dorchester County
Terri Bowers	Dorchester County
Brian Holt	SCDOT
Ron Mitchum	CHATS MPO
Dan Frazier	CHATS MPO
Chris Bickley	LATS MPO
Marsha Read	S.C. Ports Authority
Sen. Paul Campbell	Charleston International Airport
Rick Werts	Stantec
Rick Day	Stantec
Rick Reiff	Stantec
Mensah, Stephen	Stantec
Robert Christie	
M. Fleming	
Harun Rashid	

Appendix G TRANSIT RELATED STANDARDS

Table 15: Transit Related Standards

Group	SDO	Document ID	Standard Title	Standard Type
No	AASHTO/ITE	ITE TMDD	Traffic Management Data Dictionary (TMDD) and Message Sets for External Traffic Management Center Communications (MS/ETMCC)	Message/Data
No	AASHTO/ITE/NEMA	NTCIP 1201	Global Object Definitions	Message/Data
No	AASHTO/ITE/NEMA	NTCIP 1205	Object Definitions for Closed Circuit Television (CCTV) Camera Control	Message/Data
No	AASHTO/ITE/NEMA	NTCIP 1208	Object Definitions for Closed Circuit Television (CCTV) Switching	Message/Data
No	AASHTO/ITE/NEMA	NTCIP 1211	Object Definitions for Signal Control and Prioritization (SCP)	Message/Data
No	APTA	APTA TCIP-S-001 3.0.4	Standard for Transit Communications Interface Profiles	Message/Data
No	ASTM	ASTM E2468-05	Standard Practice for Metadata to Support Archived Data Management Systems	Other
Yes	AASHTO/ITE/NEMA	NTCIP C2C	NTCIP Center-to-Center Standards Group	Group
Yes	ASTM	DSRC 915MHz	Dedicated Short Range Communication at 915 MHz Standards Group	Group
Yes	IEEE	IEEE IM	Incident Management Standards Group	Group
Yes	SAE	ATIS General Use	Advanced Traveler Information Systems (ATIS) General Use Standards Group	Group