



State of Texas
Regional ITS Architectures and Deployment Plans

Lufkin Region

Regional ITS Architecture Report

Prepared by:



ConSysTec Corp

June 30, 2005

068510019

Copyright © 2004 by Texas Department of Transportation. All rights reserved.

TABLE OF CONTENTS

REGIONAL ITS ARCHITECTURE REPORT

SUMMARY	vi
1. INTRODUCTION	1-1
1.1 Project Overview.....	1-1
1.2 Document Overview.....	1-1
1.3 The Lufkin Region	1-2
1.3.1 Geographic Overview	1-2
1.3.2 Transportation Infrastructure	1-3
1.3.3 Lufkin Region ITS Plans.....	1-5
1.3.4 Stakeholders.....	1-6
2. INTEGRATION STRATEGY	2-1
2.1 Integration Purpose	2-1
2.2 Regional Needs.....	2-3
2.3 Regional Integration and Interoperability.....	2-4
3. REGIONAL ITS ARCHITECTURE DEVELOPMENT PROCESS.....	3-1
3.1 Lufkin Process	3-1
3.2 USDOT Regional ITS Architecture Guidance.....	3-4
4. CONCEPTUAL DESIGN	4-1
4.1 Systems Inventory.....	4-1
4.1.1 Subsystems and Terminators.....	4-1
4.1.2 Lufkin ITS Inventory by Stakeholder.....	4-2
4.1.3 Lufkin ITS Inventory by Entity	4-3
4.2 Regional Market Packages.....	4-18
4.3 Interconnections.....	4-34
4.3.1 Top Level Regional System Interconnect Diagram	4-34
4.3.2 Customized Market Packages	4-36
4.3.3 Lufkin Architecture Interfaces.....	4-37
4.3.4 Physical Subsystem Architecture Flows.....	4-37
4.4 Functional Requirements	4-39
4.5 Standards.....	4-43
4.6 Phases of Implementation	4-45
5. OPERATIONAL CONCEPT.....	5-1
5.1 Operational Scenarios	5-1
5.2 Roles and Responsibilities	5-3
5.3 Lufkin Agreements	5-4

APPENDIX A – CUSTOMIZED MARKET PACKAGES

APPENDIX B – INTERFACE DIAGRAMS

TABLE OF CONTENTS

REGIONAL ITS ARCHITECTURE REPORT

LIST OF FIGURES

Figure 1 – Lufkin Region Map	1-4
Figure 2 – Lufkin Regional ITS Architecture and Deployment Plan Development Process	3-1
Figure 3 – USDOT Guidance on Regional ITS Architecture Development	3-4
Figure 4 – Physical Subsystem Interconnect Diagram	4-2
Figure 5 – Lufkin Regional System Interconnect Diagram	4-35
Figure 6 – Custom Market Package for Surface Street Control	4-36
Figure 7 – TxDOT Lufkin District Traffic Signals Interfaces.....	4-38
Figure 8 – TxDOT Lufkin District TMC to City of Nacogdoches Public Works Architecture Flows ..	4-39

LIST OF TABLES

Table 1 – Lufkin Stakeholder Agencies and Contacts.....	2-1
Table 2 – Lufkin Region: Summary of ITS Needs	2-4
Table 3 – Lufkin Inventory of Regional Subsystems/Terminators (sorted by Stakeholder).....	4-4
Table 4 – Lufkin Inventory of Regional Subsystems/Terminators (sorted by Entity)	4-11
Table 5 – Lufkin Region Selected Market Packages.....	4-18
Table 6 – Lufkin Region Equipment Packages	4-40
Table 7 – Applicable ITS Standards for the Lufkin Region.....	4-44
Table 8 – Potential Agreements for the Lufkin Region.....	5-5

LIST OF ACRONYMS

AASHTO	American Association of State Highway and Transportation Officials
AD	Archived Data
ANRA	Angelina and Neches River Authority
APTS	Advanced Public Transportation Systems
ASTM	American Society for Testing and Materials
ATIS	Advanced Travel Information System
ATMS	Advanced Traffic Management System
AVL	Automated Vehicle Location
BRINSAP	Bridge Inventory Inspection System
BTD	Brazos Transit District
CAD	Computer Aided Dispatch
CC	Control Center
CCTV	Closed-Circuit Television
CPT	Common Public Transportation
CV	Commercial Vehicle
CVO	Commercial Vehicle Operations
DEM	Department of Emergency Management
DETCOG	Deep East Texas Council of Governments
DMS	Dynamic Message Sign
DPS	Department of Public Safety
EM	Emergency Management
EMS	Emergency Medical Services
EOC	Emergency Operations Center
ETMCC	External TMC Communication
EV	Emergency Vehicle
FC	Fare Collection
FHWA	Federal Highway Administration
HAR	Highway Advisory Radio

LIST OF ACRONYMS

HAZMAT	Hazardous Materials
HCRS	Highway Condition Reporting System
HRI	Highway-Rail Intersections
I/F	Interface
IEEE	Institute of Electrical and Electronics Engineers
IM	Incident Management
ISP	Information Service Provider
ITE	Institute of Transportation Engineers
ITS	Intelligent Transportation System
LADOTD	Louisiana Department of Transportation and Development
MC	Maintenance and Construction
MCM	Maintenance and Construction Management
MCV	Maintenance and Construction Vehicle
MDT	Mobile Data Terminal
MOU	Memorandum of Understanding
MS	Message Sets
NEMA	National Electrical Manufacturers Association
NOAA	National Oceanic and Atmospheric Administration
NTCIP	National Transportation Communications for ITS Protocol
OB	On-board
PI	Passenger Information
PSAP	Public Safety Answering Point
PWD	Public Works Department
SAE	Society of Automotive Engineers
SDO	Standards Development Organization
SFA	Stephen F. Austin
SP	Spatial Representation
TCIP	Transit Communication Interface Protocol
TEA-21	Transportation Equity Act for the 21st Century

LIST OF ACRONYMS

TM	Traffic Management
TMC	Traffic Management Center
TMDD	Traffic Management Data Directory
TxDOT	Texas Department of Transportation
USDOT	United States Department of Transportation
USGS	United States Geological Survey
VIVDS	Video Image Vehicle Detection Systems

SUMMARY

In January 2001, the Federal Highway Administration (FHWA) issued a final rule to implement Section 5206(e) of the Transportation Equity Act for the 21st Century (TEA-21) requiring that Intelligent Transportation System (ITS) projects funded through the Highway Trust Fund conform to the National ITS Architecture and applicable standards.

To meet these requirements, in 2001 the Texas Department of Transportation (TxDOT) initiated the development of Regional ITS Architectures and Deployment Plans throughout the State of Texas. The Lufkin Region was the nineteenth in the series of Regional ITS Architectures to be prepared as part of this initiative.

The Lufkin Region is located in east Texas. The Region is bordered by the TxDOT Tyler and Atlanta Districts to the north, the State of Louisiana to the east, the TxDOT Beaumont and Houston Districts to the south, and the TxDOT Bryan District to the west.

The Architecture for the Lufkin Region followed a comprehensive process focused on stakeholder outreach and education, identifying market packages and interfaces tailored to the needs of the Lufkin Region, and developing a consensus-based architecture for the Region. This architecture provides a framework for ITS infrastructure to be deployed and integrated in the Lufkin Region over the next 20 years.

Stakeholders from throughout the Region participated in the development of the Regional ITS Architecture, including representatives from TxDOT, cities, public safety, transit and planning organizations. These stakeholders provided input and review at key steps in the architecture development process, including a project kick-off meeting, architecture development and review workshops, and final review of the architecture documentation.

An inventory of existing and planned ITS infrastructure in the Region provided the basis for the architecture development. Stakeholder needs that could be addressed by ITS technologies guided the selection of market packages, data flows, and integration requirements. A diverse range of needs were identified by stakeholders in the Region. High priority needs focused on traffic management, traffic information dissemination, coordination during hurricane evacuations, and communications among neighboring TxDOT Districts.

Market packages were selected that corresponded to the desired services and functions identified for the Region, and were customized for Lufkin Region agencies and equipment. These market packages included high priority ‘foundation’ services and functions, such as network surveillance and traveler information, as well as market packages to address coordination needs, including incident management and regional emergency response. Stakeholders then prioritized these market packages as high, medium, and low. These priorities were used in the second phase of the project to develop the ITS Deployment Plan for the Lufkin Region.

An interconnect, or “Sausage Diagram” was developed for the Lufkin Region which provided a top-level overview of system functions and primary interconnects. More detailed interfaces were then developed which identified the connectivity between the systems and elements. Each element identified in the ITS architecture for the Lufkin Region was mapped to the other elements that it must interface with. These interfaces were further defined by architecture data flows between individual elements that specify the information to be exchanged. These data flows could include requests for information, alerts and messages, status requests, confirmations, and other information requirements.



Functional requirements for the Lufkin Region were identified through customized market packages and data flows, and the equipment packages that deliver specific capabilities. The equipment packages that were identified provide more detailed descriptions of functionality and can be deployed incrementally. Standards that could apply to the Lufkin Region also were identified as part of the architecture development process.

An Operational Concept for the Lufkin Region was developed to illustrate how systems, components, and agencies will be integrated and function as a result of the framework provided by the Regional ITS Architecture. The purpose of the Operational Concept is to demonstrate the roles and responsibilities of the various stakeholders in the Lufkin Region. Potential agreements that could be required for maintenance and operations, data sharing (among agencies and with the private sector), or joint operations are listed.

The Regional ITS Architecture for the Lufkin Region is documented in the final report. In addition, a companion web site was developed that contains all of the architecture information, stakeholders, regional inventory, customized market packages, interfaces, and standards.

1. INTRODUCTION

1.1 Project Overview

In January 2001, FHWA issued a final rule to implement Section 5206(e) of the TEA-21. This rule required that ITS projects funded through the Highway Trust Fund conform to the National ITS Architecture and applicable standards. The rule requests that the National ITS Architecture be used to develop a local implementation of the National ITS Architecture, which is referred to as a “Regional ITS Architecture.”

In order to meet these requirements, TxDOT initiated the development of Regional ITS Architectures and Deployment Plans throughout the State of Texas. In addition to meeting the federal requirements for funding, the development of regional ITS architectures provides a framework for implementing ITS on a regional level, encourages interoperability and resource sharing, identifies applicable standards, and allows for cohesive long range planning among stakeholders in the Region. Although not required by the FHWA final rule, TxDOT also sought to have an ITS deployment plan developed for each Region. An ITS deployment plan identifies and prioritizes projects that are needed to implement the ITS architecture on a short-, medium-, and long-term basis.

A key goal in the development of the regional ITS architectures was to develop a consensus-based architecture with as many stakeholders as possible involved. Each stakeholder had an equal voice in determining the direction of the architecture for the Region. Stakeholders included representatives from TxDOT, cities, public safety, transit and planning organizations. A series of five meetings were held with the ITS stakeholders to discuss the development and gather input into the Lufkin Regional ITS Architecture and Deployment Plan. In addition, a project web site was developed which contains all of the information on the Lufkin Regional ITS Architecture and provides stakeholders with an opportunity to review and comment on the architecture directly from the web.

The result is an ITS architecture that establishes a vision and direction for the Region. ITS needs of the Lufkin Region were established early in the project. Existing and planned elements of the architecture have been identified and the key agencies required to develop the ITS services, or market packages as they are referred to in the National ITS Architecture, for the Lufkin Region also have been identified. An operational concept has been developed that focuses on the roles and responsibilities of the various agencies involved in the Lufkin Region. A separate ITS Deployment Plan was developed that identifies projects in the Lufkin Region that are required to implement the architecture.

1.2 Document Overview

The Lufkin Regional ITS Architecture report is organized into five key sections:

Section 1 – Introduction

This section provides an overview of the State of Texas ITS Architectures and Deployment Plan Program, the ITS Architecture for the Lufkin Region, as well as an overview of some of the key features and stakeholders in the Lufkin Region.

Section 2 – Integration Strategy

This section discusses Lufkin Region stakeholder needs and issues, regional ITS initiatives and potential regional ITS programs, and opportunities for integration to achieve regional goals and contribute to regional and national ITS interoperability. Stakeholders and their contact information are also included.

Section 3 – Regional ITS Architecture Development Process

An overview of the key steps involved in developing the ITS architecture for the Lufkin Region is provided in this section. It includes a discussion of the methodology, stakeholder involvement, architecture workshops, and architecture development process.

Section 4 – Conceptual Design

The conceptual design contains the key sections of the Lufkin Regional ITS Architecture. The inventory of existing and planned systems is presented in Section 4, and is sorted by stakeholder as well as by entity for easy reference. The market packages that were selected for the Lufkin Region are also included in this section, as are the system functional requirements. The Lufkin Region interconnects are presented, including the “Sausage Diagram” showing the relationships of the key subsystems and elements in the Region, system interfaces, and the physical subsystem architecture flows. Standards that apply to the Lufkin Regional ITS Architecture also are listed.

Section 5 – Operational Concept

An Operational Concept has been prepared that discusses the key functions and services of the envisioned ITS for the Lufkin Region. As part of this concept, operational scenarios are described and roles and responsibilities of stakeholders are discussed. Potential public-public and public-private agreements also have been identified.

The Lufkin Regional ITS Architecture also contains two appendices:

- Appendix A – Customized Market Packages; and
- Appendix B – Interface Diagrams.

A web site has been established that contains the architecture documentation, inventories, interconnects, market packages, interfaces, and functional requirements. This web site can be accessed from www.consystem.com by selecting the link to the Texas Regional ITS Architecture Home Page, and then the Lufkin Region. The web site provides hyperlinks to more detailed information about the Lufkin Regional ITS Architecture than what could feasibly be included in the printed document. In certain sections of the document, readers are referred to the web site for additional information and details. At the time this report was published, the Lufkin Regional ITS Architecture web site was being hosted at www.consystem.com. TxDOT plans to permanently host the site in the future at www.dot.state.tx.us/trf/its.

1.3 The Lufkin Region

1.3.1 Geographic Overview

The Lufkin Region is bordered by the TxDOT Tyler and Atlanta Districts to the north, the State of Louisiana to the east, the TxDOT Beaumont and Houston Districts to the south, and the TxDOT Bryan District to the west. For the Lufkin Regional ITS Architecture and



Deployment Plan, the study area included all nine counties that comprise the TxDOT Lufkin District. The geographic boundaries of the Lufkin Region are highlighted in **Figure 1**.

The counties included in the Lufkin Region are:

- Angelina;
- Houston;
- Nacogdoches;
- Polk;
- Sabine;
- San Augustine;
- San Jacinto;
- Shelby; and
- Trinity.

TxDOT partners with local governments for roadway construction, maintenance, and traffic operations support, and serves as the responsible agency for on-system roadways in cities with populations less than 50,000. Major cities in the Region include Lufkin, Nacogdoches, Crockett, and Livingston, but none of the cities in the Lufkin Region have a population greater than 50,000.

1.3.2 *Transportation Infrastructure*

As illustrated in **Figure 1**, the Lufkin Region's transportation infrastructure is primarily US and State Highway Routes. The primary roadway facilities include US 59, US 69, US 96, US 259, and State Highways 7, 21, and 103. The majority of these US routes are north/south corridors; east/west corridors are primarily state, county, and farm-to-market roads. The Sabine River separates the Lufkin Region and Louisiana, and there are several bridge crossings connecting the two areas.

US 59 is the most heavily traveled corridor in the Region, and provides a vital link between Houston and Lufkin, as well as Lufkin and Nacogdoches. North of Nacogdoches, this highway ultimately connects with I-20. Its effective operation is critical to the movement of people and goods throughout the Region. Blockages along US 59 can have serious implications on drive-time for commercial vehicles and motorists alike due to the lack of obvious alternate routes. Knowing the road and travel conditions within this transportation corridor and having the ability to disseminate this information to motorists are important elements for this project. For example, if US 59 has been closed due to a major incident or weather (such as the hazardous materials [HAZMAT] truck incident in June 2004 that shut down a substantial portion of US 59 between Lufkin and Nacogdoches) and motorists are informed of the closure in advance, they can alter their travel plans with an alternate route or wait to begin their travels.

Public transportation in the Lufkin Region is provided primarily by the Brazos Transit District, which operates both fixed-route and demand-response services. Fixed-route services are available in the Cities of Lufkin and Nacogdoches, as well as an express service between those two cities. There are also smaller transit operators that provide non-emergency medical and social services transportation. An intermodal terminal is planned for the City of Lufkin that will serve as an access point for local transit services, Greyhound, and other intercity coaches as well as include a parking facility.

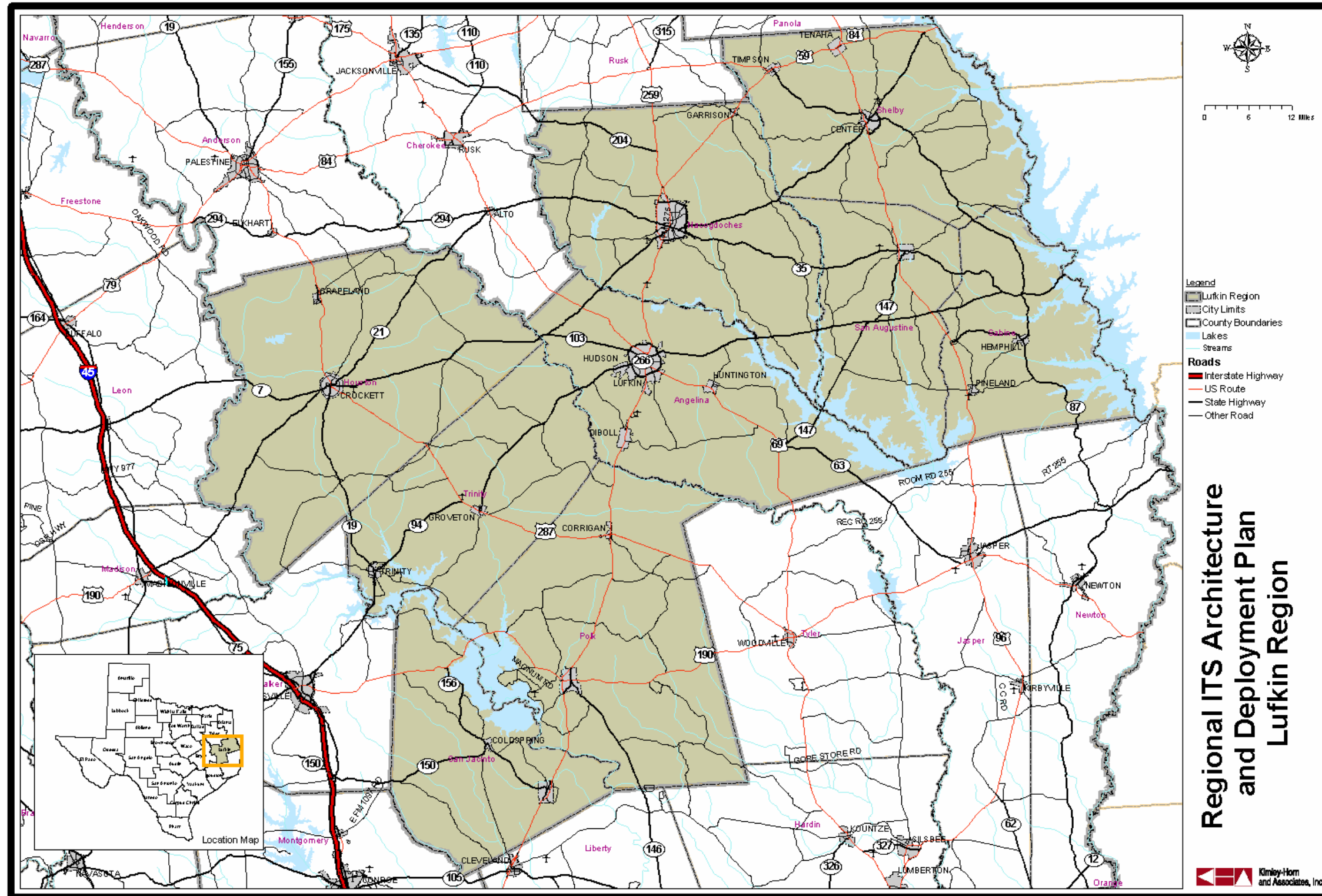


Figure 1 – Lufkin Region Map

1.3.3 Lufkin Region ITS Plans

To date, there has been limited deployment of ITS in the Lufkin Region. It is important to recognize the initial deployment of ITS infrastructure in a Region because in order for that Region to receive federal funding for ITS projects, the United States Department of Transportation (USDOT) requires that the Region have an ITS architecture by April 2005. This requirement is only for Regions with existing ITS infrastructure deployed. For Regions that do not have any ITS infrastructure deployed, the USDOT requires that they have an ITS architecture within four years of their first ITS project entering final design. As the Lufkin Region pursues funding opportunities for proposed projects, it will be necessary to show that the proposed project fits within the architecture developed for the Region as part of this project.

Currently, agencies in the Lufkin Region have deployed traffic signals with video image vehicle detection systems (VIVDS), portable dynamic message signs (DMS), signal preemption for emergency vehicles, computer aided dispatch (CAD) for public safety agencies, mobile data terminals (MDTs) on police vehicles, and automated vehicle location (AVL) on demand-response buses. The following sections discuss these deployments.

Video Detection

TxDOT is using VIVDS at several intersections within the Region. Unlike loop detection, VIVDS will not be affected by paving operations, and the detection zone of a VIVDS can be quickly changed to accommodate lane shifts during construction. VIVDS can detect vehicles approaching or stopping at a signalized intersection, and, under actuated conditions, place a call for the service of the appropriate phase for that vehicle.

Dynamic Message Signs

TxDOT and the City of Nacogdoches utilize portable dynamic message signs to provide localized information about closures, detours, etc. Messages can be customized for the specific location, and are programmed at the sign. Unlike permanent DMS which are usually mounted over freeways, the portable signs can be transported to any location and activated to provide information to travelers on specific routes. These portable signs can be used for maintenance closures or restrictions, during special events, or during incident/emergency conditions.

Signal Preemption for Emergency Vehicles

Currently, the City of Lufkin has signal preemption installed at some intersections within the city limits for emergency vehicles as part of a pilot program. Emergency vehicle preemption works when a vehicle equipped with a preemption emitter approaches an intersection and the detector activates a change in signal timing to allow fast and safe passage. Other signals in the region are equipped with manual signal preemption, which is utilized during emergency or evacuation situations.

Computer Aided Dispatch and Mobile Data Terminals

The City of Lufkin Police Department, City of Nacogdoches Police and the Texas Department of Public Safety use CAD systems to enhance dispatch capabilities and allow dispatch records and any incident information entered by the dispatcher to be saved for future reference in a dispatch log. The City of Nacogdoches also has MDTs on-board

police vehicles, which allows for automated communications and incident updates between dispatchers and officers in the field.

Automated Vehicle Location

Brazos Transit District has implemented AVL on its demand-response vehicles. AVL provides real-time bus location and status information to the Brazos Transit dispatch center. With such a vast service area, Brazos Transit is able to track, in real-time, the location of its demand-response vehicles.

1.3.4 Stakeholders

Stakeholder coordination and involvement is one of the key elements to the development of a Regional ITS Architecture and Deployment Plan. Because ITS often transcends traditional transportation infrastructure, it is important to involve non-traditional stakeholders in the architecture development and visioning process. Input from these stakeholders, both public and private, is a critical part of defining the interfaces, integration needs, and overall vision for ITS in the Lufkin Region.

The following is a list of stakeholders in the Lufkin Region who have participated in the project workshops or provided input to the study team as to the needs and issues that should be considered as part of the Lufkin Regional ITS Architecture.

- Angelina and Neches River Authority;
- Brazos Transit District;
- City of Crockett;
- City of Groveton;
- City of Livingston;
- City of Lufkin;
- City of Nacogdoches;
- City of San Augustine;
- Crockett Economic Development Corporation;
- Deep East Texas Council of Governments;
- Polk County;
- San Augustine County;
- Trinity County;
- Texas Department of Public Safety;
- TxDOT Lufkin District; and
- TxDOT Traffic Operations Division (Austin).

2. INTEGRATION STRATEGY

2.1 Integration Purpose

The purpose of the integration strategy is to identify the needs, stakeholders, and strategy for regional integration in the Lufkin Region.

For each operating agency or stakeholder entity identified through the development of the Regional ITS Architecture, there are operations that currently exist as a normal practice in order to accomplish the primary business goals and objectives for each stakeholder. As an example, a primary operation of the City of Lufkin Police Department dispatch is to dispatch emergency personnel to the appropriate locations when a 911 call for help is placed within the city. The integration of the dispatch with any of the other stakeholders will not change this primary function of the dispatch or disrupt typical business practices. The integration of the Lufkin 911 Public Safety Answering Point (PSAP) with another agency, such as the TxDOT Lufkin District or City of Lufkin Traffic Operations Center, will require that the data that will be exchanged between the two entities (such as the blockage of a lane of traffic due to a crash) meet certain requirements for that particular data type. Identifying the need for this connection between agencies and the opportunities for integration and interoperability in the Region are key purposes of this section.

This section will provide an overview of the major issues and stakeholders' needs within the Lufkin Region and the primary areas of concern that were uncovered in the preparation of the Lufkin Regional ITS Architecture. This section will also discuss the need for interregional integration with agencies external to the Lufkin Region, such as the need for integration with other TxDOT Districts.

A key step in developing any regional ITS architecture is the identification of major stakeholders in the Region. Key stakeholder agencies that participated in the development of the Lufkin Regional ITS Architecture are listed in **Table 1**. A number of other stakeholders were identified and invited to participate. In many cases, these stakeholders were not able to attend due to time constraints. Minutes of meetings, copies of reports, and access to the project web site was provided to these stakeholders to encourage their participation as much as possible.

Table 1 – Lufkin Stakeholder Agencies and Contacts

Stakeholder Agency	Contact	Address	Phone Number	E-Mail
Angelina and Neches River Authority	Kelley Holcomb	210 East Lufkin Avenue Lufkin, Texas 75901	(936) 632-7795	kholcomb@anra.org
Brazos Transit District	Jennifer Montgomery	1759 North Earl Rudder Frwy Bryan, Texas 77803	(979) 778-4489	jennifer_transit@tca.net
City of Crockett	Ron Duncan	200 North 5th Street Crockett, Texas 75835	(936) 544-5156	duncanr@cityofcrockett.org
City of Crockett	Bill Holcomb	1001 East Goliad Avenue Crockett, Texas 75835	(936) 544-7127	bholcomb@valornet.com
City of Groveton	Ralph Jester	115 East Front Street Groveton, Texas 75845	(936) 642-1255	N/A
City of Livingston	Sam Gordon	208 West Church Street Livingston, Texas 77351	(936) 327-4311	manager@livingston.net

Table 1 – Lufkin Stakeholder Agencies and Contacts (continued)

Stakeholder Agency	Contact	Address	Phone Number	E-Mail
City of Livingston	Hec Long	200 West Church Street Livingston, Texas 77351	(936) 327-8391	N/A
City of Livingston	Ben Ogletree, Jr.	200 West Church Street Livingston, Texas 77351	N/A	benroyden@livingston.net
City of Livingston	Marilyn Sutton	200 West Church Street Livingston, Texas 77351	(936) 327-4311	citysecretary@livingston.net
City of Livingston	Mark Taylor	200 West Church Street Livingston, Texas 77351	(936) 327-8655	livfire@livingston.net
City of Livingston Police Department	Dennis Clifton	208 West Church Street Livingston, Texas 77351	(936) 327-3117	livpd@livingston.net
City of Lufkin	Louis Bronaugh	P.O. Box 190 Lufkin, Texas 75902	N/A	mayor@cityoflufkin.com
City of Lufkin	Kris Greene	300 East Shepherd Lufkin, Texas 75902	(936) 633-0268	kgreene@cityoflufkin.com
City of Lufkin	Scott Marcotte	300 East Shepherd Street Lufkin, Texas 75902	(936) 633-0322	smarcotte@lufkinpolice.com
City of Lufkin	Paul Parker	P.O. Box 190 Lufkin, Texas 75902-0190	(936) 633-0211	pparker@cityoflufkin.com
City of Lufkin	Steve Poskey	P.O. Box 190 Lufkin, Texas 75902-0190	(936) 633-0235	sposkey@cityoflufkin.com
City of Lufkin Fire Department	Murry Brown	111 South 3rd Street Lufkin, Texas	(936) 633-0369	mbrown@cityoflufkin.com
City of Nacogdoches	Victoria LaFollett	P.O. Box 635030 Nacogdoches, Texas 75963	(936) 559-2503	vlafollett@ci.nacogdoches.tx.us
City of Nacogdoches	Wayne Shepherd	P.O. Box 635030 Nacogdoches, Texas 75963	(936) 559-2582	shepherdw@ci.nacogdoches.tx.us
City of Nacogdoches	David Smith	P.O. Box 635030 Nacogdoches, Texas 75963	(936) 559-2516	dsmith@ci.nacogdoches.tx.us
City of Nacogdoches Fire Department	Ronnie Kimbrough	P.O. Box 635030 Nacogdoches, Texas 75963	(936) 559-2541	kimbroug@ci.nacogdoches.tx.us
City of Nacogdoches Fire Department	Stanley Whitaker	P.O. Box 635030 Nacogdoches, Texas 75963	(936) 559-2591	whitaker@ci.nacogdoches.tx.us
City of Nacogdoches Police Department	William Lujan	P.O. Box 635030 Nacogdoches, Texas 75963	(936) 559-2601	lujanw@ci.nacogdoches.tx.us
City of San Augustine Police Department	Ken Delacerda	615 East Main San Augustine, Texas 75972	N/A	keagled@qzip.net
Crockett Economic and Industrial Development Corporation	Tim Culp	P.O. Box 307 Crockett, Texas 75835	(936) 546-5363	tculp@crockett.org
DETCOG	Gary Hanlon	274 East Lamar Street Jasper, Texas 75951	(409) 384-5704	ghanlon@detcog.org
DETCOG	John McDowell	602 E. Church Street, Ste 504 Livingston, Texas 77351	(936) 327-6825	jmcdowell@detcog.org
DETCOG	Don Morris	602 E. Church Street, Ste 504 Livingston, Texas 77351	(936) 634-0120	dmorris@detcog.org

Table 1 – Lufkin Stakeholder Agencies and Contacts (continued)

Stakeholder Agency	Contact	Address	Phone Number	E-Mail
Polk County Sheriff's Office	Randy Bridges	1733 North Washington Livingston, Texas 77351	(936) 327-6810	N/A
San Augustine County	Wayne Holt	106 Courthouse Square San Augustine, Texas 75972	(936) 275-2762	wayne.holt@co.san-augustine.tx.us
Texas Department of Public Safety	Randall Noe	2809 South John Redditt Lufkin, Texas 75904	(936) 634-5553	randall.noe@txdps.state.tx.us
Trinity County	Brent Phillips	P.O. Box 95 Groveton, Texas 75845	(936) 642-1424	trinitycoso@hotmail.com
TxDOT – Lufkin District	Herbert Bickley	1805 North Timberland Drive Lufkin, Texas 75901	(936) 634-4433	hbickle@dot.state.tx.us
TxDOT – Lufkin District	Dennis Cooley	1805 North Timberland Drive Lufkin, Texas 75901	(936) 634-4433	dcooley@dot.state.tx.us
TxDOT – Lufkin District	Cheryl Flood	1805 North Timberland Drive Lufkin, Texas 75901	N/A	cflood@dot.state.tx.us
TxDOT – Lufkin District	Margie Gandy	1805 North Timberland Drive Lufkin, Texas 75901	(936) 634-4433	mgandy@dot.state.tx.us
TxDOT – Lufkin District	Tom Hunter	1805 North Timberland Drive Lufkin, Texas 75901	(936) 633-4454	thunter@dot.state.tx.us
TxDOT – Lufkin District	Richard Ivy	1805 North Timberland Drive Lufkin, Texas 75901	(936) 633-4384	rivy@dot.state.tx.us
TxDOT – Lufkin District	John Miller	1805 North Timberland Drive Lufkin, Texas 75901	(936) 633-4302	jmiller@dot.state.tx.us
TxDOT – Lufkin District	Paul Montgomery	1805 North Timberland Drive Lufkin, Texas 75901	(936) 634-4433	pmontg@dot.state.tx.us
TxDOT – Lufkin District	David Selman	914 Industrial Boulevard Nacogdoches, Texas 75961	(936) 564-7782	dselman@dot.state.tx.us
TxDOT – Lufkin District	Brad Tiemann	Route 1, P.O. Box 724H San Augustine, Texas 75972	(939) 275-9671	btieman@dot.state.tx.us
TxDOT – Lufkin District	Kathi White	1805 North Timberland Drive Lufkin, Texas 75901	(936) 633-4395	kwhite1@dot.state.tx.us
TxDOT Traffic Operations Division	Roland Merz	125 East 11th Street Austin, Texas 78701	(512) 416-3269	rmerz@dot.state.tx.us
TxDOT Traffic Operations Division	Alex Power	Attn: TRF-Cedar Park #51 125 E. 11th Street Austin, Texas 78701-2483	(512) 506-5153	apower@dot.state.tx.us

2.2 Regional Needs

Needs from the Region were identified at the project kick-off meeting held on June 3, 2004. Stakeholders participating in that meeting identified the needs in the Region according to the eight user service areas defined in the National ITS Architecture. The needs identified in the project kick-off meeting are documented in **Table 2**.

Table 2 – Lufkin Region: Summary of ITS Needs

Lufkin Region Summary of ITS Needs Lufkin Regional ITS Architecture and Deployment Plan Kick-Off Meeting June 3, 2004
<p>Travel and Traffic Management Needs</p> <ul style="list-style-type: none"> ▪ Need hurricane evacuation/detour routes ▪ Need improved hurricane evacuation coordination between Beaumont, Houston, and Louisiana ▪ Need alternate route planning/driver notification ▪ Need flood detection ▪ Need CCTV cameras ▪ Need portable CCTV cameras ▪ Need highway advisory radio (HAR) ▪ Need TxDOT traffic management center
<p>Public Transportation Management Needs</p> <ul style="list-style-type: none"> ▪ Need improved incident, detour, and construction notification for transit ▪ Need mobile data terminals for demand response transit vehicles ▪ Need AVL's and MDTs for fixed route transit vehicles ▪ Need connections to emergency management responders for improved coordination (especially during evacuations)
<p>Electronic Payment Needs</p> <p>None Identified</p>
<p>Commercial Vehicle Operations Needs</p> <p>None Identified</p>
<p>Emergency Management Needs</p> <ul style="list-style-type: none"> ▪ Need HAZMAT incident notification ▪ Need AVL, MDTs and emergency vehicle preemption traffic signal for Nacogdoches Fire Department ▪ Need AVL, MDTs and emergency vehicle preemption traffic signal for Lufkin Fire Department ▪ Need radio interoperability
<p>Advanced Vehicle Safety Systems Needs</p> <p>None Identified</p>
<p>Information Management Needs (Data Archiving)</p> <ul style="list-style-type: none"> ▪ Need resource sharing database ▪ Need communications infrastructure to support data exchange
<p>Maintenance and Construction Management Needs</p> <ul style="list-style-type: none"> ▪ Need portable DMS for the City of Nacogdoches ▪ Need additional portable DMS for TxDOT ▪ Need flood detection/stream level monitoring in Nacogdoches ▪ Need work zone safety monitoring ▪ Need additional speed trailers

2.3 Regional Integration and Interoperability

A vision for the Lufkin Region is to integrate systems both on an intra-regional and an inter-regional basis. Within the Lufkin Region, nearly every stakeholder identified is involved in emergency management. Incidents that occur on major roadways either in the Lufkin Region or

on roadways that could impact the movement of people and goods in the Lufkin Region should be shared. The integration of the State Department of Emergency Management (DEM) and the local Emergency Operations Centers (EOCs) can facilitate the clearing of such an incident more efficiently, as will coordination among EOCs in Lufkin, Nacogdoches, and counties in the Region. As an example, a chemical spill along US 59 between Lufkin and Nacogdoches would require a large-scale clean-up effort in addition to other emergency personnel on site. Coordination between the EOCs could identify the closest clean-up crew that could respond to the spill and dispatch them to the scene. Similarly, once on scene, the response team could provide the State DEM, TxDOT, and local EOCs with status reports on the clean-up and time estimates for a return to normal operations.

The Lufkin Region is bordered by five other TxDOT Districts. Improved coordination with these surrounding Districts for incident management and roadway closures, particularly Houston and Beaumont, are very important needs in the Lufkin Region.

Road closures due to hurricane evacuations, maintenance, or major incidents also lead to a number of opportunities for improved operations through integration. TxDOT and other transportation agencies would like to be able to share this information throughout the Region so that as soon as one agency is aware of a closure, whether planned or unplanned, other agencies can also be made aware of the closure and make an appropriate response. Stakeholders in the Lufkin Region cited a strong need for improved coordination during hurricane evacuations.

Operators of the transportation system have many opportunities to improve performance through integration. Public transportation is provided through the Brazos Transit District, and private providers, such as Greyhound and other coach companies, also offer intra-city services. The Lufkin Intermodal Terminal, which will serve as a major hub for these transit operators, provides an opportunity to potentially partner among the public and private sector transit providers to share schedule and route information, fare information, and provide integrated transit travel information. Transit providers would also benefit from having advanced warning of any major hazards or closures along their routes.

Systems such as TxDOT's Highway Condition Reporting System (HCRS) provide an integrated method to gather consistent traveler information on a statewide basis. This type of system could eventually feed into a 511 traveler information number that would provide consistent traveler information throughout the state via telephone.

The headquarters of TxDOT maintains a database of traffic counts and accident records for roadways throughout the State of Texas. On occasion, agencies within the Lufkin Region will need access to these databases either to retrieve data or input data into the database. These data exchanges also will require integrating the agencies' data flows such that neither of the agencies' normal business operations is disturbed to share these data.

One of the primary purposes of the development of an ITS architecture is to ensure that while various agencies are deploying ITS components, there are some commonalities between them that will allow and facilitate the exchange of data fairly seamlessly and automatically. This is not to say that all technologies or media that are used by the various agencies will be the same, but that there is an acknowledgement that the data that is being collected and disseminated is valuable to many different agencies and that therefore an integration strategy has to be implemented to ensure that the exchange of data is possible.

3. REGIONAL ITS ARCHITECTURE DEVELOPMENT PROCESS

Development of the Regional ITS Architecture and Deployment Plan for the Lufkin Region relied heavily on stakeholder input to ensure that the architecture reflected local needs. A series of five meetings was held with stakeholders to gather input, and a web site with the components of the regional architecture as well as hard copies of documents were made available to stakeholders for review and comment.

3.1 Lufkin Process

The process followed for the Lufkin Region was designed to ensure that stakeholders could provide input and review for the development of the Region’s ITS Architecture.

Prior to the project kick-off meeting with the contractor and stakeholders, TxDOT identified relevant stakeholders in the Region to begin discussions on the development of a Regional ITS Architecture and Deployment Plan. Stakeholders signed a memorandum of understanding (MOU) stating that they would work together in the Region to develop the ITS architecture.

After selecting a contractor, the process shown in **Figure 2** was used to develop the Region’s ITS Architecture. In addition to the architecture, an ITS Deployment Plan for the Region also was developed to identify projects needed to implement the architecture.

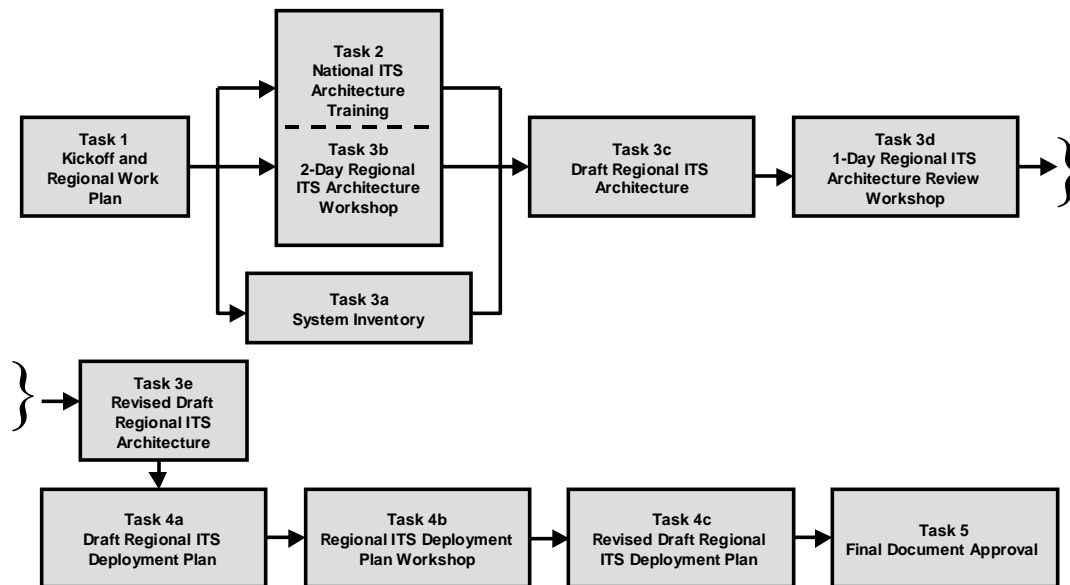


Figure 2 – Lufkin Regional ITS Architecture and Deployment Plan Development Process

A total of five meetings and workshops with stakeholders over a period of eleven months were used to develop the Lufkin Regional ITS Architecture and Deployment Plan. These meetings and workshops included:

- Kick-off and Regional Work Plan Meeting;
- 2-Day Regional ITS Architecture Workshop;
- 1-Day Regional ITS Architecture Review Workshop;
- ITS Deployment Plan Workshop; and
- Final Comment Resolution Meeting.

Key components of the process are described below:

Task 1 – Kick-Off and Regional Work Plan: Based on the initial stakeholder meeting and MOU that was signed, a number of key stakeholders were identified. Additional stakeholders that did not sign the initial MOU also were identified and invited to the project kick-off meeting. At this meeting, the regional work plan was presented to stakeholders for review and comment. Subsequent meeting dates were identified and agreed upon by the stakeholders.

As part of this meeting, a workshop was held with the stakeholders to identify three additional areas of information:

- Additional stakeholders to invite to participate in the process;
- Needs of the stakeholders in the Region; and
- Existing and planned ITS elements in the Region.

Task 2 – National ITS Architecture Training: Task 2 was the development and presentation of training on the National ITS Architecture. The purpose of the training was to familiarize stakeholders with the architecture terminology to the extent needed to allow them to provide input and review on the Lufkin Region's ITS Architecture. The National ITS Architecture training was presented in conjunction with the 2-Day Regional ITS Architecture Workshop described in Task 3B.

Task 3A – System Inventory: Collecting information for the system inventory began at the kick-off meeting through the workshop with the stakeholders to determine existing and planned ITS elements in the Region. After the kick-off meeting, follow-up calls were conducted with a number of local stakeholders to gather additional input for the architecture. To complete the inventory, stakeholders were presented with the results of the inventory in the 2-Day Regional ITS Architecture Workshop described in Task 3B.

Task 3B – 2-Day Regional ITS Architecture Workshop: The purpose of the 2-Day Regional ITS Architecture Workshop was to review the inventory with stakeholders and begin the development of the Lufkin Regional ITS Architecture. Training on the National ITS Architecture also was integrated into the workshop so that key elements of the architecture, such as market packages, could be explained prior to the selection and editing of these elements. The result of the 2-Day Regional ITS Architecture Workshop was a Regional ITS Architecture for the Lufkin Region, which included a system inventory, interconnect diagram, customized market packages, identification of functional requirements through process specifications, system interfaces, and relevant ITS standards.

Task 3C – Draft Regional ITS Architecture: After the 2-Day Regional ITS Architecture Workshop was completed, a web site was developed with a dedicated link to the Texas Regional ITS Architecture program. Stakeholders were asked to review the web site and provide comments through an email link set up on the site. A hard copy of the Draft Regional ITS Architecture for the Lufkin Region was sent to stakeholders prior to the 1-Day Regional ITS Architecture Review Workshop.

Task 3D – 1-Day Regional ITS Architecture Review Workshop: The 1-Day Regional ITS Architecture Review workshop was designed to allow stakeholders to review the draft architecture and provide comments. The primary focus of the workshop was to review the architecture flows between elements in the market packages. Training on architecture flows as well as ITS standards also was completed.

Task 3E – Revised Draft Regional ITS Architecture: Input from stakeholders in the 1-Day Regional ITS Architecture Review Workshop, as well as comments from stakeholders reviewing the web site and hard copy document, were used to revise the Draft Regional ITS Architecture. The revisions were incorporated into the web site as well as into the hard copy document. The Revised Draft Regional ITS Architecture was mailed to stakeholders for additional review.

Task 4A – Draft Regional ITS Deployment Plan: A Draft Regional ITS Deployment Plan was developed based on the prioritization of market packages and needs expressed by the stakeholders in the Region. The Draft Regional ITS Deployment Plan included a list of recommended projects in a 5-year, 10-year, and 20-year timeframe. Each project was linked to one or more market packages from the Lufkin Regional ITS Architecture.

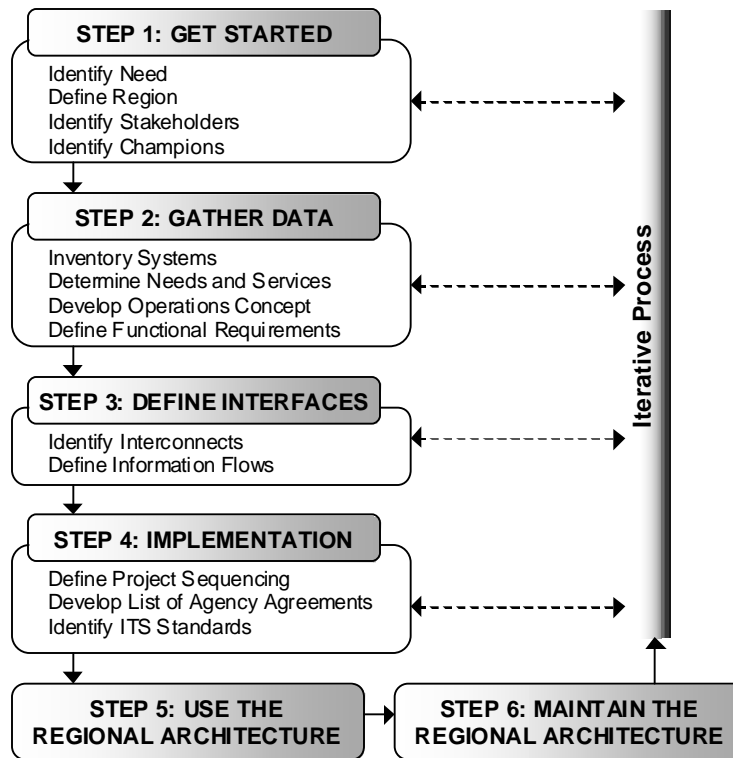
Task 4B – Regional ITS Deployment Plan Workshop: The Draft Regional ITS Deployment Plan was presented to stakeholders at the Regional ITS Deployment Plan Workshop. Stakeholders were asked to provide input on the recommended projects, priority, and deployment timeframe.

Task 4C – Revised Draft Regional ITS Deployment Plan: Based on the review and input from stakeholders at the Regional ITS Deployment Plan Workshop, as well as review comments received from stakeholders outside of the workshop, a Revised Draft Regional ITS Deployment Plan was developed and sent to stakeholders.

Task 5 – Final Document Approval: A final comment resolution meeting was held with stakeholders to review the Revised Draft Regional ITS Architecture and the Revised Draft Regional ITS Deployment Plan. Next steps for the Region were also discussed. Comments were incorporated and a final Regional ITS Architecture and Regional ITS Deployment Plan were developed.

3.2 USDOT Regional ITS Architecture Guidance

On October 12, 2001, the USDOT issued guidance on development of a regional ITS architecture through the document “Regional ITS Architecture Guidance: Developing, Using, and Maintaining an ITS Architecture for Your Region.” **Figure 3** summarizes the guidance provided by the USDOT.



(Source: Regional ITS Architecture Guidance: Developing, Using, and Maintaining an ITS Architecture for Your Region, USDOT)

Figure 3 – USDOT Guidance on Regional ITS Architecture Development

The process used to develop the Lufkin Regional ITS Architecture and Deployment Plan follows Steps 1 through 4 of the guidance. Steps 5 and 6 are designed to provide guidance upon the completion of the development of the Regional ITS Architecture.

Step 1, Get Started, of the guidance was completed in Task 1 – Kick-off and Regional Work Plan, as well as preliminary work completed by TxDOT to identify initial stakeholders and the need to complete the architecture for the Lufkin Region. Through these efforts, the need for an architecture, appropriate stakeholders, and the Region was defined.

Step 2, Gather Data, was completed through Task 1 – Kick-off and Regional Work Plan, Task 3A – System Inventory, and Task 3B – 2-Day Regional ITS Architecture Workshop. These efforts allowed the inventory for the Lufkin Region to be completed, identified ITS needs in the Region, and led to the development of an operational concept and definition of functional requirements.



Step 3, Define Interfaces, was completed in Task 3B – 2-Day Regional ITS Architecture Workshop and Task 3D – 1-Day Regional ITS Architecture Review Workshop. These workshops engaged stakeholders in customizing Market Packages for the Region, which included identifying interconnects among elements in the architecture and reviewing and selecting data flows between elements.

Step 4, Implementation, was completed in Task 3D – 1-Day Regional ITS Architecture Review Workshop through the prioritization of market packages. Sequencing of projects began in this process and was completed in the ITS Deployment Plan. Applicable ITS standards to match the identified data flows also were identified through the 1-Day ITS Architecture Review Workshop. Based on the envisioned information exchanges and integration outlined in the Regional ITS Architecture, potential agreements were identified.

4. CONCEPTUAL DESIGN

4.1 Systems Inventory

An important initial step in the architecture development process is to establish an inventory of existing ITS elements. At the project kick-off meeting and through subsequent discussions with agency representatives throughout the Region, Lufkin stakeholders provided the team with a list of existing, planned, and future systems that would play a role in the Region's ITS architecture. "Planned" is defined as a system with funding identified while "future" is defined as a system that does not yet have funding identified.

Existing, planned, and future systems in the Lufkin Region were identified in the following categories:

- ***Travel and Traffic Management*** – includes a Traffic Management Center at the TxDOT Lufkin District Office, center-to-center links, detection systems, CCTV, fixed and portable dynamic message signs, broadcast traveler information, road closure management, and other related technologies.
- ***Public Transportation Management*** – includes transit and paratransit automated vehicle location as well as transit travel information systems.
- ***Commercial Vehicle Operations*** – includes coordination with TexView (CVISN) efforts and HAZMAT permit coordination.
- ***Emergency Management*** – includes emergency operations/management centers, emergency traffic signal preemption, and improved information sharing among traffic and emergency services.
- ***Information Management*** – includes electronic data management and archiving systems.
- ***Maintenance and Construction Management*** – includes maintenance and construction vehicle tracking, flood detection, roadway maintenance and construction information, and work zone management.

The System Inventory is a valuable task for several reasons. First, it provides a baseline of existing and planned ITS projects and systems in the Region. Second, it outlines which agencies are currently deploying and operating ITS, as well as those that are planning to implement ITS programs. Third, it provides a foundation for identifying needed elements or agency participation for the regional ITS, which will be important for subsequent tasks including the market package identification and prioritization, system interface and integration requirements in the Region, and ultimately the ITS Deployment Plan.

4.1.1 Subsystems and Terminators

Each identified system or component in the Lufkin Regional ITS inventory was mapped to a subsystem or terminator in the National ITS Architecture. Subsystems and terminators are the 'entities' that represent systems in ITS. Subsystems are the highest level building blocks of the physical architecture, and the National ITS Architecture groups them into four major classes: Centers, Roadside, Vehicles, and Travelers. Each of these major classes includes various subsystems that represent a set of transportation functions (or processes) that are likely to be collected together under one agency, jurisdiction, or location, and correspond to physical elements, such as traffic operations centers, traffic signals, vehicles, and so on.

Figure 4 shows the National ITS Architecture subsystems. This figure, also known as the “sausage diagram” is a standard interconnect diagram, showing the relationships of the various subsystems within the architecture; a customized interconnect diagram for the Lufkin Region is included in Section 4.3.1 of this report. Communication functions between the subsystems are represented in the ovals. It should be noted that “wireline” communication refers to fixed-point to fixed-point communications, which include not only twisted pair and fiber optic technologies, but also such wireless technologies as microwave and spread spectrum.

Terminators are the people, systems, other facilities, and environmental conditions outside of ITS that need to communicate or interface with ITS subsystems. They help to define the boundaries of the National ITS Architecture as well as a regional system. Examples of terminators include drivers, traffic operations personnel, information service providers, weather effects (snow, rain, ice), telecommunications systems, and government reporting systems, among others.

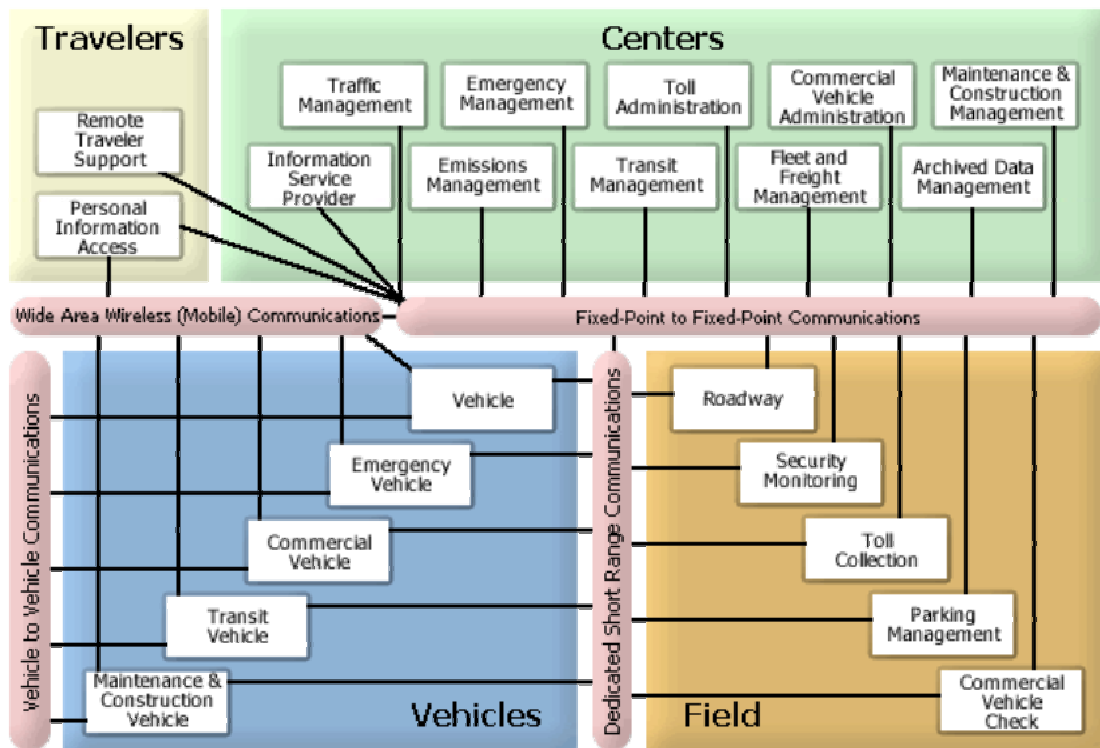


Figure 4 – Physical Subsystem Interconnect Diagram

4.1.2 Lufkin ITS Inventory by Stakeholder

Each stakeholder is associated with one or more systems or elements (subsystems and terminators) that make up the transportation system in the Lufkin Region. **Table 3** sorts the inventory by stakeholder, so each stakeholder can easily identify and review all their relevant assets that are identified in the Lufkin Regional ITS Architecture.

The information in **Table 3** also is included on the Lufkin ITS Architecture web site, which is accessible by selecting the link to the Texas Regional ITS Architecture, the Lufkin

Region, and then selecting the “Inventory by Stakeholder” button which will open the stakeholder list. Each element in the list contains a hyperlink to more detailed information, including status, description, stakeholder, and other elements within the inventory with which it interfaces. (At the time this report was published, the Lufkin Regional ITS Architecture web site was being hosted at www.consystem.com. TxDOT plans to permanently host the site in the future at www.dot.state.tx.us/trf/its.)

4.1.3 Lufkin ITS Inventory by Entity

The Lufkin Regional ITS Architecture inventory is made up of the transportation and communications centers, the field equipment, the vehicles, and other systems in the regional transportation system. These components have been assigned to an entity (subsystem or terminator) as defined by the National ITS Architecture. **Table 4** presents the Lufkin Region inventory using the associated National ITS Architecture subsystem or terminator. This sorts elements that perform similar functions together, so elements of a particular type can be easily identified. This inventory also can be accessed from the Lufkin Regional ITS Architecture web site by selecting the “Inventory by Entity” button.

Table 3 – Lufkin Inventory of Regional Subsystems/Terminators (sorted by Stakeholder)

Stakeholder	Element	Entity	Status
Angelina Neches River Authority	Angelina Neches River Authority Dispatch	Emergency Management Subsystem	Existing
	Angelina Neches River Authority Flood Detectors	Roadway Subsystem	Existing
BTD – Brazos Transit District	BTD Demand Response Transit Vehicles	Transit Vehicle Subsystem	Existing
	BTD Fixed Route Transit Vehicles	Transit Vehicle Subsystem	Existing
	BTD Fixed Route Transit Vehicles	Vehicle Subsystem	Existing
	BTD Information Display / Point of Sale	Remote Traveler Support Subsystem	Planned
	BTD Transit Database	Archived Data Management Subsystem	Existing
	BTD Transit Database Users	Archived Data User Systems	Existing
	BTD Transit Dispatch	Transit Management Subsystem	Existing
	BTD Transit Kiosks	Information Service Provider Subsystem	Planned
	BTD Transit Kiosks	Remote Traveler Support Subsystem	Planned
	BTD Transit Vehicle Operator	Transit Vehicle Operator	Existing
	BTD Transit Website	Information Service Provider Subsystem	Existing
Lufkin Regional Smart Card	Traveler Card	Planned	
City of Livingston	City of Livingston Crash Records Database	Archived Data Management Subsystem	Existing
	City of Livingston ITS Field Equipment	Roadway Subsystem	Planned
	City of Livingston Public Works	Maintenance and Construction Management Subsystem	Existing
	City of Livingston Traffic Operations Center	Emergency Management Subsystem	Planned
	City of Livingston Traffic Operations Center	Traffic Management Subsystem	Planned
	City of Livingston Web Page	Information Service Provider Subsystem	Existing
City of Livingston Public Safety Departments	City of Livingston Fire/EMS Vehicles	Emergency Vehicle Subsystem	Existing
	City of Livingston Fire/Police/EMS Dispatch and PSAP	Emergency Management Subsystem	Existing
	City of Livingston Police Vehicles	Emergency Vehicle Subsystem	Existing
City of Lufkin	City of Lufkin Crash Records Database	Archived Data Management Subsystem	Existing
	City of Lufkin ITS Field Equipment	Roadway Subsystem	Planned

Table 3 – Lufkin Inventory of Regional Subsystems/Terminators (sorted by Stakeholder) (continued)

Stakeholder	Element	Entity	Status
City of Lufkin (continued)	City of Lufkin Maintenance	Maintenance and Construction Management Subsystem	Existing
	City of Lufkin Traffic Operations Center	Emergency Management Subsystem	Planned
	City of Lufkin Traffic Operations Center	Traffic Management Subsystem	Planned
	City of Lufkin Web Page	Information Service Provider Subsystem	Existing
	Lufkin Intermodal Terminal	Multimodal Transportation Service Provider	Planned
	Lufkin Intermodal Terminal	Parking Management Subsystem	Planned
City of Lufkin Public Safety Departments	City of Lufkin Fire/EMS Vehicles	Emergency Vehicle Subsystem	Existing
	City of Lufkin Fire/Police/EMS Dispatch and PSAP	Emergency Management Subsystem	Existing
	City of Lufkin Law Enforcement Citation Database	Archived Data Management Subsystem	Existing
	City of Lufkin Law Enforcement Citation Database Users	Archived Data User Systems	Existing
	City of Lufkin Police Vehicles	Emergency Vehicle Subsystem	Existing
City of Nacogdoches	City of Nacogdoches Crash Records Database	Archived Data Management Subsystem	Existing
	City of Nacogdoches EOC	Emergency Management Subsystem	Existing
	City of Nacogdoches ITS Field Equipment	Roadway Subsystem	Planned
	City of Nacogdoches Public Works	Maintenance and Construction Management Subsystem	Existing
	City of Nacogdoches Traffic Operations Center	Emergency Management Subsystem	Planned
	City of Nacogdoches Traffic Operations Center	Traffic Management Subsystem	Planned
	City of Nacogdoches Web Page	Information Service Provider Subsystem	Existing
City of Nacogdoches Public Safety Departments	City of Nacogdoches EMS Dispatch	Emergency Management Subsystem	Existing
	City of Nacogdoches EMS Vehicles	Emergency Vehicle Subsystem	Existing
	City of Nacogdoches Fire Vehicles	Emergency Vehicle Subsystem	Existing
	City of Nacogdoches Police Vehicles	Emergency Vehicle Subsystem	Existing
	City of Nacogdoches Police/Fire Dispatch	Emergency Management Subsystem	Existing

Table 3 – Lufkin Inventory of Regional Subsystems/Terminators (sorted by Stakeholder) (continued)

Stakeholder	Element	Entity	Status
Commercial Vehicle Operators	Commercial Vehicles	Commercial Vehicle Subsystem	Existing
	Commercial Vehicles	Vehicle Subsystem	Existing
	Private Fleet Management Systems	Fleet and Freight Management Subsystem	Existing
County Emergency Management Agencies	County EOC	Emergency Management Subsystem	Existing
	County EOC Public Information Office	Information Service Provider Subsystem	Existing
County Road and Bridge	County Road and Bridge	Maintenance and Construction Management Subsystem	Existing
	County Road and Bridge Equipment Repair	Equipment Repair Facility	Existing
	County Road and Bridge Field Equipment	Roadway Subsystem	Planned
	County Road and Bridge Vehicles	Maintenance and Construction Vehicle Subsystem	Existing
County Sheriff	County Public Safety Dispatch and PSAP	Emergency Management Subsystem	Existing
DETCOG	DETCOG Accident Database	Archived Data Management Subsystem	Existing
	DETCOG Accident Database User Systems	Archived Data User Systems	Existing
	DETCOG Data System Users	Archived Data User Systems	Planned
	DETCOG Regional ITS Database	Archived Data Management Subsystem	Planned
	DETCOG Website	Information Service Provider Subsystem	Existing
DPS	DPS Administration	Emergency Management Subsystem	Existing
	DPS Communications Service	Emergency Management Subsystem	Existing
	DPS Emergency Vehicles	Emergency Vehicle Subsystem	Existing
	DPS Public Information Office	Information Service Provider Subsystem	Existing
	Statewide Crash Records Information System	Archived Data Management Subsystem	Existing
	Statewide Crash Records Information System	Information Service Provider Subsystem	Existing
	Statewide Crash Records Information System Users	Archived Data User Systems	Existing
DPS Division of Emergency Management	State EOC	Emergency Management Subsystem	Existing
Financial Institution	Financial Institution	Financial Institution	Existing

Table 3 – Lufkin Inventory of Regional Subsystems/Terminators (sorted by Stakeholder) (continued)

Stakeholder	Element	Entity	Status
Independent School Districts	Independent School Bus Operator	Transit Vehicle Operator	Existing
	Independent School District Buses	Transit Vehicle Subsystem	Existing
	Independent School District Dispatch	Transit Management Subsystem	Existing
LA DPS	LA DPS Dispatch	Emergency Management Subsystem	Existing
LADOTD	LADOTD	Traffic Management Subsystem	Existing
Local Media	Local Print and Broadcast Media	Media	Existing
Local Transit Agencies	Local Transit Operations	Transit Management Subsystem	Existing
Lower Neches Valley Authority	Lower Neches Valley Dispatch	Emergency Management Subsystem	Existing
	Lower Neches Valley Flood Detectors	Roadway Subsystem	Existing
Municipal Convention and Visitors Bureau	Municipal Convention and Visitors Bureau	Event Promoters	Existing
Municipal or County Government	Municipal ITS Field Equipment	Roadway Subsystem	Planned
	Municipal or County Permitting System	Commercial Vehicle Administration Subsystem	Existing
	Municipal or County Traffic Operations Center	Traffic Management Subsystem	Planned
	Municipal PWD	Maintenance and Construction Management Subsystem	Existing
	Municipal PWD Vehicles	Maintenance and Construction Vehicle Subsystem	Existing
	Municipal Web Page	Information Service Provider Subsystem	Planned
	Municipal/County Crash Records Database	Archived Data Management Subsystem	Existing
Municipal or County Public Safety	Municipal EOC Public Information Office	Information Service Provider Subsystem	Existing
	Municipal or County Public Safety Vehicles	Emergency Vehicle Subsystem	Existing
	Municipal Public Safety Dispatch	Emergency Management Subsystem	Existing
National Forest Service	Forest Service Dispatch	Emergency Management Subsystem	Planned
NOAA	National Weather Service	Weather Service	Existing

Table 3 – Lufkin Inventory of Regional Subsystems/Terminators (sorted by Stakeholder) (continued)

Stakeholder	Element	Entity	Status
Private Ambulance	Private Ambulance Dispatch	Emergency Management Subsystem	Existing
	Private Ambulance Vehicle	Emergency Vehicle Subsystem	Existing
Private Hazmat Carriers	Private Hazmat Dispatch	Emergency Management Subsystem	Existing
Private Information Service Providers	Concierge Service Provider	Emergency Management Subsystem	Planned
	Private Sector Traveler Information Services	Information Service Provider Subsystem	Planned
Private Long-Distance Bus Company Dispatch	Private Long Distance Bus Company Dispatch	Transit Management Subsystem	Existing
Private Shuttle Providers	Private Shuttle Operations	Transit Management Subsystem	Existing
Private Taxi Providers	Private Taxi Provider Dispatch	Transit Management Subsystem	Existing
Private Tow/Wrecker Providers	Private Tow/Wrecker Dispatch	Emergency Management Subsystem	Existing
	Private Tow/Wrecker Vehicles	Emergency Vehicle Subsystem	Existing
Private Travelers	Driver	Driver	Existing
	Private Travelers Personal Computing Devices	Personal Information Access Subsystem	Existing
	Private Vehicles	Vehicle Subsystem	Existing
Rail Operators	Rail Operations Centers	Archived Data User Systems	Existing
	Rail Operations Centers	Fleet and Freight Management Subsystem	Existing
	Rail Operations Centers	Rail Operations	Existing
	Rail Operators Rail Cars	Commercial Vehicle Subsystem	Existing
	Rail Operators Rail Cars	Vehicle Subsystem	Existing
	Rail Operators Wayside Equipment	Wayside Equipment	Existing
Regional Airports	Regional Airports	Multimodal Transportation Service Provider	Existing
Regional Medical Center	Regional Medical Center	Care Facility	Existing
Regulatory Agencies	Regulatory Agencies	Emergency Management Subsystem	Existing
Sabine River Authority of Texas	Sabine River Authority Flood Warning Devices	Roadway Subsystem	Existing
	Sabine River Authority Gulf Coast Division	Emergency Management Subsystem	Existing

Table 3 – Lufkin Inventory of Regional Subsystems/Terminators (sorted by Stakeholder) (continued)

Stakeholder	Element	Entity	Status
Stephen F. Austin State University	SFA Shuttle Buses	Transit Vehicle Subsystem	Existing
	SFA Shuttle Dispatch	Transit Management Subsystem	Existing
Trinity River Authority	Trinity River Authority Control Center	Emergency Management Subsystem	Existing
	Trinity River Authority Flood Detectors	Roadway Subsystem	Existing
TxDOT	Other TxDOT District Maintenance Sections	Maintenance and Construction Management Subsystem	Existing
	TranStar and Other Texas Region TMCs	Emergency Management Subsystem	Existing
	TranStar and Other Texas Region TMCs	Traffic Management Subsystem	Existing
	TxDOT 511 System	Information Service Provider Subsystem	Planned
	TxDOT BRINSAP	Asset Management	Existing
	TxDOT Fort Worth TMC (TransVision)	Emergency Management Subsystem	Existing
	TxDOT Fort Worth TMC (TransVision)	Traffic Management Subsystem	Existing
	TxDOT Highway Conditions Reporting System	Information Service Provider Subsystem	Existing
	TxDOT Highway Conditions Reporting System	Maintenance and Construction Management Subsystem	Existing
	TxDOT Lufkin District Area Engineers Office	Maintenance and Construction Administrative Systems	Existing
	TxDOT Lufkin District Area Engineers Office	Maintenance and Construction Management Subsystem	Existing
	TxDOT Lufkin District CCTV	Roadway Subsystem	Planned
	TxDOT Lufkin District DMS	Roadway Subsystem	Existing
	TxDOT Lufkin District Field Sensors	Roadway Subsystem	Existing
	TxDOT Lufkin District Flood Sensors	Roadway Subsystem	Planned
TxDOT Lufkin District HAR	Roadway Subsystem	Planned	
TxDOT Lufkin District Maintenance Sections	Maintenance and Construction Management Subsystem	Existing	

Table 3 – Lufkin Inventory of Regional Subsystems/Terminators (sorted by Stakeholder) (continued)

Stakeholder	Element	Entity	Status
TxDOT (continued)	TxDOT Lufkin District Maintenance Vehicles	Maintenance and Construction Vehicle Subsystem	Existing
	TxDOT Lufkin District Office	Traffic Management Subsystem	Existing
	TxDOT Lufkin District Pavement Management System	Archived Data Management Subsystem	Existing
	TxDOT Lufkin District Pavement Management System	Asset Management	Existing
	TxDOT Lufkin District Pavement Management System Users	Archived Data User Systems	Planned
	TxDOT Lufkin District Public Information Office	Information Service Provider Subsystem	Existing
	TxDOT Lufkin District School Pager System	Roadway Subsystem	Planned
	TxDOT Lufkin District Shop	Equipment Repair Facility	Existing
	TxDOT Lufkin District TMC	Emergency Management Subsystem	Planned
	TxDOT Lufkin District TMC	Traffic Management Subsystem	Planned
	TxDOT Lufkin District Traffic Signals	Roadway Subsystem	Existing
	TxDOT Lufkin District Web Page	Information Service Provider Subsystem	Existing
	TxDOT Lufkin District Work Zone Equipment	Roadway Subsystem	Planned
	TxDOT Motor Carrier Routing Information	Information Service Provider Subsystem	Existing
	TxDOT Rest Area/Visitor Center/Truck Stop/Service Plaza Kiosks	Remote Traveler Support Subsystem	Planned
	TxDOT Statewide Highway Conditions Reporting System	Traffic Management Subsystem	Existing
TxDOT Statewide Pavement Management System	Archived Data Management Subsystem	Existing	
Volunteer Fire Departments	Volunteer Fire Departments	Emergency Management Subsystem	Existing
Other Emergency Management	Texas DEM Disaster District Information System	DPS Division of Emergency Management	Existing
	DPS Headquarters (Austin)	DPS Division of Emergency Management	Existing
	Army Corps of Engineers Flood Monitoring System	Army Corps of Engineers	Existing
	USGS Flood Monitoring System	USGS	Existing

Table 4 – Lufkin Inventory of Regional Subsystems/Terminators (sorted by Entity)

Entity	Element	Stakeholder	Status
Archived Data Management Subsystem	BTD Transit Database	BTD – Brazos Transit District	Existing
	City of Livingston Crash Records Database	City of Livingston	Existing
	City of Lufkin Crash Records Database	City of Lufkin	Existing
	City of Lufkin Law Enforcement Citation Database	City of Lufkin Public Safety Departments	Existing
	City of Nacogdoches Crash Records Database	City of Nacogdoches	Existing
	DETCOG Accident Database	DETCOG	Existing
	DETCOG Regional ITS Database	DETCOG	Planned
	Municipal/County Crash Records Database	Municipal or County Government	Existing
	Statewide Crash Records Information System	DPS	Existing
	TxDOT Lufkin District Pavement Management System	TxDOT	Existing
	TxDOT Statewide Pavement Management System	TxDOT	Existing
Archived Data User Systems	BTD Transit Database Users	BTD – Brazos Transit District	Existing
	City of Lufkin Law Enforcement Citation Database Users	City of Lufkin Public Safety Departments	Existing
	DETCOG Accident Database User Systems	DETCOG	Existing
	DETCOG Data System Users	DETCOG	Planned
	Rail Operations Centers	Rail Operators	Existing
	Statewide Crash Records Information System Users	DPS	Existing
	TxDOT Lufkin District Pavement Management System Users	TxDOT	Planned
Asset Management	TxDOT BRINSAP	TxDOT	Existing
	TxDOT Lufkin District Pavement Management System	TxDOT	Existing
Care Facility	Regional Medical Center	Regional Medical Center	Existing
Commercial Vehicle Administration Subsystem	Municipal or County Permitting System	Municipal or County Government	Existing
Commercial Vehicle Subsystem	Commercial Vehicles	Commercial Vehicle Operators	Existing
	Rail Operators Rail Cars	Rail Operators	Existing

Table 4 – Lufkin Inventory of Regional Subsystems/Terminators (sorted by Entity) (continued)

Entity	Element	Stakeholder	Status
Driver	Driver	Private Travelers	Existing
Emergency Management Subsystem	Angelina Neches River Authority Dispatch	Angelina Neches River Authority	Existing
	City of Livingston Fire/Police/EMS Dispatch and PSAP	City of Livingston Public Safety Departments	Existing
	City of Livingston Traffic Operations Center	City of Livingston	Planned
	City of Lufkin Fire/Police/EMS Dispatch and PSAP	City of Lufkin Public Safety Departments	Existing
	City of Lufkin Traffic Operations Center	City of Lufkin	Planned
	City of Nacogdoches EMS Dispatch	City of Nacogdoches Public Safety Departments	Existing
	City of Nacogdoches EOC	City of Nacogdoches	Existing
	City of Nacogdoches Police/Fire Dispatch	City of Nacogdoches Public Safety Departments	Existing
	City of Nacogdoches Traffic Operations Center	City of Nacogdoches	Planned
	Concierge Service Provider	Private Information Service Providers	Planned
	County EOC	County Emergency Management Agencies	Existing
	County Public Safety Dispatch and PSAP	County Sheriff	Existing
	DPS Administration	DPS	Existing
	DPS Communications Service	DPS	Existing
	Forest Service Dispatch	National Forest Service	Planned
	LA DPS Dispatch	LA DPS	Existing
	Lower Neches Valley Dispatch	Lower Neches Valley Authority	Existing
	Municipal Public Safety Dispatch	Municipal or County Public Safety	Existing
	Private Ambulance Dispatch	Private Ambulance	Existing
	Private Hazmat Dispatch	Private Hazmat Carriers	Existing
Private Tow/Wrecker Dispatch	Private Tow/Wrecker Providers	Existing	
Regulatory Agencies	Regulatory Agencies	Existing	
Sabine River Authority Gulf Coast Division	Sabine River Authority of Texas	Existing	

Table 4 – Lufkin Inventory of Regional Subsystems/Terminators (sorted by Entity) (continued)

Entity	Element	Stakeholder	Status
Emergency Management Subsystem (continued)	State EOC	DPS Division of Emergency Management	Existing
	TranStar and Other Texas Region TMCs	TxDOT	Existing
	Trinity River Authority Control Center	Trinity River Authority	Existing
	TxDOT Fort Worth TMC (TransVision)	TxDOT	Existing
	TxDOT Lufkin District TMC	TxDOT	Planned
	Volunteer Fire Departments	Volunteer Fire Departments	Existing
Emergency Vehicle Subsystem	City of Livingston Fire/EMS Vehicles	City of Livingston Public Safety Departments	Existing
	City of Livingston Police Vehicles	City of Livingston Public Safety Departments	Existing
	City of Lufkin Fire/EMS Vehicles	City of Lufkin Public Safety Departments	Existing
	City of Lufkin Police Vehicles	City of Lufkin Public Safety Departments	Existing
	City of Nacogdoches EMS Vehicles	City of Nacogdoches Public Safety Departments	Existing
	City of Nacogdoches Fire Vehicles	City of Nacogdoches Public Safety Departments	Existing
	City of Nacogdoches Police Vehicles	City of Nacogdoches Public Safety Departments	Existing
	DPS Emergency Vehicles	DPS	Existing
	Municipal or County Public Safety Vehicles	Municipal or County Public Safety	Existing
	Private Ambulance Vehicle	Private Ambulance	Existing
	Private Tow/Wrecker Vehicles	Private Tow/Wrecker Providers	Existing
Equipment Repair Facility	County Road and Bridge Equipment Repair	County Road and Bridge	Existing
	TxDOT Lufkin District Shop	TxDOT	Existing
Event Promoters	Municipal Convention and Visitors Bureau	Municipal Convention and Visitors Bureau	Existing
Financial Institution	Financial Institution	Financial Institution	Existing
Fleet and Freight Management Subsystem	Private Fleet Management Systems	Commercial Vehicle Operators	Existing
	Rail Operations Centers	Rail Operators	Existing

Table 4 – Lufkin Inventory of Regional Subsystems/Terminators (sorted by Entity) (continued)

Entity	Element	Stakeholder	Status
Information Service Provider Subsystem	BTD Transit Kiosks	BTD – Brazos Transit District	Planned
	BTD Transit Website	BTD – Brazos Transit District	Existing
	City of Livingston Web Page	City of Livingston	Existing
	City of Lufkin Web Page	City of Lufkin	Existing
	City of Nacogdoches Web Page	City of Nacogdoches	Existing
	County EOC Public Information Office	County Emergency Management Agencies	Existing
	DETCOG Website	DETCOG	Existing
	DPS Public Information Office	DPS	Existing
	Municipal EOC Public Information Office	Municipal or County Public Safety	Existing
	Municipal Web Page	Municipal or County Government	Planned
	Private Sector Traveler Information Services	Private Information Service Providers	Planned
	Statewide Crash Records Information System	DPS	Existing
	TxDOT 511 System	TxDOT	Planned
	TxDOT Highway Conditions Reporting System	TxDOT	Existing
	TxDOT Lufkin District Public Information Office	TxDOT	Existing
	TxDOT Lufkin District Web Page	TxDOT	Existing
TxDOT Motor Carrier Routing Information	TxDOT	Existing	
Maintenance and Construction Administrative Systems	TxDOT Lufkin District Area Engineers Office	TxDOT	Existing
Maintenance and Construction Management Subsystem	City of Livingston Public Works	City of Livingston	Existing
	City of Lufkin Maintenance	City of Lufkin	Existing
	City of Nacogdoches Public Works	City of Nacogdoches	Existing
	County Road and Bridge	County Road and Bridge	Existing
	Municipal PWD	Municipal or County Government	Existing
	Other TxDOT District Maintenance Sections	TxDOT	Existing

Table 4 – Lufkin Inventory of Regional Subsystems/Terminators (sorted by Entity) (continued)

Entity	Element	Stakeholder	Status
Maintenance and Construction Management Subsystem (continued)	TxDOT Highway Conditions Reporting System	TxDOT	Existing
	TxDOT Lufkin District Area Engineers Office	TxDOT	Existing
	TxDOT Lufkin District Maintenance Sections	TxDOT	Existing
Maintenance and Construction Vehicle Subsystem	County Road and Bridge Vehicles	County Road and Bridge	Existing
	Municipal PWD Vehicles	Municipal or County Government	Existing
	TxDOT Lufkin District Maintenance Vehicles	TxDOT	Existing
Media	Local Print and Broadcast Media	Local Media	Existing
Multimodal Transportation Service Provider	Lufkin Intermodal Terminal	City of Lufkin	Planned
	Regional Airports	Regional Airports	Existing
Parking Management Subsystem	Lufkin Intermodal Terminal	City of Lufkin	Planned
Personal Information Access Subsystem	Private Travelers Personal Computing Devices	Private Travelers	Existing
Rail Operations	Rail Operations Centers	Rail Operators	Existing
Remote Traveler Support Subsystem	BTD Information Display / Point of Sale	BTD – Brazos Transit District	Planned
	BTD Transit Kiosks	BTD – Brazos Transit District	Planned
	TxDOT Rest Area/Visitor Center/Truck Stop/Service Plaza Kiosks	TxDOT	Planned
Roadway Subsystem	Angelina Neches River Authority Flood Detectors	Angelina Neches River Authority	Existing
	City of Livingston ITS Field Equipment	City of Livingston	Planned
	City of Lufkin ITS Field Equipment	City of Lufkin	Planned
	City of Nacogdoches ITS Field Equipment	City of Nacogdoches	Planned
	County Road and Bridge Field Equipment	County Road and Bridge	Planned
	Lower Neches Valley Flood Detectors	Lower Neches Valley Authority	Existing
	Municipal ITS Field Equipment	Municipal or County Government	Planned
	Sabine River Authority Flood Warning Devices	Sabine River Authority of Texas	Existing
Trinity River Authority Flood Detectors	Trinity River Authority	Existing	

Table 4 – Lufkin Inventory of Regional Subsystems/Terminators (sorted by Entity) (continued)

Entity	Element	Stakeholder	Status
Roadway Subsystem (continued)	TxDOT Lufkin District CCTV	TxDOT	Planned
	TxDOT Lufkin District DMS	TxDOT	Existing
	TxDOT Lufkin District Field Sensors	TxDOT	Existing
	TxDOT Lufkin District Flood Sensors	TxDOT	Planned
	TxDOT Lufkin District HAR	TxDOT	Planned
	TxDOT Lufkin District School Pager System	TxDOT	Planned
	TxDOT Lufkin District Traffic Signals	TxDOT	Existing
	TxDOT Lufkin District Work Zone Equipment	TxDOT	Planned
Traffic Management Subsystem	City of Livingston Traffic Operations Center	City of Livingston	Planned
	City of Lufkin Traffic Operations Center	City of Lufkin	Planned
	City of Nacogdoches Traffic Operations Center	City of Nacogdoches	Planned
	LADOTD	LADOTD	Existing
	Municipal or County Traffic Operations Center	Municipal or County Government	Planned
	TranStar and Other Texas Region TMCs	TxDOT	Existing
	TxDOT Fort Worth TMC (TransVision)	TxDOT	Existing
	TxDOT Lufkin District Office	TxDOT	Existing
	TxDOT Lufkin District TMC	TxDOT	Planned
	TxDOT Statewide Highway Conditions Reporting System	TxDOT	Existing
Transit Management Subsystem	BTD Transit Dispatch	BTD – Brazos Transit District	Existing
	Independent School District Dispatch	Independent School Districts	Existing
	Local Transit Operations	Local Transit Agencies	Existing
	Private Long Distance Bus Company Dispatch	Private Long-Distance Bus Company Dispatch	Existing
	Private Shuttle Operations	Private Shuttle Providers	Existing
	Private Taxi Provider Dispatch	Private Taxi Providers	Existing
	SFA Shuttle Dispatch	Stephen F. Austin State University	Existing

Table 4 – Lufkin Inventory of Regional Subsystems/Terminators (sorted by Entity) (continued)

Entity	Element	Stakeholder	Status
Transit Vehicle Operator	BTD Transit Vehicle Operator	BTD – Brazos Transit District	Existing
	Independent School Bus Operator	Independent School Districts	Existing
Transit Vehicle Subsystem	BTD Demand Response Transit Vehicles	BTD – Brazos Transit District	Existing
	BTD Fixed Route Transit Vehicles	BTD – Brazos Transit District	Existing
	Independent School District Buses	Independent School Districts	Existing
	SFA Shuttle Buses	Stephen F. Austin State University	Existing
Traveler Card	Lufkin Regional Smart Card	BTD – Brazos Transit District	Planned
Vehicle Subsystem	BTD Fixed Route Transit Vehicles	BTD – Brazos Transit District	Existing
	Commercial Vehicles	Commercial Vehicle Operators	Existing
	Private Vehicles	Private Travelers	Existing
	Rail Operators Rail Cars	Rail Operators	Existing
Wayside Equipment	Rail Operators Wayside Equipment	Rail Operators	Existing
Weather Service	National Weather Service	NOAA	Existing
Other Emergency Management	Texas DEM Disaster District Information System	DPS Division of Emergency Management	Existing
	DPS Headquarters (Austin)	DPS Division of Emergency Management	Existing
	Army Corps of Engineers Flood Monitoring System	Army Corps of Engineers	Existing
	USGS Flood Monitoring System	USGS	Existing

4.2 Regional Market Packages

Upon completion of the system inventory, the next step in the development of the architecture was to identify the transportation services that are important to the Lufkin Region. In the National ITS Architecture, services are referred to as market packages. Market packages could include several stakeholders and elements that work together to provide a service in the Region. Examples of market packages from the National ITS Architecture include Network Surveillance, Traffic Information Dissemination, and Transit Vehicle Tracking. There are currently a total of 85 market packages identified in the National ITS Architecture Version 5.0.

In the Lufkin Region, the National ITS Architecture market packages were reviewed by the stakeholders and selected based on the relevance of the service that the market package could provide to the Region. All of the market packages that stakeholders in the Lufkin Region selected for implementation in the Region are identified in **Table 5**, as well as the elements in the Region that serve a role in providing the market package service and the primary stakeholders responsible for implementing the market packages.

In several cases, there are multiple stakeholders in the Region that provide the same service at different levels. For example, Surface Street Control (ATMS03) could be provided on arterials by the City of Lufkin and by TxDOT on highways throughout the Lufkin District. The market package status is identified as existing, planned, or future for each of the primary stakeholders in the Region. In many cases market packages classified as existing might still need to be enhanced to increase the service that the market package provides and establish all of the elements associated with it.

Upon selecting the market packages that were applicable for the Region, stakeholders then reviewed each market package and the elements that could be included to customize it for the Region. This customization is discussed further in the following section.

Table 5 – Lufkin Region Selected Market Packages

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
ATMS01	Network Surveillance	City of Livingston ITS Field Equipment	City of Livingston	Future
		City of Livingston Traffic Operations Center	City of Lufkin	Future
		City of Livingston Web Page	City of Nacogdoches	Future
		City of Lufkin ITS Field Equipment	Municipalities	Future
		City of Lufkin Traffic Operations Center	TxDOT Lufkin	Existing
		City of Lufkin Web Page		
		City of Nacogdoches ITS Field Equipment		
		City of Nacogdoches Traffic Operations Center		
		City of Nacogdoches Web Page		
		Municipal ITS Field Equipment		
		Municipal or County Traffic Operations Center		
		Municipal Web Page		
		Private Sector Traveler Information Services		

Table 5 – Lufkin Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
ATMS01 (continued)	Network Surveillance (continued)	TxDOT Lufkin District CCTV TxDOT Lufkin District Field Sensors TxDOT Lufkin District Public Information Office TxDOT Lufkin District TMC TxDOT Lufkin District Web Page		
ATMS02	Probe Surveillance	BTD Fixed Route Transit Vehicles Commercial Vehicles TxDOT Lufkin District Field Sensors TxDOT Lufkin District TMC	TxDOT Lufkin	Future
ATMS03	Surface Street Control	City of Livingston ITS Field Equipment City of Livingston Traffic Operations Center City of Lufkin ITS Field Equipment City of Lufkin Traffic Operations Center City of Nacogdoches ITS Field Equipment City of Nacogdoches Traffic Operations Center Municipal ITS Field Equipment Municipal or County Traffic Operations Center TxDOT Lufkin District CCTV TxDOT Lufkin District Field Sensors TxDOT Lufkin District TMC TxDOT Lufkin District School Pager System TxDOT Lufkin District Traffic Signals	City of Livingston	Future
			City of Lufkin	Future
			City of Nacogdoches	Future
			Municipalities	Future
			TxDOT Lufkin	Existing
ATMS06	Traffic Information Dissemination	BTD Transit Dispatch City of Livingston Fire/Police/EMS Dispatch and PSAP City of Livingston ITS Field Equipment City of Livingston Public Works City of Livingston Traffic Operations Center City of Livingston Web Page City of Lufkin Fire/Police/EMS Dispatch and PSAP City of Lufkin ITS Field Equipment City of Lufkin Maintenance City of Lufkin Traffic Operations Center City of Lufkin Web Page City of Nacogdoches EMS Dispatch City of Nacogdoches EOC City of Nacogdoches ITS Field Equipment	City of Livingston	Future
			City of Lufkin	Future
			City of Nacogdoches	Future
			Municipalities	Future
			TxDOT Lufkin	Future

Table 5 – Lufkin Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
ATMS06 (continued)	Traffic Information Dissemination (continued)	City of Nacogdoches Police/Fire Dispatch City of Nacogdoches Public Works City of Nacogdoches Traffic Operations Center City of Nacogdoches Web Page County Public Safety Dispatch and PSAP County Road and Bridge DPS Communications Service Independent School District Dispatch Local Print and Broadcast Media Municipal ITS Field Equipment Municipal or County Traffic Operations Center Municipal Public Safety Dispatch Municipal PWD Municipal Web Page Private Sector Traveler Information Services Private Tow/Wrecker Dispatch SFA Shuttle Dispatch TxDOT 511 System TxDOT Highway Conditions Reporting System TxDOT Lufkin District DMS TxDOT Lufkin District HAR TxDOT Lufkin District Maintenance Sections TxDOT Lufkin District Public Information Office TxDOT Lufkin District TMC TxDOT Lufkin District Web Page TxDOT Statewide Highway Conditions Reporting System		
ATMS07	Regional Traffic Control	City of Livingston Traffic Operations Center City of Lufkin Traffic Operations Center City of Nacogdoches Traffic Operations Center LADOTD Municipal or County Traffic Operations Center TranStar and Other Texas Region TMCs TxDOT Lufkin District TMC	TxDOT Lufkin	Future

Table 5 – Lufkin Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
ATMS08	Traffic Incident Management System	Angelina Neches River Authority Dispatch Angelina Neches River Authority Flood Detectors Army Corps of Engineers Flood Monitoring System City of Livingston Fire/EMS Vehicles City of Livingston Fire/Police/EMS Dispatch and PSAP City of Livingston Police Vehicles City of Livingston Public Works City of Livingston Traffic Operations Center City of Lufkin Fire/EMS Vehicles City of Lufkin Fire/Police/EMS Dispatch and PSAP City of Lufkin Maintenance City of Lufkin Police Vehicles City of Lufkin Traffic Operations Center City of Nacogdoches EMS Dispatch City of Nacogdoches EMS Vehicles City of Nacogdoches EOC City of Nacogdoches Fire Vehicles City of Nacogdoches Police Vehicles City of Nacogdoches Police/Fire Dispatch City of Nacogdoches Public Works City of Nacogdoches Traffic Operations Center County EOC County Public Safety Dispatch and PSAP DPS Communications Service DPS Emergency Vehicles Local Print and Broadcast Media Lower Neches Valley Dispatch Lower Neches Valley Flood Detectors Municipal Convention and Visitors Bureau Municipal or County Public Safety Vehicles Municipal or County Traffic Operations Center Municipal Public Safety Dispatch Municipal PWD Other TxDOT District Maintenance Sections	Traffic and Emergency Management Agencies	Future

Table 5 – Lufkin Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
ATMS08 (continued)	Traffic Incident Management System (continued)	Private Ambulance Dispatch Private Ambulance Vehicle Private Tow/Wrecker Dispatch Private Tow/Wrecker Vehicles Rail Operations Centers Sabine River Authority Flood Warning Devices Sabine River Authority Gulf Coast Division Three River Authority Control Center TranStar and Other Texas Region TMCs Trinity River Authority Control Center Trinity River Authority Flood Detectors TxDOT Lufkin District Maintenance Sections TxDOT Lufkin District TMC USGS Flood Monitoring System Volunteer Fire Departments		
ATMS13	Standard Railroad Grade Crossing	City of Livingston ITS Field Equipment City of Livingston Traffic Operations Center City of Lufkin ITS Field Equipment City of Lufkin Traffic Operations Center City of Nacogdoches ITS Field Equipment City of Nacogdoches Traffic Operations Center Municipal ITS Field Equipment Municipal or County Traffic Operations Center Rail Operations Centers Rail Operators Wayside Equipment TxDOT Lufkin District TMC TxDOT Lufkin District Traffic Signals	City of Livingston	Future
			City of Lufkin	Existing
			City of Nacogdoches	Existing
			Municipalities	Future
			TxDOT Lufkin	Existing
ATMS15	Railroad Operations Coordination	City of Livingston Traffic Operations Center City of Lufkin Traffic Operations Center City of Nacogdoches Traffic Operations Center Municipal or County Traffic Operations Center Rail Operations Centers TxDOT Lufkin District TMC	City of Livingston	Future
			City of Lufkin	Future
			City of Nacogdoches	Future
			Municipalities	Future
			TxDOT Lufkin	Future

Table 5 – Lufkin Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
ATMS16	Parking Facility Management	City of Lufkin Web Page Financial Institution Lufkin Intermodal Terminal Lufkin Regional Smart Card Private Vehicles	City of Lufkin	Future
ATMS19	Speed Monitoring	Driver TxDOT Lufkin District Field Sensors TxDOT Lufkin District TMC	TxDOT Lufkin	Future
EM01	Emergency Call-Taking and Dispatch	Angelina Neches River Authority Dispatch BTD Transit Dispatch City of Livingston Fire/Police/EMS Dispatch and PSAP City of Livingston Traffic Operations Center City of Lufkin Fire/Police/EMS Dispatch and PSAP City of Lufkin Traffic Operations Center City of Nacogdoches EMS Dispatch City of Nacogdoches EOC City of Nacogdoches Police/Fire Dispatch City of Nacogdoches Traffic Operations Center County EOC County Public Safety Dispatch and PSAP DPS Communications Service Forest Service Dispatch Independent School District Dispatch LA DPS Dispatch Local Transit Operations Lower Neches Valley Dispatch Municipal or County Traffic Operations Center Municipal Public Safety Dispatch Private Ambulance Dispatch Private Ambulance Vehicle Private Tow/Wrecker Dispatch Sabine River Authority Gulf Coast Division State EOC Texas DEM Disaster District Information System TranStar and Other Texas Region TMCs	Emergency Management Agencies	Future

Table 5 – Lufkin Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
EM01 (continued)	Emergency Call-Taking and Dispatch (continued)	Trinity River Authority Control Center TxDOT Lufkin District TMC		
EM02	Emergency Routing	City of Livingston Fire/EMS Vehicles	City of Livingston	Future
		City of Livingston Fire/Police/EMS Dispatch and PSAP	City of Lufkin	Future
		City of Livingston ITS Field Equipment	City of Nacogdoches	Future
		City of Livingston Traffic Operations Center	Private EMS	Future
		City of Lufkin Fire/EMS Vehicles City of Lufkin Fire/Police/EMS Dispatch and PSAP City of Lufkin ITS Field Equipment City of Lufkin Police Vehicles City of Lufkin Traffic Operations Center City of Nacogdoches EMS Dispatch City of Nacogdoches Fire Vehicles City of Nacogdoches EMS Vehicles City of Nacogdoches ITS Field Equipment City of Nacogdoches Police/Fire Dispatch City of Nacogdoches Traffic Operations Center Private Ambulance Dispatch Private Ambulance Vehicle Regional Medical Center		
EM06	Wide-Area Alert	City of Livingston Fire/Police/EMS Dispatch and PSAP	DPS	Future
		City of Livingston Traffic Operations Center City of Lufkin Fire/Police/EMS Dispatch and PSAP City of Lufkin Traffic Operations Center City of Nacogdoches EMS Dispatch City of Nacogdoches Police/Fire Dispatch City of Nacogdoches Traffic Operations Center County Public Safety Dispatch and PSAP DPS Communications Service DPS Headquarters (Austin) Municipal or County Traffic Operations Center Municipal Public Safety Dispatch	TxDOT Lufkin	Future

Table 5 – Lufkin Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
EM06 (continued)	Wide-Area Alert (continued)	TxDOT Fort Worth TMC (TransVision) TxDOT Lufkin District TMC		
EM09	Evacuation and Reentry Management	Angelina Neches River Authority Dispatch BTD Transit Dispatch City of Livingston Fire/Police/EMS Dispatch and PSAP City of Livingston Public Works City of Livingston Traffic Operations Center City of Lufkin Fire/Police/EMS Dispatch and PSAP City of Lufkin Maintenance City of Lufkin Traffic Operations Center City of Nacogdoches EMS Dispatch City of Nacogdoches EOC City of Nacogdoches Police/Fire Dispatch City of Nacogdoches Public Works City of Nacogdoches Traffic Operations Center County EOC County Public Safety Dispatch and PSAP DPS Communications Service Forest Service Dispatch Independent School District Dispatch LA DPS Dispatch LADOTD Lower Neches Valley Dispatch Municipal or County Traffic Operations Center Municipal Public Safety Dispatch Municipal PWD Other TxDOT District Maintenance Sections Sabine River Authority Gulf Coast Division State EOC TranStar and Other Texas Region TMCs Trinity River Authority Control Center TxDOT Lufkin District Maintenance Sections TxDOT Lufkin District TMC	City of Nacogdoches	Future
			Counties	Future
			DPS	Future

Table 5 – Lufkin Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
EM10	Disaster Traveler Information	BTD Transit Dispatch City of Livingston Fire/Police/EMS Dispatch and PSAP City of Livingston Traffic Operations Center City of Lufkin Fire/Police/EMS Dispatch and PSAP City of Lufkin Traffic Operations Center City of Nacogdoches EOC City of Nacogdoches Traffic Operations Center County EOC County EOC Public Information Office County Public Safety Dispatch and PSAP DPS Communications Service DPS Public Information Office Independent School District Dispatch Local Print and Broadcast Media Local Transit Operations Municipal EOC Public Information Office Municipal Public Safety Dispatch SFA Shuttle Dispatch State EOC TxDOT 511 System TxDOT Lufkin District Public Information Office TxDOT Lufkin District Web Page TxDOT Highway Conditions Reporting System	Emergency Management Agencies	Future
MC01	Maintenance and Construction Vehicle and Equipment Tracking	City of Livingston Public Works City of Lufkin Maintenance City of Nacogdoches Public Works County Road and Bridge County Road and Bridge Vehicles Municipal PWD Municipal PWD Vehicles TxDOT Lufkin District Maintenance Sections TxDOT Lufkin District Maintenance Vehicles	Counties	Future
			Municipalities	Future
			TxDOT Lufkin	Future

Table 5 – Lufkin Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
MC02	Maintenance and Construction Vehicle Maintenance	City of Livingston Public Works	Counties	Future
		City of Lufkin Maintenance	Municipalities	Future
		City of Nacogdoches Public Works	TxDOT Lufkin	Future
		County Road and Bridge County Road and Bridge Equipment Repair County Road and Bridge Vehicles Municipal PWD Municipal PWD Vehicles TxDOT Lufkin District Maintenance Sections TxDOT Lufkin District Maintenance Vehicles TxDOT Lufkin District Shop		
MC03	Road Weather Data Collection	City of Lufkin ITS Field Equipment	City of Lufkin	Future
		City of Lufkin Maintenance	City of Nacogdoches	Future
		City of Lufkin Traffic Operations Center	Municipalities	Future
		City of Nacogdoches ITS Field Equipment	TxDOT Lufkin	Future
		City of Nacogdoches Public Works City of Nacogdoches Traffic Operations Center Municipal ITS Field Equipment Municipal or County Traffic Operations Center Municipal PWD National Weather Service TxDOT Lufkin District Flood Sensors TxDOT Lufkin District Maintenance Sections TxDOT Lufkin District TMC		
MC04	Weather Information Processing and Distribution	City of Livingston Public Works	TxDOT Lufkin	Future
		City of Lufkin Maintenance City of Nacogdoches Public Works County Road and Bridge Municipal PWD National Weather Service Other TxDOT District Maintenance Sections TxDOT Lufkin District Maintenance Sections		
MC07	Roadway Maintenance and Construction	City of Livingston Public Works	City of Livingston	Future
		City of Livingston Traffic Operations Center	City of Lufkin	Future
		City of Lufkin Maintenance	City of Nacogdoches	Future
		City of Lufkin Traffic Operations Center	Municipalities	Future
		City of Nacogdoches Public Works	TxDOT Lufkin	Future

Table 5 – Lufkin Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
MC07 (continued)	Roadway Maintenance and Construction (continued)	City of Nacogdoches Traffic Operations Center Municipal or County Traffic Operations Center Municipal PWD Municipal PWD Vehicles National Weather Service TxDOT BRINSAP TxDOT Lufkin District Area Engineers Office TxDOT Lufkin District Maintenance Sections TxDOT Lufkin District Maintenance Vehicles TxDOT Lufkin District Pavement Management System TxDOT Lufkin District TMC		
MC08	Work Zone Management	BTD Transit Dispatch	City of Livingston	Future
		City of Livingston Fire/Police/EMS Dispatch and PSAP	City of Lufkin	Future
		City of Livingston ITS Field Equipment	City of Nacogdoches	Future
		City of Livingston Public Works	Counties	Future
		City of Lufkin Fire/Police/EMS Dispatch and PSAP	Municipalities	Future
		City of Lufkin ITS Field Equipment	TxDOT Lufkin	Future
		City of Lufkin Maintenance		
City of Nacogdoches EMS Dispatch				
City of Nacogdoches EOC				
City of Nacogdoches ITS Field Equipment				
City of Nacogdoches Police/Fire Dispatch				
City of Nacogdoches Public Works				
County EOC				
County Public Safety Dispatch and PSAP				
County Road and Bridge				
County Road and Bridge Field Equipment				
County Road and Bridge Vehicles				
DPS Communications Service				
Independent School District Dispatch				
LADOTD				
Municipal ITS Field Equipment				
Municipal Public Safety Dispatch				
Municipal PWD				
Municipal PWD Vehicles				
Other TxDOT District Maintenance Sections				

Table 5 – Lufkin Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
MC08 (continued)	Work Zone Management (continued)	Private Tow/Wrecker Dispatch TxDOT Highway Conditions Reporting System TxDOT Lufkin District Area Engineers Office TxDOT Lufkin District Maintenance Sections TxDOT Lufkin District Maintenance Vehicles TxDOT Lufkin District Office TxDOT Lufkin District Public Information Office TxDOT Lufkin District TMC TxDOT Lufkin District Web Page TxDOT Lufkin District Work Zone Equipment		
MC09	Work Zone Safety Monitoring	City of Livingston ITS Field Equipment City of Livingston Public Works City of Lufkin ITS Field Equipment City of Lufkin Maintenance City of Nacogdoches ITS Field Equipment City of Nacogdoches Public Works County Road and Bridge County Road and Bridge Field Equipment County Road and Bridge Vehicles Municipal PWD Vehicles TxDOT Lufkin District Maintenance Sections TxDOT Lufkin District Maintenance Vehicles TxDOT Lufkin District Work Zone Equipment	City of Livingston	Future
			City of Lufkin	Future
			City of Nacogdoches	Future
			Counties	Future
			TxDOT Lufkin	Future
MC10	Maintenance and Construction Activity Coordination	BTD Transit Dispatch City of Livingston Fire/Police/EMS Dispatch and PSAP City of Livingston Public Works City of Livingston Traffic Operations Center City of Lufkin Fire/Police/EMS Dispatch and PSAP City of Lufkin Maintenance City of Lufkin Traffic Operations Center City of Nacogdoches Police/Fire Dispatch City of Nacogdoches Public Works City of Nacogdoches Traffic Operations Center County EOC County Public Safety Dispatch and PSAP County Road and Bridge	City of Livingston	Future
			City of Lufkin	Future
			City of Nacogdoches	Future
			Municipalities	Future
			TxDOT (Statewide)	Future
			TxDOT Lufkin	Future

Table 5 – Lufkin Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
MC10 (continued)	Maintenance and Construction Activity Coordination (continued)	DPS Communications Service Independent School District Dispatch Municipal or County Traffic Operations Center Municipal Public Safety Dispatch Municipal PWD Other TxDOT District Maintenance Sections Private Tow/Wrecker Dispatch SFA Shuttle Dispatch TxDOT Highway Conditions Reporting System TxDOT Lufkin District Maintenance Sections TxDOT Lufkin District TMC TxDOT Lufkin District Web Page		
APTS1	Transit Vehicle Tracking	BTD Transit Dispatch BTD Demand Response Transit Vehicles BTD Fixed Route Transit Vehicles Independent School District Buses Independent School District Dispatch SFA Shuttle Buses SFA Shuttle Dispatch	Brazos Transit	Future
			Independent School Districts	Future
			Stephen F. Austin State University	Future
APTS2	Transit Fixed-Route Operations	BTD Transit Dispatch BTD Fixed Route Transit Vehicles BTD Transit Website City of Livingston Traffic Operations Center City of Lufkin Traffic Operations Center City of Nacogdoches Traffic Operations Center Independent School District Buses Independent School District Dispatch Municipal or County Traffic Operations Center Private Sector Traveler Information Services SFA Shuttle Buses SFA Shuttle Dispatch TxDOT 511 System TxDOT Lufkin District Maintenance Sections TxDOT Lufkin District TMC	Brazos Transit	Future
			Independent School Districts	Future
			Stephen F. Austin State University	Future

Table 5 – Lufkin Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
APTS3	Demand Response Transit Operations	BTD Transit Dispatch BTD Demand Response Transit Vehicles BTD Transit Website City of Livingston Traffic Operations Center City of Lufkin Traffic Operations Center City of Nacogdoches Traffic Operations Center Municipal or County Traffic Operations Center Private Sector Traveler Information Services TxDOT 511 System TxDOT Lufkin District Maintenance Sections	Brazos Transit	Future
APTS4	Transit Passenger and Fare Management	BTD Information Display/Point of Sale BTD Demand Response Transit Vehicles BTD Fixed Route Transit Vehicles BTD Transit Dispatch Financial Institution Lufkin Regional Smart Card	Brazos Transit	Future
APTS5	Transit Security	BTD Transit Dispatch BTD Transit Vehicle Operator BTD Demand Response Transit Vehicles BTD Fixed Route Transit Vehicle City of Livingston Fire/Police/EMS Dispatch and PSAP City of Lufkin Fire/Police/EMS Dispatch and PSAP City of Nacogdoches Police/Fire Dispatch County Public Safety Dispatch and PSAP Independent School Bus Operator Independent School District Buses Independent School District Dispatch Municipal Public Safety Dispatch	Brazos Transit	Existing
			Independent School Districts	Future
APTS7	Multi-modal Coordination	BTD Transit Dispatch BTD Demand Response Transit Vehicles BTD Fixed Route Transit Vehicles BTD Transit Kiosks Local Transit Operations Lufkin Intermodal Terminal Private Long Distance Bus Company Dispatch Private Shuttle Operations	Brazos Transit	Future

Table 5 – Lufkin Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
APTS7 (continued)	Multi-modal Coordination (continued)	Private Taxi Provider Dispatch Regional Airports SFA Shuttle Dispatch		
APTS8	Transit Traveler Information	BTD Information Display/Point of Sale BTD Transit Dispatch BTD Transit Website Private Travelers Personal Computing Devices TxDOT 511 System TxDOT Rest Areas/Visitor Centers/Truck Stops/Service Plaza Kiosks	Brazos Transit	Future
CVO04	CV Administrative Processes	City of Livingston Traffic Operations Center City of Lufkin Traffic Operations Center City of Nacogdoches Traffic Operations Center DPS Communications Service DPS Emergency Vehicles Municipal or County Permitting System Municipal or County Traffic Operations Center Private Fleet Management Systems TxDOT Lufkin District Office	Counties	Future
			Municipalities	Future
CVO10	HAZMAT Management	Angelina Neches River Authority Dispatch City of Livingston Fire/Police/EMS Dispatch and PSAP City of Lufkin Fire/Police/EMS Dispatch and PSAP City of Nacogdoches Police/Fire Dispatch Commercial Vehicles Concierge Service Provider County Public Safety Dispatch and PSAP DPS Communications Service Lower Neches Valley Dispatch Municipal Public Safety Dispatch Private Fleet Management Systems Private Hazmat Dispatch Rail Operations Centers Rail Operators Rail Cars Regulatory Agencies Sabine River Authority Gulf Coast Division Trinity River Authority Control Center	Emergency Management Agencies	Future

Table 5 – Lufkin Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
ATIS1	Broadcast Traveler Information	City of Livingston Traffic Operations Center City of Lufkin Traffic Operations Center City of Nacogdoches Traffic Operations Center Local Print and Broadcast Media Local Transit Operations Municipal or County Traffic Operations Center Private Travelers Personal Computing Devices TxDOT 511 System TxDOT Highway Conditions Reporting System TxDOT Lufkin District Maintenance Sections TxDOT Lufkin District Public Information Office TxDOT Lufkin District TMC TxDOT Rest Areas/Visitor Centers/Truck Stops/Service Plaza Kiosks	TxDOT (Statewide)	Future
			TxDOT Lufkin	Future
ATIS2	Interactive Traveler Information	Local Print and Broadcast Media Private Travelers Personal Computing Devices Private Vehicles TxDOT 511 System TxDOT Rest Areas/Visitor Centers/Truck Stops/Service Plaza Kiosks	TxDOT (Statewide)	Future
ATIS5	ISP Based Route Guidance	Private Fleet Management Systems TxDOT Motor Carrier Routing Information TxDOT Rest Areas/Visitor Centers/Truck Stops/Service Plaza Kiosks TxDOT Statewide Highway Conditions Reporting System	TxDOT Motor Carrier	Future
AD1	ITS Data Mart	BTD Transit Database BTD Transit Database Users BTD Transit Dispatch City of Livingston Crash Records Database City of Livingston Fire/Police/EMS Dispatch and PSAP City of Lufkin Crash Records Database City of Lufkin Fire/Police/EMS Dispatch and PSAP City of Lufkin Law Enforcement Citation Database	Brazos Transit	Future
			City of Livingston	Future
			City of Lufkin	Future
			City of Nacogdoches	Future
			DETCOG	Future
			DPS	Future
			TxDOT Lufkin	Future

Table 5 – Lufkin Region Selected Market Packages (continued)

Market Package	Market Package Name	Elements Associated with Market Package	Primary Stakeholders Responsible for Implementation	Market Package Status
AD1 (continued)	ITS Data Mart (continued)	City of Lufkin Law Enforcement Citation Database Users City of Nacogdoches Crash Records Database City of Nacogdoches EMS Dispatch City of Nacogdoches Police/Fire Dispatch County Public Safety Dispatch and PSAP DETCOG Accident Database DETCOG Accident Database User Systems DETCOG Data System Users DETCOG Regional ITS Database DETCOG Website DPS Administration Municipal Public Safety Dispatch Municipal/County Crash Records Database Statewide Crash Records Information System Statewide Crash Records Information System Users TxDOT Lufkin District Maintenance Sections TxDOT Lufkin District Pavement Management System TxDOT Lufkin District Pavement Management System Users TxDOT Statewide Pavement Management System		

4.3 Interconnections

4.3.1 Top Level Regional System Interconnect Diagram

A system interconnect diagram, or sausage diagram (shown previously in **Figure 4**), shows the systems and primary interconnects in the Region. The National ITS Architecture interconnect diagram has been customized for the Lufkin Region based on the information gathered from the stakeholders and system inventory. **Figure 5** summarizes the existing, planned, and future ITS elements for the Lufkin Region in the context of a physical interconnect. Subsystems and elements specific to Lufkin are called out in the boxes surrounding the main interconnect diagram, and these are color-coded to correspond to the subsystem with which they are associated.

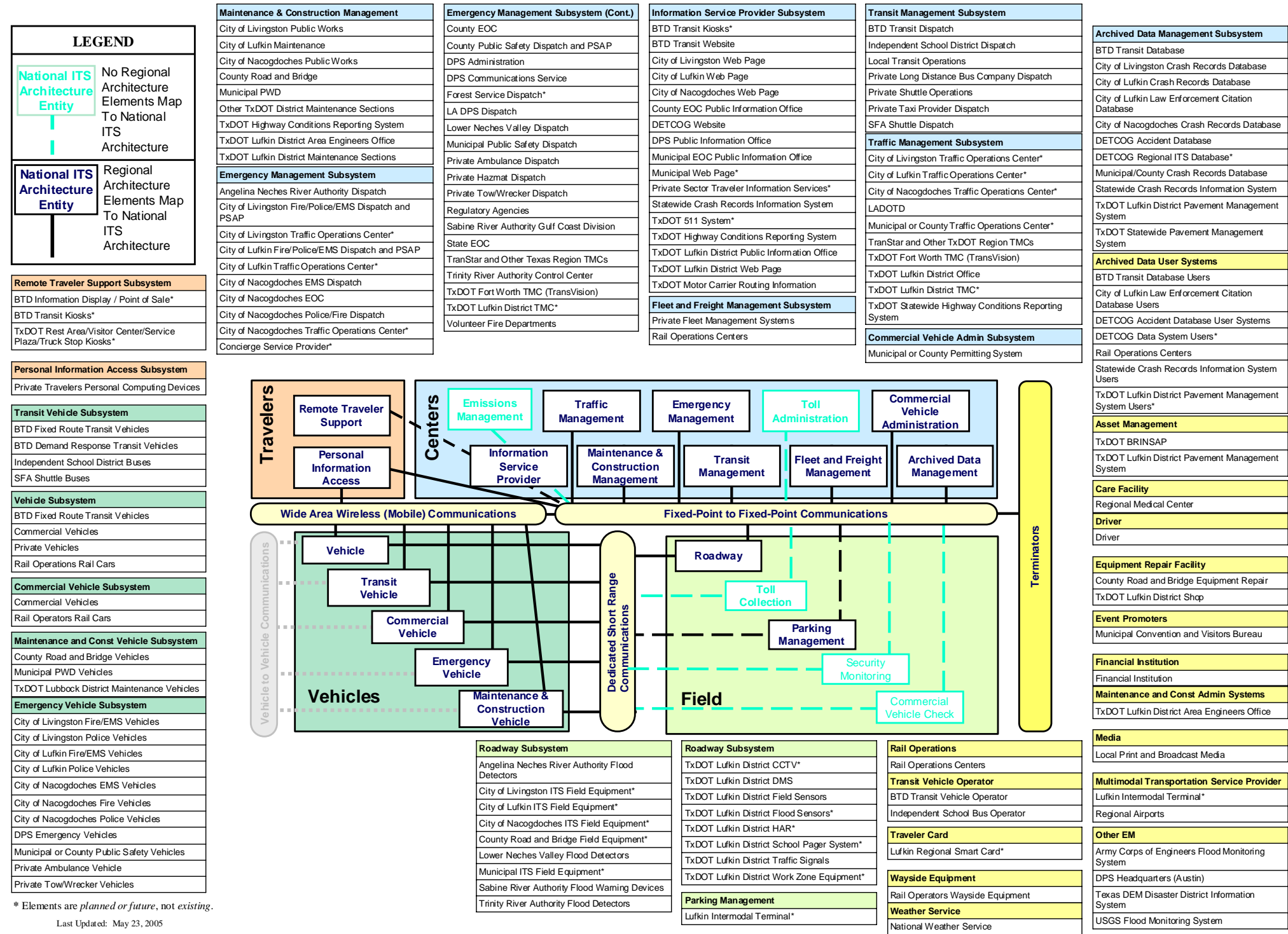


Figure 5 – Lufkin Regional System Interconnect Diagram

4.3.2 Customized Market Packages

The market packages in the National ITS Architecture were customized to reflect the unique systems, subsystems, and terminators in the Lufkin Region. Each market package is shown graphically, with the market package name, Lufkin-specific element, and with the unique agency and system identifiers within the subsystems and terminators. Market packages represent a service that will be deployed as an integrated capability. Market packages often are comprised of one or more equipment packages, which are functional capabilities that could be deployed at a specific time. Equipment packages are the most basic functions that will be developed or bought by implementers.

Figure 6 is an example of an ATMS market package for Surface Street Control that has been customized for the Lufkin Region. This market package shows the two subsystems, Traffic Management and Roadway, and the associated entities (TxDOT Lufkin District Traffic Signals, TxDOT Lufkin District Field Sensors, etc.) for the TxDOT Lufkin District signal system. Data flows between the subsystems indicate what information is being shared.

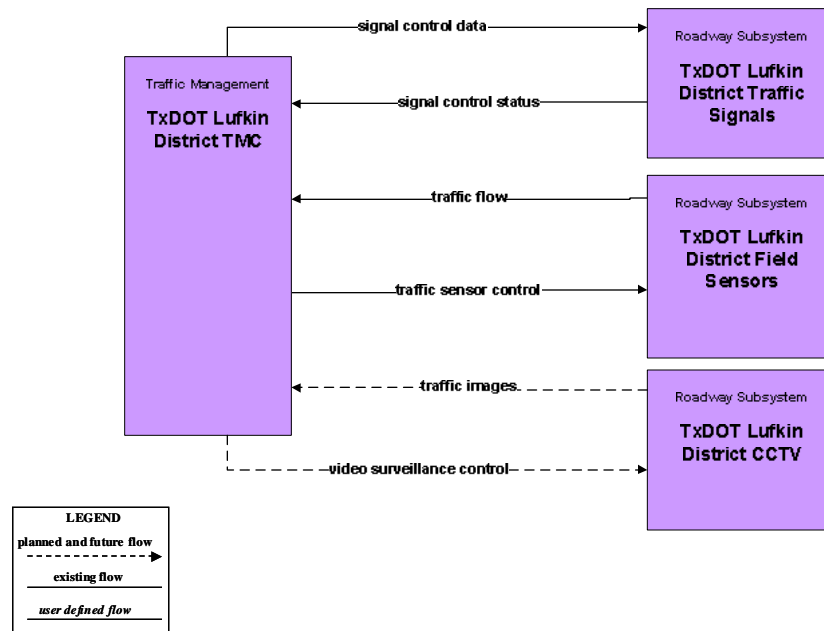


Figure 6 – Custom Market Package for Surface Street Control

Market packages that were customized for the Lufkin Region are shown in **Appendix A**. These market packages also are included on the Lufkin Regional ITS Architecture web site by selecting the “Market Package” button. Market packages are grouped by functional area (Traffic Management, Maintenance and Construction, Public Transportation, etc.), and each of the customized market packages can be viewed by clicking on the Market Package Diagram icon under each area heading. It is important to note that while the market package table on the web site shows all of the available market packages from the National ITS Architecture, only those selected for the Lufkin Region are included in the diagrams. The selected market packages on the web site also are highlighted in the table with bold print, and are indicated as existing or planned.

4.3.3 Lufkin Architecture Interfaces

While it is important to identify the various systems and stakeholders as part of a regional ITS, a primary purpose of the architecture is to identify the connectivity between transportation systems in the Lufkin Region. The interconnect diagram shown previously in **Figure 5** showed the high-level relationships of the subsystems and terminators in the Lufkin Region and the associated local projects and systems. The customized market packages represent services that can be deployed as an integrated capability, and the market package diagrams show the information flows between the subsystems and terminators that are most important to the operation of the market packages. How these systems interface with each other is an integral part of the overall ITS architecture.

There are 144 different elements identified as part of the Lufkin Regional ITS Architecture. These elements include traffic management centers, transit vehicles, dispatch systems, emergency management agencies, media outlets, and others – essentially, all of the existing and planned physical components that contribute to the regional intelligent transportation system. Interfaces have been identified for each element in the Lufkin Regional ITS Architecture, and each element has been mapped to those other elements with which it must interface. For example, the TxDOT Lufkin District Traffic Management Center (TMC) has planned interfaces with 44 other elements in the Lufkin Region, ranging from field equipment and dispatch centers, to other TxDOT District TMCs. Other interfaces are far less complex, such as the interface between the DPS vehicles and the DPS Communications Dispatch.

An example of one of the system interfaces is shown in **Figure 7**. This graphic shows the TxDOT Lufkin District Traffic Signals and the existing and planned interfaces with other elements throughout the Region. These interfaces are shown as existing, planned, or future. Interfaces defined as planned have funding identified, while future interfaces are desired by stakeholders but funding has not yet been identified.

Each element and its defined interfaces are listed in **Appendix B**. Elements and their interfaces also are accessible via the Lufkin Regional ITS Architecture web site by clicking on the “Interfaces” button. Elements are listed alphabetically in the column on the left, and each entry in the Interfacing Element column on the right is a link to more detailed information about the particular interface. The architecture flows between the individual element interfaces are described in more detail in the following section.

4.3.4 Physical Subsystem Architecture Flows

Architecture flows between the subsystems and terminators define the specific information (data) that is exchanged between subsystems and terminators. Each architecture flow has one or more data flows that specify what information is exchanged and the direction of the exchange. These data flows could be requests for information, alerts and messages, status requests, broadcast advisories, event messages, confirmations, electronic credentials, and other key information requirements. These architecture flows define the interface requirements between the various elements in the Lufkin Regional ITS Architecture.

An example of the architecture flows between two elements is shown in **Figure 8**. In this interface, the flows between the TxDOT Lufkin District TMC and the City of Nacogdoches Public Works Department show information that must go from the Lufkin District TMC to the City of Nacogdoches Public Works Department, as well as information that the TMC needs from devices. Similar to the interfaces, architecture flows also are defined as existing, planned, or future.

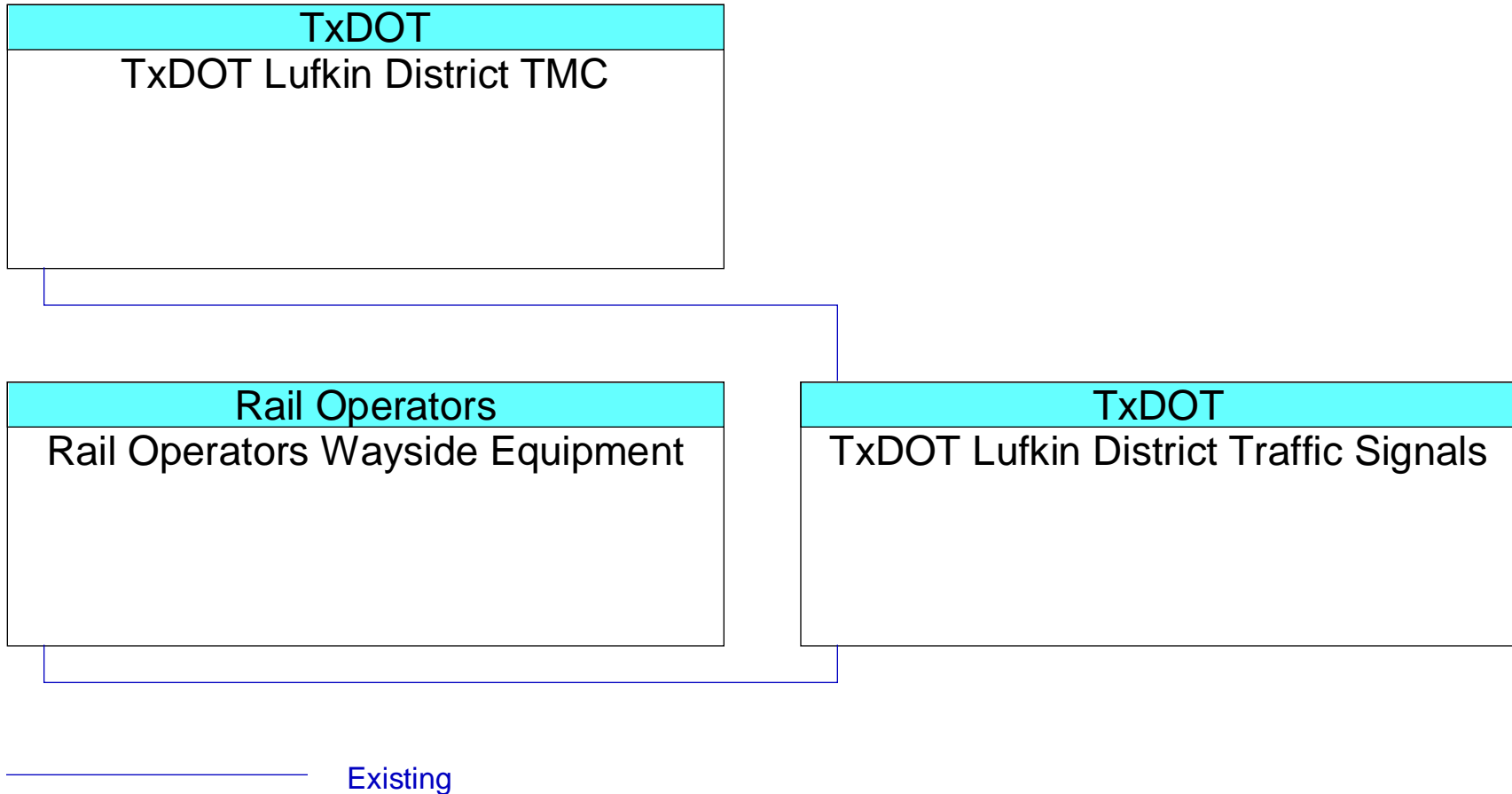


Figure 7 – TxDOT Lufkin District Traffic Signals Interfaces

Each of the individual element interfaces can be accessed on the Lufkin Regional ITS Architecture web site by clicking on the “Interfaces” button. Selecting any of the interfacing elements from the column on the right will display an interface diagram and architecture flows between two specific elements, similar to the diagram shown in **Figure 8**. Each data flow is defined, and any standards associated with that data flow are noted. Standards as they apply to the Lufkin Region are discussed in more detail in Section 4.5.

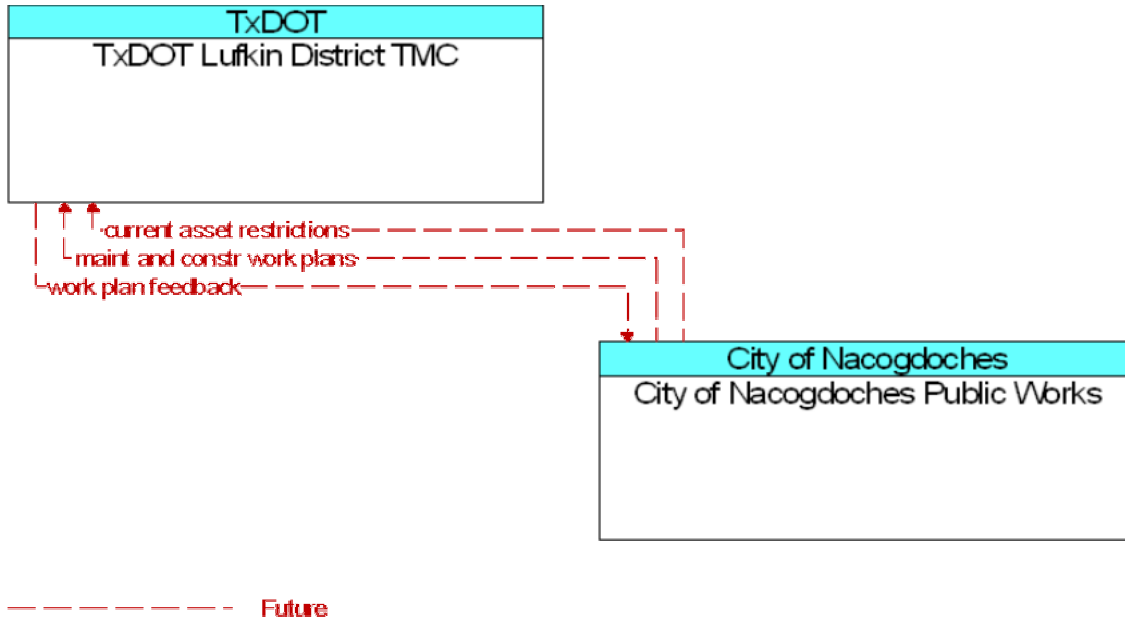


Figure 8 – TxDOT Lufkin District TMC to City of Nacogdoches Public Works Architecture Flows

4.4 Functional Requirements

Functions are a description of what the system has to do. In the National ITS Architecture, functions are defined at several different levels, ranging from general subsystem descriptions through somewhat more specific equipment package descriptions to Process Specifications that include substantial detail. Guidance from the USDOT on developing a Regional ITS Architecture recommends that each Region determine the level of detail of the functional requirements for their Region. In the Lufkin Region, it is recommended that the development of detailed functional requirements such as the “shall” statements included in Process Specifications for a system be developed at the project level. These detailed “shall” statements identify all functions that a project or system needs to perform.

For the Lufkin Regional ITS Architecture, functional requirements have been identified at two levels. The customized market packages, discussed previously in Section 4.3.2, describe the services that ITS needs to provide in the Region and the architecture flows between the elements. These market packages and data flows describe what the ITS system in Lufkin has to do and the data that needs to be shared among elements.

At a more detailed level, functional requirements for the Lufkin Region also are described in terms of equipment packages that are associated with one or more subsystems in the Lufkin Regional ITS Architecture as shown in **Table 6**. An equipment package is a functional capability that could be deployed at a specific time. Each equipment package can be linked in the National ITS Architecture to the Process Specifications that might be applicable. It is recommended that during the design concept stage of a project, the applicable equipment package, and associated Process Specifications from the National ITS Architecture be reviewed by the implementer to determine the appropriate functional requirements for the project. A link for each equipment package is available on the Lufkin Regional ITS Architecture web site by clicking on the “Functions” button.

Table 6 – Lufkin Region Equipment Packages

Subsystem	Equipment Package
Archived Data Management Subsystem	Government Reporting Systems Support
	ITS Data Repository
	Traffic and Roadside Data Archival
Commercial Vehicle Administration Subsystem	Credentials and Taxes Administration
	CV Data Collection
	CV Information Exchange
Commercial Vehicle Subsystem	On-board Cargo Monitoring
Emergency Management Subsystem	Center Secure Area Alarm Support
	Center Secure Area Sensor Management
	Center Secure Area Surveillance
	Emergency Call-Taking
	Emergency Data Collection
	Emergency Dispatch
	Emergency Early Warning System
	Emergency Environmental Monitoring
	Emergency Evacuation Support
	Emergency Response Management
	Emergency Routing
	Incident Command
	Mayday Support
Emergency Vehicle Subsystem	On-board EV En Route Support
	On-board EV Environmental Monitoring
	On-board EV Incident Management Communication
Emissions Management Subsystem	Emissions Data Collection
Fleet and Freight Management Subsystem	Fleet Administration
	Fleet Credentials and Taxes Management and Reporting
	Fleet HAZMAT Management
Information Service Provider Subsystem	Basic Information Broadcast
	Infrastructure Provided Route Selection
	Interactive Infrastructure Information

Table 6 – Lufkin Region Equipment Packages (continued)

Subsystem	Equipment Package
Information Service Provider Subsystem (continued)	ISP Data Collection
	ISP Emergency Traveler Information
	ISP Probe Information Collection
	Traveler Telephone Information
Maintenance and Construction Management Subsystem	MCM Data Collection
	MCM Environmental Information Collection
	MCM Environmental Information Processing
	MCM Incident Management
	MCM Maintenance Decision Support
	MCM Roadway Maintenance and Construction
	MCM Speed Monitoring
	MCM Vehicle and Equipment Maintenance Management
	MCM Vehicle Tracking
	MCM Work Activity Coordination
	MCM Work Zone Management
	MCM Work Zone Safety Management
Maintenance and Construction Vehicle Subsystem	MCV Environmental Monitoring
	MCV Infrastructure Monitoring
	MCV Roadway Maintenance and Construction
	MCV Vehicle Location Tracking
	MCV Vehicle Safety Monitoring
	MCV Vehicle System Monitoring and Diagnostics
	MCV Work Zone Support
Parking Management Subsystem	Parking Data Collection
	Parking Electronic Payment
	Parking Management
	Parking Surveillance
Personal Information Access Subsystem	Personal Basic Information Reception
	Personal Interactive Information Reception
	Personal Location Determination
	Personal Provider-Based Route Guidance
Remote Traveler Support Subsystem	Remote Basic Information Reception
	Remote Interactive Information Reception
	Remote Transit Fare Management
	Remote Transit Information Services
	Remote Traveler Security
	Traveler Secure Area Sensor Monitoring
	Traveler Secure Area Surveillance

Table 6 – Lufkin Region Equipment Packages (continued)

Subsystem	Equipment Package
Roadway Subsystem	Field Barrier System Control
	Roadway Basic Surveillance
	Roadway Data Collection
	Roadway Environmental Monitoring
	Roadway Equipment Coordination
	Roadway Incident Detection
	Roadway Infrastructure Monitoring
	Roadway Probe Beacons
	Roadway Signal Controls
	Roadway Signal Priority
	Roadway Speed Monitoring
	Roadway Traffic Information Dissemination
	Roadway Work Zone Safety
	Roadway Work Zone Traffic Control
	Standard Rail Crossing
Security Monitoring Subsystem	Field Secure Area Sensor Monitoring
	Field Secure Area Surveillance
Toll Administration Subsystem	Toll Data Collection
	Toll Operator Alert
Toll Collection Subsystem	Toll Plaza Toll Collection
Traffic Management Subsystem	Barrier System Management
	Collect Traffic Surveillance
	HRI Traffic Management
	Rail Operations Coordination
	TMC Environmental Monitoring
	TMC Evacuation Support
	TMC Freeway Management
	TMC Incident Detection
	TMC Incident Dispatch Coordination/Communication
	TMC Multimodal Coordination
	TMC Probe Information Collection
	TMC Regional Traffic Control
	TMC Signal Control
	TMC Speed Monitoring
	TMC Traffic Information Dissemination
	TMC Work Zone Traffic Management
	Traffic Data Collection
	Traffic Maintenance

Table 6 – Lufkin Region Equipment Packages (continued)

Subsystem	Equipment Package
Transit Management Subsystem	Transit Center Fare and Load Management
	Transit Center Fixed-Route Operations
	Transit Center Information Services
	Transit Center Multi-Modal Coordination
	Transit Center Paratransit Operations
	Transit Center Security
	Transit Center Tracking and Dispatch
	Transit Data Collection
	Transit Environmental Monitoring
	Transit Evacuation Support
	Transit Garage Operations
Transit Vehicle Subsystem	On-board Environmental Monitoring
	On-board Fixed Route Schedule Management
	On-board Paratransit Operations
	On-board Transit Fare and Load Management
	On-board Transit Information Services
	On-board Transit Security
	On-board Transit Signal Priority
	On-board Transit Trip Monitoring
Vehicle Subsystem	Basic Vehicle Reception
	Interactive Vehicle Reception
	Smart Probe
	Vehicle Location Determination
	Vehicle Mayday I/F
	Vehicle Probe Support
	Vehicle Provider-Based Route Guidance
	Vehicle Safety Monitoring System
	Vehicle Toll/Parking Interface

4.5 Standards

Standards are an important tool that will allow efficient implementation of the elements in the Lufkin Regional ITS Architecture over time. Standards facilitate deployment of interoperable systems at local, regional, and national levels without impeding innovation as technology advances, vendors change, and as new approaches evolve. The USDOT’s ITS Joint Program Office is supporting Standards Development Organizations (SDOs) with an extensive, multi-year program of accelerated, consensus-based standards development to facilitate successful ITS deployment in the United States. **Table 7** identifies each of the ITS standards that could apply to the Lufkin Regional ITS Architecture. These standards are based on the physical subsystem architecture flows previously identified in Section 4.3.4. The connection of each standard to the

applicable architecture flows between elements can be viewed on the Lufkin Regional ITS Architecture web site by clicking on the “Interfaces” or “Standards” buttons.

Table 7 – Applicable ITS Standards for the Lufkin Region

SDO	Document ID	Title	Type
AASHTO/ITE/NEMA	NTCIP 1201	Global Object Definitions	Message/Data
	NTCIP 1202	Object Definitions for Actuated Traffic Signal Controller Units	Message/Data
	NTCIP 1203	Object Definitions for Dynamic Message Signs	Message/Data
	NTCIP 1204	Object Definitions for Environmental Sensor Stations and Roadside Weather Information System	Message/Data
	NTCIP 1205	Data Dictionary for Closed Circuit Television (CCTV)	Message/Data
	NTCIP 1206	Data Collection and Monitoring Devices	Message/Data
	NTCIP 1208	Object Definitions for Video Switches	Message/Data
	NTCIP 1209	Transportation System Sensor Objects	Message/Data
	NTCIP 1210	Objects for Signal Systems Master	Message/Data
	NTCIP 1211	Objects for Signal Control Priority	Message/Data
	NTCIP 1401	TCIP – Common Public Transportation (CPT) Business Area Standard	Message/Data
	NTCIP 1402	TCIP – Incident Management (IM) Business Area Standard	Message/Data
	NTCIP 1403	TCIP – Passenger Information (PI) Business Area Standard	Message/Data
	NTCIP 1404	TCIP – Scheduling/Runcutting (SCH) Business Area Standard	Message/Data
	NTCIP 1405	TCIP – Spatial Representation (SP) Business Area Standard	Message/Data
	NTCIP 1406	TCIP – Onboard (OB) Business Area Standard	Message/Data
	NTCIP 1407	TCIP – Control Center (CC) Business Area Standard	Message/Data
	NTCIP 1408	TCIP – Fare Collection (FC) Business Area Standard	Message/Data
	Various	NTCIP Center-to-Center Standards Group	Group
	Various	NTCIP Center-to-Field Standards Group	Group
ASTM	Various	Dedicated Short Range Communication at 915 MHz Standards Group	Group
IEEE	IEEE 1570-2002	Standard for Interface Between the Rail Subsystem and the Highway Subsystem at a Highway Rail Intersection	Message/Data
	IEEE Std 1455-1999	Standard for Message Sets for Vehicle/Roadside Communications	Message/Data
	Various	Incident Management Standards Group	Group
ITE	ITE TM 1.03	Standard for Functional Level Traffic Management Data Dictionary (TMDD)	Message/Data
	ITE TM 2.01	Message Sets for External TMC Communication (MS/ETMCC)	Message/Data

Table 7 – Applicable ITS Standards for the Lufkin Region (continued)

SDO	Document ID	Title	Type
SAE	Various	Advanced Traveler Information Systems (ATIS) General Use Standards Group	Group
	Various	ATIS Bandwidth Limited Standards Group	Group
	Various	On-board Vehicle Mayday Standards Group	Group
SAE/IEEE	Various	Dedicated Short Range Communication at 5.9 GHz Standards Group	Group

4.6 Phases of Implementation

The Lufkin Regional ITS Architecture will be implemented through a series of projects led by public sector, and in some cases private sector agencies. Key foundation systems will need to be implemented in order to support other systems that have been identified in the Regional ITS Architecture. The deployment of all of the systems required to achieve the final Lufkin Regional ITS Architecture build out will occur over many years.

A sequence of projects and their respective time frames have been identified in the Lufkin Regional ITS Deployment Plan. These projects have been sequenced over a 20-year period, with projects identified for deployment in 5-, 10- and 20-year timeframes.

Some of the key market packages that will provide the functions for the key foundation systems in the Lufkin Region are listed below. Projects associated with these and other market packages identified for the Region have been included in the Lufkin Regional ITS Deployment Plan.

- Network Surveillance;
- Traffic Information Dissemination;
- Road Weather Data Collection; and
- Work Zone Management.

5. OPERATIONAL CONCEPT

The operational concept for the Lufkin Region provides a description of the stakeholders' roles and responsibilities in the operation of the systems that currently exist or that are being proposed. This operational concept provides an "executive summary" view of the way the Lufkin Region's systems will work together, and it documents the roles and responsibilities for each of the services that ITS will provide. The approach to describing the operational concept is to present specific operational scenarios that describe and define the stakeholders' general roles in providing the services.

In addition to the operational scenarios that illustrate the roles and responsibilities of each agency, a list of the key agencies that are responsible for operations in the eight ITS areas is presented in Section 5.2. This list will serve as a high level overview of the different roles and responsibilities in this operational concept. In addition, specific roles and coordination requirements for operations are illustrated through the customized market package diagrams presented in **Appendix A**.

With the integration, information sharing, and in some cases joint operations of systems, there will likely be a requirement for agency agreements. Descriptions of potential agreements that may be needed in the Lufkin Region are included in Section 5.3.

5.1 Operational Scenarios

Scenario 1

The first operational scenario describes how ITS technologies may be used during a major evacuation due to a hurricane. In this operational scenario, US 59 in Lufkin has been instrumented with CCTV cameras, detectors, DMS, and lane control signals. Connections between the City of Nacogdoches, City of Lufkin, TxDOT Lufkin District TMC, and other key agencies have been established. TxDOT's center-to-center communications allows for real-time communication and information exchange among District TMCs in Lufkin, Houston, Beaumont and others around the state. Flood sensors have been deployed at key locations in the Region by several agencies, and flood data also is available from the US Geological Survey and river authorities. All the systems are continuously monitored using an integrated network of detection and monitoring systems providing real-time information to the TxDOT TMC. At the TxDOT TMC the surveillance information is assimilated and "packaged" so it can be effectively disseminated to the public through the Lufkin Region's traveler information system.

A hurricane is approaching southeast Texas, and an alert is put out to citizens in Houston and Beaumont to begin evacuating the area. The TxDOT Houston and Beaumont Districts activate evacuation routing and advisory plans, and notify the TxDOT Lufkin TMC that evacuees are advised to head north. US 59 from Houston and US 287/69 from Beaumont are primary evacuation corridors. TxDOT Lufkin TMC alerts the City of Nacogdoches, City of Nacogdoches EOC, City of Lufkin, the City of Livingston and local media that evacuations will be causing significant increases in northbound traffic volumes on the major US highways in the region. Although there is no immediate wind danger or evacuation required for residents in the Lufkin Region, heavy rains from the hurricane have been pounding the area for several hours, flooding roads in the metro areas and causing the rivers and streams to swell. River authorities are monitoring their stream gauges and issue high water advisories to TxDOT and DPS. TxDOT's flood sensors are indicating that portions of key routes in low-lying areas are starting to flood.

TxDOT monitors conditions on US 59 in Lufkin through CCTV cameras and vehicle detectors to determine the level of congestion on roadways. DMS along US 59 approaching the Lufkin urban area provide up to date information to motorists as they head inland, and highway advisory radio (HAR) and 511 provide longer more detailed messages for motorists en-route. The arterial streets are also closely monitored by TxDOT, the City of Lufkin, and the City of Nacogdoches using VIVDS at intersections as well as CCTV video feeds that are shared among the three operations centers. The Brazos Transit District receives updated information about current road conditions and evacuation traffic issues on major corridors. The Brazos Transit District is put on alert that buses might be needed to transport evacuees to shelters established in Livingston, Lufkin, and Nacogdoches.

As the evacuation traffic increases, a joint decision is made by local and state agencies to use all lanes of US 59 and US 287/69 as northbound. TxDOT uses lane control signals to indicate which lanes are open as well as DMS to alert vehicles that may be attempting to travel southbound. Special traffic signal timing plans are implemented on traffic signals, which facilitates steady traffic movement on key corridors in the urban areas, and provides priority for northbound traffic. HAR messages are updated to warn motorists of the all-lanes-north evacuation routes, and an emergency message on 511 provides up-to-the-minute information about routing on these key evacuation corridors. Heavy rains continue to fall in the Lufkin Region, and river authorities, TxDOT, and cities of Lufkin and Nacogdoches share real-time flood data, and provide DPS with updates on flooded portions of roadways. 911 Dispatch Centers are kept apprised of current road conditions, including heavy traffic volumes and one-way routing that has been implemented. TxDOT TMCs in Lufkin and Beaumont continue to provide updated information to the TxDOT Lufkin TMC, and operators in Lufkin are able to view camera images from US 59 near Houston, which show substantial back-ups as evacuees make their way north.

Throughout the evacuation, data and camera feeds have been continuously sent to the media for broadcast alerts on traffic conditions. Data is continuously updated on HCRS, 511 and TxDOT web sites. The improved accuracy of traveler information and the ability to monitor and control the freeway and arterial systems have contributed to the successful management of evacuation traffic in the Lufkin Region.

Scenario 2

The second operational scenario describes how the integrated elements of the Lufkin Region's ITS program will function together in the event of a HAZMAT incident on US 59 between Lufkin and Nacogdoches. In this operational scenario, TxDOT has instrumented some corridors with permanent DMS and CCTV cameras for monitoring. Portable DMS provide additional spot-coverage. The TxDOT Lufkin District TMC also facilitates information sharing with motorists on state routes.

The City of Lufkin 911 dispatch receives several calls from motorists on US 59 about a crash in the northbound lanes involving a large tanker truck. The dispatcher logs the incident details and relays the incident information to the Lufkin Fire/EMS and the DPS Communications center, which sends out an officer. The crash, which took place approximately eight miles north of Lufkin, is blocking both northbound lanes. Once on-scene, the DPS officer sees that the tanker is carrying hazardous material, and there is a potential spill. Using his mobile data terminal, the DPS officer sends a message with the incident details, including the license number of the tanker truck and a request for additional highway patrol support as well as emergency services, to dispatch. Through the regional HAZMAT permit and notification system, DPS Communications is able to message back to the officer that the truck is carrying an extremely dangerous substance

and that the extent of damage to the vehicle indicates that a leak is likely. A message from DPS Communications with the incident details is automatically routed to the City of Nacogdoches Public Works and EOC, City of Lufkin, and TxDOT Lufkin District Office, and a request is made for HAZMAT crews to assist with incident clearance.

DPS closes US 59 in both directions to allow HAZMAT teams to safely clear the area and limit exposure to travelers. DPS Communications notifies the TxDOT Lufkin TMC of the closure, and operators at the TMC immediately dispatch maintenance crews to implement the closure and re-route motorists that are stopped in both directions. TxDOT Lufkin maintenance crews also set up a portable work zone unit that is equipped with a wireless CCTV camera and allows operators at the TxDOT Lufkin TMC to observe activities and traffic impacts at the accident scene. Video feeds are also shared with the Cities of Lufkin and Nacogdoches, DPS Communications and local media. Local media are informed of the incident and closure, and they broadcast via radio and TV reports that many streets will be closed for several hours. TxDOT updates the HCRS web page, HAR, and 511 traveler information phone number with the information.

There are few alternate routes on that portion of US 59, and DPS officers are routing motorists onto FM roads where available. TxDOT Lufkin TMC operators post messages on permanent DMS on US 59 in advance of the incident to warn motorists about the closure. Through center-to-center communications, TxDOT Lufkin advises TxDOT TMCs in Houston and Tyler about the closure and that traffic is being re-routed. Messages are immediately placed on permanent DMS throughout the Region to notify motorists of the incident and resulting road closures. Portable DMS are placed at key locations in the Lufkin and Nacogdoches metro areas to warn motorists about the closure on US 59 while they can still take an alternate route.

Although the closure and HAZMAT cleanup takes several hours, systems and technologies in the Lufkin Region provide up-to-the minute information to multiple agencies, and motorists are able to have advanced warning about the closure of this major route, thus minimizing the impact of this incident.

5.2 Roles and Responsibilities

The operational scenarios described in the previous section illustrate the interagency cooperation and coordination that is required in two situations that might occur in the Lufkin Region. During any operational scenario, a number of agencies will be required to coordinate closely to perform their operational responsibilities. The key agencies that have a lead role or responsibility during operations are listed below for each ITS area. It is recognized that a number of other agencies will also need to be involved during a scenario in addition to the ones listed below, although it is not expected that these agencies will play as critical a role in operations.

Travel and Traffic Management

- TxDOT
- City of Lufkin, including Police, Public Works
- City of Nacogdoches, including Police, Public Works
- Other TxDOT Districts (Houston, Beaumont)
- Louisiana Department of Transportation and Development
- County Road and Bridge
- Brazos Transit District

Public Transportation Management

- Brazos Transit District
- TxDOT (non-emergency medical transport)
- Independent School Districts

Electronic Payment

- Not Applicable

Commercial Vehicle Operations

- Department of Public Safety
- TxDOT

Emergency Management

- City of Lufkin, Including Police, Fire and EMS
- City of Nacogdoches, Including Police, Fire, EMS and EOC
- Texas Department of Public Safety
- Angelina and Neches River Authority
- Texas Department of Emergency Management

Advanced Vehicle Safety System Needs

- Not Applicable

Information Management

- Deep East Texas Council of Governments
- TxDOT

Maintenance and Construction Management

- TxDOT
- City of Lufkin
- City of Nacogdoches
- County Road and Bridge
- Louisiana Department of Transportation and Development

5.3 Lufkin Agreements

The Regional ITS Architecture for the Lufkin Region has identified several agency interfaces, information exchanges, and integration strategies that would be needed to provide the ITS services and systems identified by the stakeholders in the Region. Interfaces and data flows among public and private entities in the Lufkin Region will require agreements among agencies that establish parameters for sharing agency information to support traffic management, incident

management, provide traveler information, and other functions identified in the Regional ITS Architecture.

Currently, there are no formal agreements in place in the Lufkin Region with regards to ITS. Stakeholders indicated that while there is a high degree of cooperation among agencies, there hasn't been a need for formal agreements to facilitate multi-jurisdictional resource sharing and cooperation. With the implementation of ITS technologies, integrating systems from one or more agencies, and the anticipated level of information exchange identified in the architecture, it is likely that more formal agreements will be needed. These agreements, while perhaps not requiring a financial commitment from agencies in the Region, should outline specific roles, responsibilities, data exchanges, levels of authority, and other facets of regional operations. Some agreements will also outline specific funding responsibilities, where appropriate and applicable.

Table 8 provides a list of potential agreements for the Lufkin Region based on the interfaces identified in the Regional Architecture. It is important to note that as ITS services and systems are implemented in the Region, part of the planning and review process for those projects should include a review of potential agreements that would be needed for implementation or operations.

Table 8 – Potential Agreements for the Lufkin Region

Agreement and Agencies	Status	Agreement Description	Considerations
<p>Data Sharing and Usage (Public) TxDOT Lufkin District and Public Agencies within the Region</p>	<p>Future</p>	<p>This agreement would define the parameters, guidelines and policies for inter- and intra-agency ITS data sharing. This data sharing would support regional activities related to traffic management, incident management, and traveler information, and other functions, most likely real-time or near-real-time. Data also would include video images from CCTV cameras. The terms of this agreement should generally address such items as:</p> <ul style="list-style-type: none"> ▪ Types of data and information to be shared ▪ Repository for information (i.e., TxDOT Lufkin District as central hub) ▪ How the information will be used (traffic incident management, displayed on web site for travel information, distributed to private media, etc.) ▪ Parameters for data format, quality, security 	<p>These agreements are typically zero-dollar agreements, in that there is no charge among agencies for the actual data, although there might be some cost incurred for infrastructure, systems/software interfaces, or communications systems to enable data sharing between agencies.</p>

Table 8 – Potential Agreements for the Lufkin Region (continued)

Agreement and Agencies	Status	Agreement Description	Considerations
<p>Data Sharing and Usage (Public-Private) TxDOT Lufkin District and Private Media/Information Service Providers</p>	<p>Future</p>	<p>This agreement would define the parameters, guidelines and policies for private media use of regional ITS-related information from TxDOT Lufkin. This type of agreement is recommended between TxDOT (data provider) and the media (data user) to define terms of use for broadcasting public-agency information regarding traffic conditions, closures, restrictions, as well as video images. Agreements can also include requirements for the media to 'source' the information (i.e., using the TxDOT logo on all video images broadcast).</p>	<p>These agreements can be zero-dollar agreements, although some agencies have stipulated identifying source of the information, public service announcements by the media, or other requirements as a term of use. The private media entity is typically responsible for paying any necessary costs for access (i.e., communications infrastructure to link to the TxDOT database or video switch). These agreements also typically include a sunset clause to allow the agency to periodically review the agreement and make any modifications prior to renewal.</p>
<p>Shared Video Monitoring (Public) TxDOT Lufkin City of Lufkin City of Nacogdoches City of Livingston City of Crockett City/County EOCs DPS Dispatch River Authorities</p>	<p>Future</p>	<p>This agreement would enable shared video monitoring of TxDOT CCTV cameras by public safety and emergency services agencies in the Lufkin Region for incident management purposes. This agreement would define the parameters and policies for public safety agencies to access video images via the TxDOT video switch. It is recommended that the agreement include any TxDOT policies relating to video images (including recording/archiving, privacy, disclaimers, use of video and redistribution) as well as processes for agency requests for specific views. Shared video monitoring <u>does not</u> address shared use or shared control of video equipment functions.</p>	<p>These agreements are typically zero-dollar agreements, in that there is no charge among agencies for the actual data, although there might be some cost incurred for infrastructure, systems or communications between agencies, particularly with the high bandwidth required for transmitting live video images.</p>
<p>Mutual Aid Agreements (Public and Private) TxDOT Lufkin DPS City and Volunteer Fire Departments City Police</p>	<p>Existing (Informal)</p>	<p>Mutual aid agreements currently exist as informal arrangements in the Lufkin Region, although they are a routine practice among public safety and emergency services agencies. Formal mutual aid agreements will become more important as agencies integrate systems and capabilities, particularly automated dispatch and notification.</p>	<p>These agreements are typically zero-dollar agreements, although there might be some funding required to support regional incident management activities. The agreement also would outline resource commitments that would be part of any mutual aid arrangement (personnel, equipment, facilities, etc.).</p>



Table 8 – Potential Agreements for the Lufkin Region (continued)

Agreement and Agencies	Status	Agreement Description	Considerations
<p>Joint Operations/Shared Control Agreements (Public)</p> <p>TxDOT Lufkin City of Lufkin City of Nacogdoches City of Livingston City of Crockett DPS</p>	<p>Future</p>	<p>These agreements are formal arrangements to allow joint operations or control of certain systems and equipment. This could include operating or changing timing plans on traffic signals, using CCTV cameras, and posting messages on DMS. The agreement would need to define the terms of this arrangement, such as hours of operation and time of day/time of week where shared control would take effect, circumstances or incidents where shared control would take effect, notification procedures between the agencies agreeing to shared control arrangements, etc.</p>	<p>Joint operations/shared control agreements could consider some form of mutual funding for certain system elements, primarily communication links. Appropriate software interfaces on agency workstations will also be required for agencies desiring to share control of field equipment.</p>